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Application of Salagean differential operator to certain Subclasses of harmonic univalent functions

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Abstract: For analytic functions of the form $f_i(z) = z + \sum_{n=2}^{\infty} a_n^i z^n$ in the open unit disk, we define the Salagean differential operator $D^n f_i(z)$ to be

$$D^n f_i(z) = z + \sum_{n=2}^{\infty} n^k a_n^i z^n$$

In this paper, we investigated some properties of $D^n f_i(z)$ for $\Gamma_{\alpha}^n(\zeta_1, \zeta_2; \gamma)$ in

$$F_{\alpha}(z) = \int_0^z \prod_{i=1}^k \left(\frac{D^n f_i(s)}{s} \right)^{1/\alpha} ds, \alpha \in \mathbb{C} \quad |\alpha| \leq 1$$

Mathematics Subject Classification: 30C45

Index Terms: Analytic, Univalence, Harmonic, Coefficient bound, Convolution, Convex combination.

I. INTRODUCTION

Let H denote the family of continuous complex-valued functions which are harmonic in the open unit disk $U = \{z : |z| < 1\}$ and let A be the subclass of H consisting of functions which are analytic in U . A function harmonic in U may be written as

$f = h + \bar{g}$, where h is referred to as the analytic part and g the co-analytic part of f and h, g are members of A . f is said to be sense preserving if $|h'(z)| > |g'(z)|$ where

$$h(z) = z + \sum_{n=2}^{\infty} a_n z^n, \quad g(z) = \sum_{n=1}^{\infty} a_n z^n \tag{1}$$

It is observed that the sense preserving property implies that $|b_1| < 1$. Let SH denote the family of functions $f = h + \bar{g}$ which are harmonic univalent and sense-preserving in

U for which f is normalized with $f_z(0) = f'_z(0) - 1 = 0$. It noted that SH reduces to the class S of normalized analytic univalent function in U if the co-analytic part of f

is identically zero. Clunie and Sheil-Small [3] in 1984 investigated the class SH as well as its geometric subclasses and obtained some coefficient bounds. Since then, there have been several related papers on SH and its subclasses. Elif Yasar and Sibel Yalcni

[7] studied convolution properties of Salagean-type of harmonic univalent functions, Ahuja and Jahangiri[2], Makinde [5] studied convolution of special class of harmonic univalent functions. N.Seenivasagan [6] gave a condition for the univalence of the integral operator defined by

$$F_{\alpha, \beta}(z) = \left\{ \beta \int_0^z t^{\beta-1} \prod_{i=1}^k \left(\frac{f_i(t)}{t} \right)^{1/\alpha} dt \right\}^{1/\alpha}$$

Where $f_i(z)$ is defined as

$$f_i(z) = z + \sum_{n=2}^{\infty} a_n^i z^n \tag{2}$$

The differential operator $D^n (n \in \mathbb{N})_0$ was introduced by Salagean [6]. Where $D^n f(z)$

is defined by

$$D^n f(z) = D(D^{n-1} f(z)) = z(D^{n-1} f(z))' \text{ with } D^0 f(z) = f(z) \quad (3)$$

We give the Salagean Differential operator for the function $f_i(z)$ in (2) to be of the form

$$D^n f_i(z) = z + \sum_{n=2}^{\infty} n^k a_n^i z^n \quad (4)$$

Let $f_i(z) = h_i(z) + \bar{g}_i(z)$ where

$$h_i(z) = z + \sum_{n=2}^{\infty} a_n^i z^n, \quad g_i(z) = \sum_{n=1}^{\infty} b_n^i z^n \quad (5)$$

And

$$D^n F_i(z) = z + \sum_{n=2}^{\infty} n^k a_n^i z^n + \overline{\sum_{n=1}^{\infty} n^k b_n^i z^n} \quad (6)$$

$$F_\alpha(z) = \int_0^z \prod_{i=1}^k \left(\frac{D^n f_i(s)}{s} \right)^{1/\alpha} ds, \alpha \in \mathbb{C} \quad |\alpha| \leq 1 \quad (7)$$

Where $f_i(z)$ is as in (2). Makinde and Oladipo in [5] investigated some properties of $\Gamma_\alpha^n(\zeta_1, \zeta_2; \gamma)$ for the function $f_i(z)$ in $F_\alpha(z)$ defined by (7).

We define

$$\Gamma_\alpha^n(\zeta_1, \zeta_2; \gamma) = \left\{ F_i \in A : \left| \frac{G(z) + \frac{1}{\alpha} - 1}{\zeta_1 \left(G(z) + \frac{1}{\alpha} \right) + \zeta_2} \right| \leq \gamma \right\}$$

Where

$$G(z) = \frac{z F'_\alpha(z)}{F_\alpha(z)} = \sum_{i=1}^k \frac{1}{\alpha} \left(\frac{D^{n+1} f_i(z)}{D^n f_i(z)} - 1 \right) \\ D^n H_i(z) = z + \sum_{n=2}^{\infty} n^k c_n^i z^n + \overline{\sum_{n=1}^{\infty} n^k d_n^i z^n} \quad (8)$$

Moreover, we recall the following definition of the well known classes of starlike and convex functions S^* and S^c given by Acu and Owa [1] denoted by

$$S^* = \left\{ f \in A : \operatorname{Re} \left\{ \frac{z f'(z)}{f(z)} \right\} > 0, z \in U \right\} \quad (9)$$

$$S^c = \left\{ f \in A : \operatorname{Re} \left\{ 1 + \frac{z f''(z)}{f'(z)} \right\} > 0, z \in U \right\} \quad (10)$$

We introduce the class of function

$$F_i(z) * D^n H_i(z) = (D^n F_i * D^n H_i)(z) = z + \sum_{n=2}^{\infty} n^k a_n^i c_n^i z^n + \overline{\sum_{n=1}^{\infty} n^k b_n^i d_n^i z^n} \quad (11)$$

In this paper, we obtain some properties of the class $\Gamma_\alpha^n(\zeta_1, \zeta_2; \gamma)$.

II. MAIN RESULTS

Theorem 1 Let $D^n F_i(z)$ be as in (6) and $F_\alpha(z)$ be as in (7). Then $D^n F_i(z)$ is in the class $\Gamma_\alpha^n(\zeta_1, \zeta_2; \gamma)$ if and only if

$$\sum_{i=1}^k \sum_{n=2}^{\infty} \{ n^k [n(1 + \gamma \zeta_1) + \alpha(\gamma \zeta_2 - 1)] \} |a_n^i + b_n^i| \leq 2[\gamma|\zeta_1 + \alpha \zeta_2| - |1 - \alpha|] \quad (10)$$

$$\zeta_1 (0 \leq \zeta_1 \leq 1), \quad \zeta_2 (0 < \zeta_2 \leq 1), \quad \alpha (0 < \alpha \leq 1); \quad |b_n^i| = 1$$

Proof

$$\left| \frac{G(z) + \frac{1}{\alpha} - 1}{\zeta_1 \left(G(z) + \frac{1}{\alpha} \right) + \zeta_2} \right| = \left| \frac{\sum_{i=1}^k D^{n+1} F_i(z) - \alpha D^n F_i(z)}{\sum_{i=1}^k \zeta_1 D^{n+1} F_i(z) - \alpha \zeta_2 D^n F_i(z)} \right|$$

$$= \left| \frac{\sum_{i=1}^k \frac{2z(1-\alpha) + \sum_{n=2}^{\infty} n^k (n-\alpha) (a_n^i z^n + \overline{b_n^i z^n})}{2z(\zeta_1 + \alpha \zeta_2) + \sum_{n=2}^{\infty} n^k (n\zeta_1 + \alpha \zeta_2) (a_n^i z^n + \overline{b_n^i z^n})}}{2|1-\alpha| + \sum_{i=1}^k \sum_{n=2}^{\infty} n^k (n-\alpha) |a_n^i + b_n^i|} \right|$$

$$\leq \frac{2|\zeta_1 + \alpha \zeta_2| - \sum_{i=1}^k \sum_{n=2}^{\infty} n^k (n\zeta_1 + \alpha \zeta_2) |a_n^i + b_n^i|}{2|\zeta_1 + \alpha \zeta_2| - |1-\alpha|}$$

Let $D^n F_i(z)$ satisfies inequality (10), then $D^n F_i(z)$ is in the class $\Gamma_{\alpha}^n(\zeta_1, \zeta_2; \gamma)$.

Conversely, let $D^n F_i(z)$ be in the class $\Gamma_{\alpha}^n(\zeta_1, \zeta_2; \gamma)$ then

$$\sum_{i=1}^k \sum_{n=2}^{\infty} \{n^k [n(1 + \gamma \zeta_1) + \alpha(\gamma \zeta_2 - 1)]\} |a_n^i + b_n^i| \leq 2[\gamma|\zeta_1 + \alpha \zeta_2| - |1 - \alpha|]$$

Corollary 1 If $D^n F_i(z)$ is in the class $\Gamma_{\alpha}^n(\zeta_1, \zeta_2; \gamma)$ then

$$|a_n^i + b_n^i| \leq \frac{2[\gamma|\zeta_1 + \alpha \zeta_2| - |1 - \alpha|]}{n^k [n(1 + \gamma \zeta_1) + \alpha(\gamma \zeta_2 - 1)]}$$

Corollary 2 If $D^n F_i(z)$ is in the class $\Gamma_{\alpha}^n(\zeta_1, \zeta_2; \gamma)$ then

$$|a_n^i| \leq \frac{2[\gamma|\zeta_1 + \alpha \zeta_2| - |1 - \alpha|] - |b_n^i| n^k [n(1 + \gamma \zeta_1) + \alpha(\gamma \zeta_2 - 1)]}{n^k [n(1 + \gamma \zeta_1) + \alpha(\gamma \zeta_2 - 1)]}$$

Corollary 3 If $D^n F_i(z)$ is in the class $\Gamma_{\alpha}^n(\zeta_1, \zeta_2; \gamma)$ then

$$|b_n^i| \leq \frac{2[\gamma|\zeta_1 + \alpha \zeta_2| - |1 - \alpha|] - |a_n^i| n^k [n(1 + \gamma \zeta_1) + \alpha(\gamma \zeta_2 - 1)]}{n^k [n(1 + \gamma \zeta_1) + \alpha(\gamma \zeta_2 - 1)]}$$

Theorem 2 Let $D^n F_i(z)$ be in the class $\Gamma_{\alpha}^n(\zeta_1, \zeta_2; \gamma)$ and the function $D^n H_i(z)$ defined by

$$D^n H_i(z) = z + \sum_{n=2}^{\infty} n^k A_n^i z^n + \sum_{n=1}^{\infty} n^k B_n^i z^n$$

Be in the same class $\Gamma_{\alpha}^n(\zeta_1, \zeta_2; \gamma)$. Then the function $H(z)$ defined by

$$H(z) = (1 - \lambda) D^n F_i(z) + \lambda D^n H_i(z) = z + \sum_{n=2}^{\infty} n^k C_n^i z^n$$

Is also in the class $\Gamma_{\alpha}^n(\zeta_1, \zeta_2; \gamma)$, where

$$C_n^i = (1 - \lambda)(a_n^i + \overline{b_n^i}) + \lambda(A_n^i + \overline{B_n^i})$$

Proof: Suppose that each of $D^n F_i(z)$, $D^n H_i(z)$ is in the class $\Gamma_{\alpha}^n(\zeta_1, \zeta_2; \gamma)$.

Then by(10)

$$\sum_{i=1}^k \sum_{n=2}^{\infty} \{n^k [n(1 + \gamma \zeta_1) + \alpha(\gamma \zeta_2 - 1)]\} |C_n^i|$$

$$= \sum_{i=1}^k \sum_{n=2}^{\infty} \{n^k [n(1 + \gamma \zeta_1) + \alpha(\gamma \zeta_2 - 1)]\} |(1 - \lambda)(a_n^i + \overline{b_n^i}) + \lambda(A_n^i + \overline{B_n^i})|$$

$$= \sum_{i=1}^k \sum_{n=2}^{\infty} \{n^k [n(1 + \gamma \zeta_1) + \alpha(\gamma \zeta_2 - 1)]\} [(1 - \lambda)(|a_n^i + \overline{b_n^i}|) + \lambda(|A_n^i + \overline{B_n^i}|)]$$

$$\leq (1 - \lambda) 2[\gamma|\zeta_1 + \alpha \zeta_2| - |1 - \alpha|] + \lambda 2[\gamma|\zeta_1 + \alpha \zeta_2| - |1 - \alpha|]$$

$$= 2[\gamma|\zeta_1 + \alpha \zeta_2| - |1 - \alpha|]$$

Which proves the theorem.

Theorem 3 Let $D^n F_i(z)$ be as in (6) and $F_{\alpha}(z)$ be as in (7). Then the function $D^n C_i(z)$

Defined by $D^n C_i(z) = z + \sum_{n=2}^{\infty} n^k a_n^i A_n^i z^n + \sum_{n=1}^{\infty} n^k b_n^i B_n^i z^n$ belong to the class $\Gamma_{\alpha}^n(\zeta_1, \zeta_2; \gamma)$ if and only if

$$\sum_{i=1}^k \sum_{n=2}^{\infty} \{n^k [n(1 + \gamma\zeta_1) + \alpha(\gamma\zeta_2 - 1)]\} |a_n^i A_n^i + b_n^i B_n^i| \leq 2[\gamma|\zeta_1 + \alpha\zeta_2| - |1 - \alpha|]$$

Proof: The proof follows the procedure of that of the Theorem 1

Corollary 4 Let $D^n F_i(z)$ be as in (6) and $F_\alpha(z)$ be as in (7) and the function $D^n C_i(z)$ Defined by $D^n C_i(z) = z + \sum_{n=2}^{\infty} n^k a_n^i A_n^i z^n + \sum_{n=1}^{\infty} n^k b_n^i B_n^i z^n$ belong to the class $\Gamma_\alpha^n(\zeta_1, \zeta_2; \gamma)$ Then we have

$$|a_n^i A_n^i + b_n^i B_n^i| \leq \frac{2[\gamma|\zeta_1 + \alpha\zeta_2| - |1 - \alpha|]}{n^k [n(1 + \gamma\zeta_1) + \alpha(\gamma\zeta_2 - 1)]}$$

Corollary 5 Let $D^n F_i(z)$ be as in (6) and $F_\alpha(z)$ be as in (7) and the function $D^n C_i(z)$ Defined by $D^n C_i(z) = z + \sum_{n=2}^{\infty} n^k a_n^i A_n^i z^n + \sum_{n=1}^{\infty} n^k b_n^i B_n^i z^n$ belong to the class $\Gamma_\alpha^n(\zeta_1, \zeta_2; \gamma)$ Then we have

$$|a_n^i A_n^i| \leq \frac{2[\gamma|\zeta_1 + \alpha\zeta_2| - |1 - \alpha|] - |b_n^i B_n^i| n^k [n(1 + \gamma\zeta_1) + \alpha(\gamma\zeta_2 - 1)]}{n^k [n(1 + \gamma\zeta_1) + \alpha(\gamma\zeta_2 - 1)]}$$

Corollary 6 Let $D^n F_i(z)$ be as in (6) and $F_\alpha(z)$ be as in (7) and the function $D^n C_i(z)$ Defined by $D^n C_i(z) = z + \sum_{n=2}^{\infty} n^k a_n^i A_n^i z^n + \sum_{n=1}^{\infty} n^k b_n^i B_n^i z^n$ belong to the class $\Gamma_\alpha^n(\zeta_1, \zeta_2; \gamma)$ Then we have

$$|b_n^i B_n^i| \leq \frac{2[\gamma|\zeta_1 + \alpha\zeta_2| - |1 - \alpha|] - |a_n^i A_n^i| n^k [n(1 + \gamma\zeta_1) + \alpha(\gamma\zeta_2 - 1)]}{n^k [n(1 + \gamma\zeta_1) + \alpha(\gamma\zeta_2 - 1)]}$$

Corollary 7 Let $D^n F_i(z)$ be as in (6) and $F_\alpha(z)$ be as in (7) and the function $D^n C_i(z)$ Defined by $D^n C_i(z) = z + \sum_{n=2}^{\infty} n^k a_n^i A_n^i z^n + \sum_{n=1}^{\infty} n^k b_n^i B_n^i z^n$ belong to the class $\Gamma_\alpha^n(\zeta_1, \zeta_2; \gamma)$ Then we have

$$|a_n^i| \leq \frac{2[\gamma|\zeta_1 + \alpha\zeta_2| - |1 - \alpha|] - |b_n^i B_n^i| n^k [n(1 + \gamma\zeta_1) + \alpha(\gamma\zeta_2 - 1)]}{|A_n^i| n^k [n(1 + \gamma\zeta_1) + \alpha(\gamma\zeta_2 - 1)]}$$

Corollary 8 Let $D^n F_i(z)$ be as in (6) and $F_\alpha(z)$ be as in (7) and the function $D^n C_i(z)$ Defined by $D^n C_i(z) = z + \sum_{n=2}^{\infty} n^k a_n^i A_n^i z^n + \sum_{n=1}^{\infty} n^k b_n^i B_n^i z^n$ belong to the class $\Gamma_\alpha^n(\zeta_1, \zeta_2; \gamma)$ Then we have

$$|A_n^i| \leq \frac{2[\gamma|\zeta_1 + \alpha\zeta_2| - |1 - \alpha|] - |b_n^i B_n^i| n^k [n(1 + \gamma\zeta_1) + \alpha(\gamma\zeta_2 - 1)]}{|a_n^i| n^k [n(1 + \gamma\zeta_1) + \alpha(\gamma\zeta_2 - 1)]}$$

Corollary 9 Let $D^n F_i(z)$ be as in (6) and $F_\alpha(z)$ be as in (7) and the function $D^n C_i(z)$ Defined by $D^n C_i(z) = z + \sum_{n=2}^{\infty} n^k a_n^i A_n^i z^n + \sum_{n=1}^{\infty} n^k b_n^i B_n^i z^n$ belong to the class $\Gamma_\alpha^n(\zeta_1, \zeta_2; \gamma)$ Then we have

$$|b_n^i| \leq \frac{2[\gamma|\zeta_1 + \alpha\zeta_2| - |1 - \alpha|] - |a_n^i A_n^i| n^k [n(1 + \gamma\zeta_1) + \alpha(\gamma\zeta_2 - 1)]}{|B_n^i| n^k [n(1 + \gamma\zeta_1) + \alpha(\gamma\zeta_2 - 1)]}$$

Corollary 10 Let $D^n F_i(z)$ be as in (6) and $F_\alpha(z)$ be as in (7) and the function $D^n C_i(z)$ Defined by $D^n C_i(z) = z + \sum_{n=2}^{\infty} n^k a_n^i A_n^i z^n + \sum_{n=1}^{\infty} n^k b_n^i B_n^i z^n$ belong to the class $\Gamma_\alpha^n(\zeta_1, \zeta_2; \gamma)$ Then we have

$$|B_n^i| \leq \frac{2[\gamma|\zeta_1 + \alpha\zeta_2| - |1 - \alpha|] - |a_n^i A_n^i| n^k [n(1 + \gamma\zeta_1) + \alpha(\gamma\zeta_2 - 1)]}{|b_n^i| n^k [n(1 + \gamma\zeta_1) + \alpha(\gamma\zeta_2 - 1)]}$$

Remarks: It is noted that $\Gamma_1^0(0,1; 1)$ is equivalent to the well known classes of starlike function S^* given by

$$S^* = \left\{ f_i: Re \left\{ \frac{zf'_i(z)}{f_i(z)} \right\} > 0, z \in U \right\}$$

And that $\Gamma_1^1(0,1; 1)$ is equivalent to the well known classes of convex function S^c given b

$$S^c = \left\{ f_i: Re \left\{ 1 + \frac{zf''_i(z)}{f'_i(z)} \right\} > 0, z \in U \right\}$$

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A novel method for the efficient reduction of TDD based Electromagnetic Asymmetry with Demand based slot allocation scheme incorporating TD-SCDMA

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Abstract- Most mobile communications services such as high multimedia are Asymmetric. There is a great difference in their downlink & uplink requirement both in transmitted amount and transmitted rate. This paper discusses asymmetry between uplink and downlink in view of EM radiation, termed as electro-magnetic Asymmetry. The influence of surrounding environment caused by EM radiation is always a serious problem. Also in view of the fact that the wireless resource is limited and to mainly minimise the asymmetry in TDD and to effectively mitigate cross-slot interference an efficient scheme called Demand based slot allocation (DBSA) with reference to TD-SCDMA is proposed. Finally, the simulation result shows that DBSA strategy markedly minimize the Asymmetry leading to human safety and also improves the system performance leading to higher resource utilization.

Index Terms- Demand based slot allotment, electro-magnetic asymmetry, TD-SCDMA, cross-slot interference, Demand based slot allocation

I. INTRODUCTION

In view of the effects of electromagnetic radiation to human body, this paper discusses asymmetry between uplink and downlink in mobile communications system in a new aspect which is termed as Electromagnetic Asymmetry (EA). In the future, most mobile communications services will be asymmetric, such as high multimedia [1, 3]. The downlink of service requirement is much greater than the uplink both in transmission total amount and transmission rate. In this paper, we consider the asymmetric characteristic of uplink and downlink caused by electromagnetic radiation, which is termed as Electromagnetic Asymmetry (EA) between uplink and downlink. The influence on surrounding environment caused by electromagnetic radiation is always a controversial problem. With the large-scale application of mobile communications, the total amount of electromagnetic radiation will increase and people will have to re-evaluate the social effect of mobile communications [5]. The influence of electromagnetic radiation will be one of the most important elements which should be considered in the research and design of mobile communications system. This paper analyzes the asymmetric characteristics of mobile communications system influenced by electromagnetic radiation. And also because of the need of rich mobile communication services and the difference of the traffic volume requirement between uplink and downlink, the asymmetric traffic services now becomes an important feature for the mobile communication system. However, the wireless resources is finite and the asymmetric traffic services varies from cell to cell. Demand based slot allocation (DBSA) is the most effective method proposed to settle these issues, and it plays an important role in TD-SCDMA network. DBSA can govern the overall service quality and offer flexible downlink and uplink capacity & if the technology of DBSA is applied to the mobile communication system in TD-SCDMA network, it will also raise the system capacity and get better the resource utilization.

II. ASYMMETRIC NATURE CAUSED BY ELECTROMAGNETIC RADIATION

It is notable that the mobile terminal is very close to human body, which is a small transceiver. The distance from mobile terminal to human body ranges from several centimeters to dozens of centimeters. In contrast to that, the distance from base station to human body is much longer, which ranges from dozens of meters to several kilometers. So the electromagnetic radiation impact on human body caused by mobile terminal is much more intense than that caused by base station.

(a) Radiation power of base station absorbed by human body

As there is a long distance from base station to human body, we can consider ideal LOS propagation environment.

(b) Radiation power of mobile absorbed by human body

The mobile terminal is close to human body and the radiation is inductive, so the free space propagation model above is not suitable. Here we introduce the concept of antenna propagation efficiency [6, 7].

To ignore the heat loss of mobile terminal itself, the total emission power of the antenna is

$$P_t = P_a + P_r \tag{1}$$

P_a is the power transmitted to faraway place, and P_r is the power absorbed by human.

There are many indexes used to evaluate the electromagnetic radiation influence upon human body. Among these, Specific Absorption Rate (SAR) is fundamental and widely used for analysis of electromagnetic radiation. The SAR means the power absorbed by unit weight of organism exposed to the electromagnetic fields.

$$SAR = (P_r/M) \tag{2}$$

where P_r is the power absorbed by human body, and M is the weight of the absorbing radiation part of human body.

We consider the SAR to human body caused by base station and mobile terminal.

1. SAR to human body caused by base station

As there is a long distance from base station to human body, the radiation distribution on each part of human body can be considered even.

2. SAR to human body caused by mobile terminal

The radiation of mobile to human body differs from that base station to human body. It is inductive close field radiation and its intensity decreases rapidly when the distance increases. The influences of electromagnetic radiation on human body mainly focus on human parts close to mobile terminal. In this paper, two using mobile modes are considered:

4.1 Mobile near the ear. This is a common mode of calling, the radiation on human body mostly focuses on head.

B. Mobile terminal is in the same height with person's eyes and the distance between them is about 50 cm. This mode corresponds to high downlink services such as video on demand or online game. In this mode, the radiation mostly focuses on head and parts of chest.

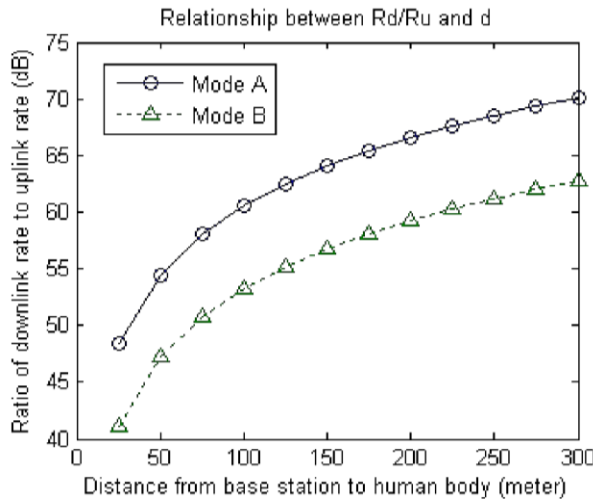


Figure 1: The relationship between ratio of downlink rate to uplink rate (dB) and distance form base station to human body (meter).

Under the constraint of electromagnetic radiation, we can find using Matlab simulation that the downlink transmission rate is much higher than that of uplink in mobile communication system. In mode A, the ratio of maximum rate of downlink and uplink is more than 10^5 times, which shows the asymmetric transmission characteristic of uplink and downlink. The uplink is much easier to reach transmission capacity saturation for one user, while there is much transmission rate and transmission power margin in downlink. So we call it Electromagnetic Asymmetry (EA) between uplink and downlink.

III THE THEORY OF DBSA INCORPORATING TD-SCDMA

For the mobile communication system in TD-SCDMA network, a physical channel is indicated by a combination of its carrier frequency, time slot, and spreading code. The sub-frame is shown in Figure 2. The length of the sub-frame is 5ms. Each sub-frame is divided into 7 main time slots (TS0- TS6) and 3 special time slots: downlink pilot time slots (DwPTS), guard period (GP) and up link pilot time slots (UpPTS). The length of each main time slot is 0.675ms, where in TS0 is a downlink time slot, TS 1 is an uplink time slot, while the remaining main time slots can be configured flexibly to be used for uplink or downlink according to the system demand. A switch point is set between the uplink slots and downlink slots. In the mobile communication system, Demand based slot allocation changes the switch point between downlink and uplink slots adaptively according to the rate of asymmetry traffic in a cell, and maximize the resource utilization.

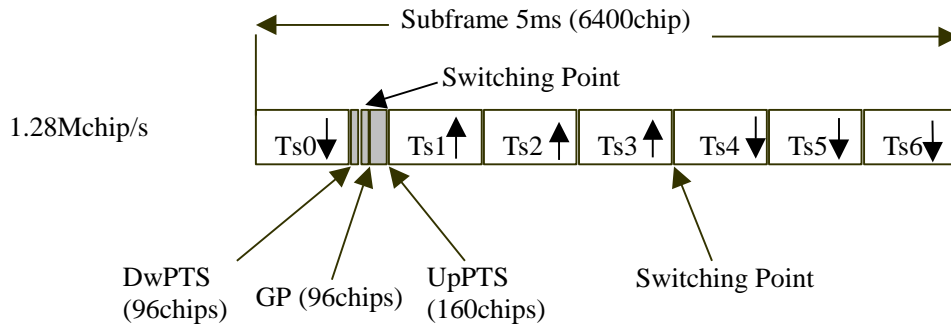


Figure 2: A sub-frame structure of the system

As the name implies, TD-SCDMA combines two leading technologies: an advanced TDMA/TDD [17] system with an adaptive CDMA component operating in synchronous mode. Code Division Multiple Access (CDMA) in combination with Time Division Duplex (TDD) significantly improves the network performance by radio network resources to process network traffic in both uplink and downlink directions.

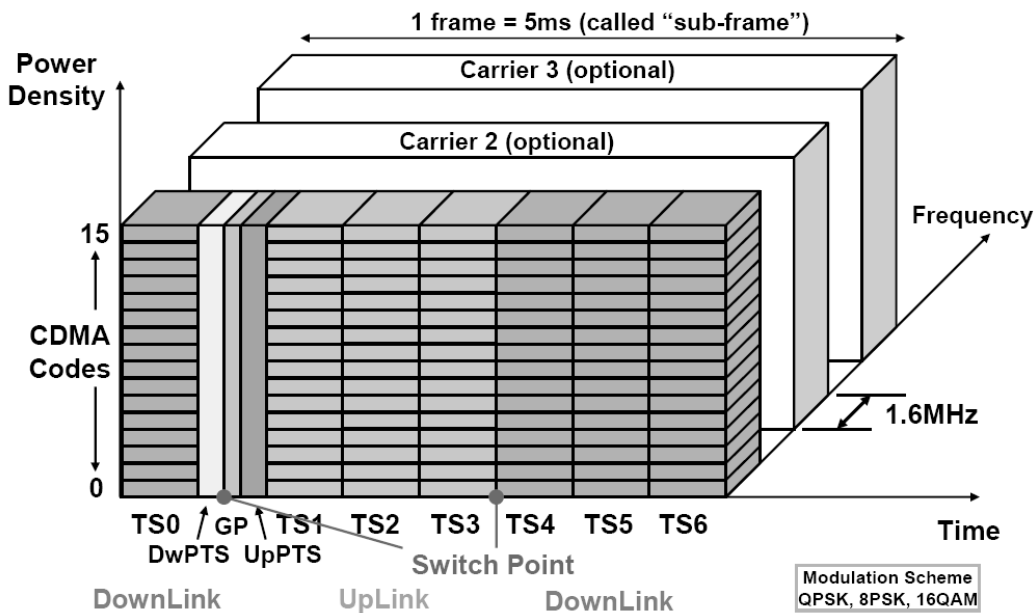


Figure 3: TD-SCDMA Resource Structure

The frame structure for each sub-frame is shown in Figure 2. Every sub-frame includes 7 traffic time slots and 3 special ones. The length for each traffic time slot is 864 chips duration. Among the 7 traffic time slots, Ts 0 is always allocated as a downlink while Ts 1 is always allocated as an uplink. The switching point is used here for separating the time slots for the uplink and the downlink. Using this kind of frame structure, TD-SCDMA can operate on both symmetric and asymmetric modes by moving the switching point and configuring the number of uplink and downlink time slots. For symmetric services used during telephone and video calls (multimedia applications), where the same amount of data is transmitted in both directions, the time slots are split equally between the downlink and uplink. For asymmetric services used with Internet access (download), where high data volumes are transmitted from the base station to the terminal, more time slots are used for the downlink than the uplink.

IV THE PROBLEM OF ASYMMETRY & CROSS-SLOT INTERFERENCE

(A.) Asymmetry

Mitigating the Asymmetry and resource utilization [11] to scale the performance of the system, we will define two variables namely, Slot asymmetry (γ) and traffic asymmetry factor (δ):

$$\gamma = (\text{the number downlink slots} / \text{the number of uplink slots}) \tag{3}$$

$$\delta = (\rho_d / \rho_u) \tag{4}$$

ρ_d & ρ_u denote the accumulated traffic load (measured in bits/sec) by all users in a cell on downlink and uplink.

The offered load in a cell between downlink and uplink is determined at a time. As the sub-frame structure of the communication system in TD-SCDMA network is showed in Fig .1, and TSO is used for the downlink communication services, the value of slot asymmetry factor in this system will be 1:5, 2:4, 3:3, 4:2, 5:1. It is determined by the position of switch point. In order to acquire maximum utilization of resource, DBSA changes the switch point between downlink and uplink to discover the most appropriate value of slot asymmetry factor.

(B) Cross-slot interference

In multi-cell environment, we must consider that the degree of traffic asymmetry generally varies from cell to cell. In this case, to maximize resource efficiency, one can use unequal γ for each cell, but now the cross-slot interference is generated for different slot allocation among cells.

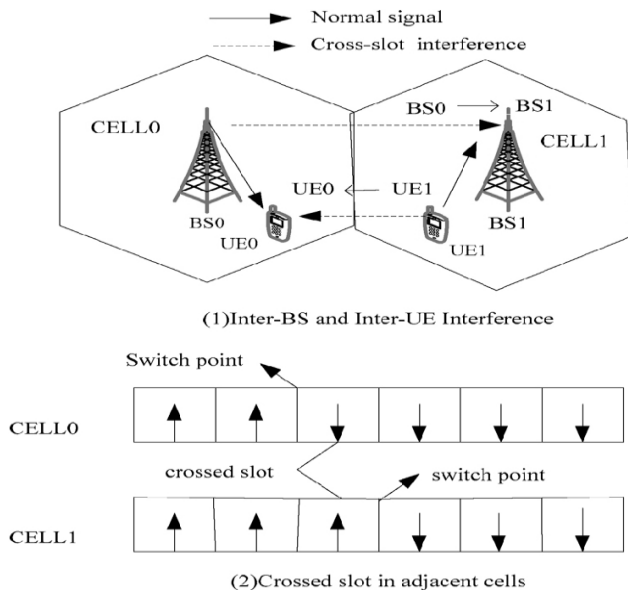


Figure 4 : The interference caused by crossed slot between cells

$$U = \sum u_i \quad \text{where } i = 1 \text{ to } 2 \tag{5}$$

Since TSO is reserved for common channels, we only use the rest 6 time slots to allocate to consumers. To make the utilization of resource better, the switch point in CELLO is between TS2 and TS3 while in CELL I it is between TS3 and TS4, and thus cross-slot is TS3. When in TS3, BSO (BS, Base Station) sent a signal to UE, and at the same time, UEI sent a signal to BS I, then the inter-BS interference and inter-UE interference [12] are produced.

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V SOLUTIONS TO THE PROBLEMS

To cut down the interference of cross-slot discussed before, [13] and [14] recommend the same slot allocation (thus, the same γ). However, for various multimedia services and traffic asymmetry in the mobile communication system, the method will debase resource efficiency. We should find out a way to reduce the interference of cross-slot and increase the utilization of resource.

If the time slot of the high transmit power BS or UE is the uncross-slot, and the lower transmit power BS or UE is cross-slot, it will have lower interference. The status of the system will be greatly improved. As illustrated in Fig.3, [15] and [16] divided the cell into two zones: the inner region near to the base station and the outer region that enclose the first one. The crossed-slots can be allocated only to UEs in the inner region for both links. This way can abstain the appearance of cross-slot interference and reduce the blocking probability and heighten the resource utilization.

Thinking of one-to-multipoint communication mode in the mobile communication system, if one of the called is blocked, it will do not influence the system communication. But if it is the call blocked, the whole of group-uses will not communicate normally. For the purpose of improving the mobile communication system performance, we should try to allocate the uncross-slot to the group-uses, whether they locate in the inner or the outer region.

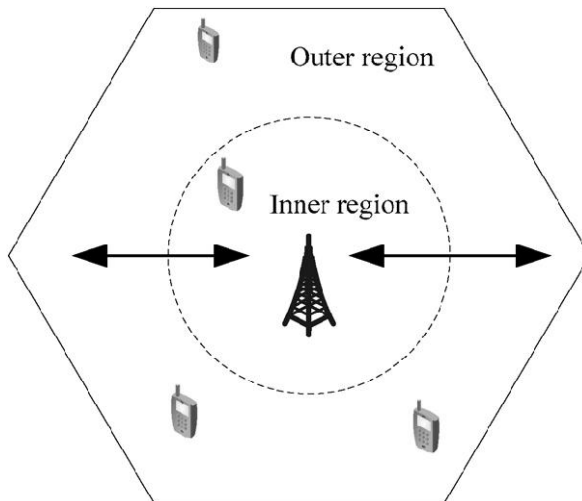


Figure 5 : The division of a cell

VI STATERGY OF TD-SCDMA AND ITS SIMULATION

Figure 2.4 shows the generation of the TD-SCDMA signal of a user (reverse channel). Quadrature phase-shift keying (QPSK) modulation is used for the RF carrier. Base-band filtering is defined in the TD-SCDMA standard in terms of a digital finite impulse (FIR) filter.

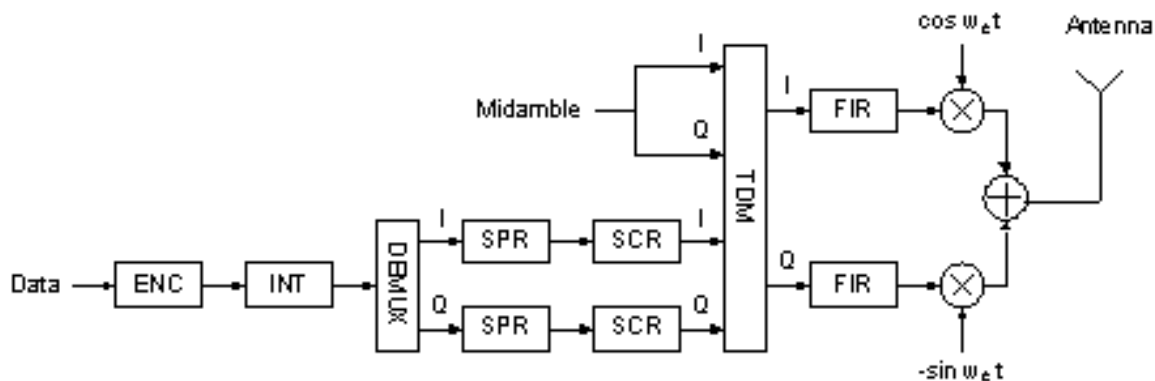


Figure 6 : Generating the Signal for TD-SCDMA Standard

(a) *The TD-SCDMA Signal Equivalent Mathematical Model*

TD-SCDMA adopts time division multiplex (TDD) operation instead of the frequency division multiplex (FDD) of W-CDMA, which may be considered a major difference between these two systems. In TDD mode, a 5ms frame is subdivided into 7 time slots, which can be flexibly assigned to either several users or to a single user who may require multiple time slots. Within one time slot, the system uses CDMA (Code Division Multiple Access) to further increase the capacity of the radio interface. Therefore, the TD-SCDMA system's mathematical model can be separated into TDMA and CDMA two processes.

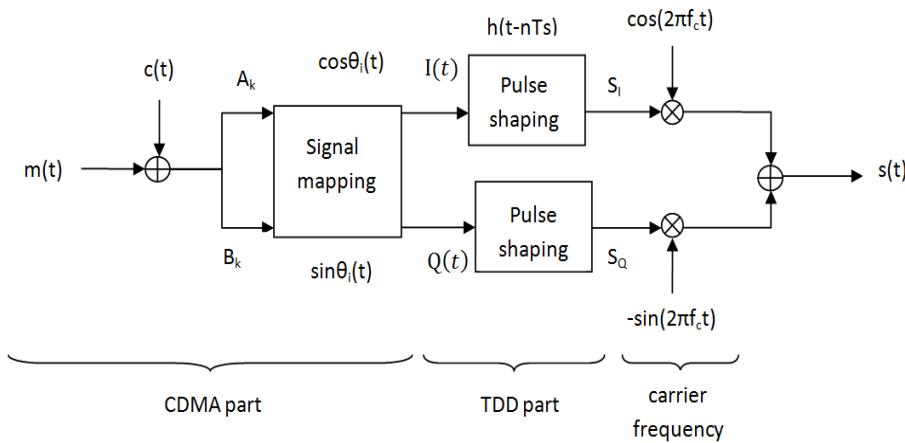


Figure 7 : Signal Modulation Procedure of TD-SCDMA math model

(b) *The Power Spectrum Density (PSD) of TD-SCDMA Signal*

In [18], the spread spectrum signal $f(t)$ will be a band-limited Gaussian stochastic process with zero mean, so the general expression for the PSD of a digital signal $f(t)$ is

$$P_f(f) = \begin{cases} \frac{N_0}{2}, & |f| \leq B \\ 0, & |f| > B \end{cases} \quad (6)$$

the envelope of the TD-SCDMA signal can be expressed as,

$$P_g(f) = \frac{N_0}{2} R_c |H(f)|^2 \quad (7)$$

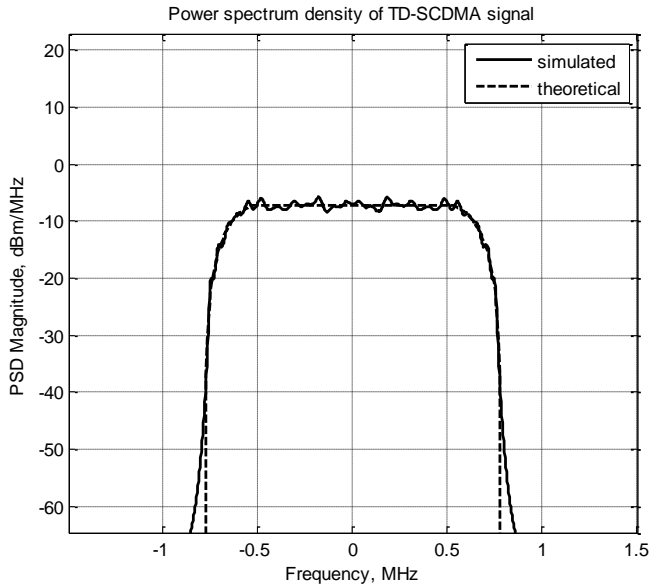


Figure 8 : PSD of TD-SCDMA signal

VII THE STRATEGY OF DBSA & SIMULATION OF RESULTS

To reduce the asymmetry and also to improve the capacity of communication service and allocate the limited resource effectively in the mobile communication system based on TD-SCDMA network, we can allocate the channel dynamically by the condition of traffic load between downlink and uplink to find out the optimal time slot allocation. Then divide a cell into two zone to minimize the cross slot interference. The specific implementing strategy of DBSA in this system as follows:

- a) The initialization of a system. Under the value of traffic asymmetry factor in a cell, we can find out the optimal slot allocation and determine the value of the slot asymmetry factor to get the max. utilization by.
- b) According the allocation of time slot between uplink and downlink, we find out the number of cross-slot and uncross-slot. Depending on the value of them, we can divide the cell into inter and outer region.
- c) Access of consumers and detect the position of them.
- d) In the service of consumers in mobile communication, the uncross-slot should be allocated. If the consumers belong to inner region, it will allocate the cross- slot, and the outer region customs will be allocated the uncross-slot. If the cross-slot (uncross-time) is distributed over, the uncross-slot (cross-slot) will be instead. If there are not any available resources remained, the new customs will be blocked. Wait for the update at next time.
- e) When the traffic load between uplink and downlink is changed in the next time ,the allocation of resource should be renewed. The implementing returns to a.

The simulation scenario is illustrated in Figure 4. We presume two cells and each of them have a group-use. We give the value of traffic asymmetry factor of each cell in ten testing times as Table 1.

From the Table 1, we can detect the value of traffic asymmetry factor of the two cells is equal in some times (e.g,4),but it is unequal in other times(e.g,1).In a cell, sometimes the traffic load of downlink is equal to the uplink's, but in other time the value of downlink is higher than uplink. It fit the mobile communication condition. So the result which is gotten by using MATLAB software shows the advantage of the DBSA strategy applied in the mobile communication system. We should allocate the channel dynamically and renew the dividing line in Figure 5 in the light of the mutative traffic asymmetry factor.

Times	1	2	3	4	5	6	7	8	9	10
Cell 0	0.5	1	1.5	2	2.5	3	3.5	4	5	6
Cell 1	1.5	3	2.5	2	1.5	4	2.5	1	2	3.5

Table 1 : The value of traffic Asymmetry factor

To reflecting the advantage of DBSA, We take two strategy to allocate the channel in the mobile communication system: same slot allocation and dynamic slot allocation. The simulation result will concern the average resource utilization of the two cells by (5), and compare the two methods function.

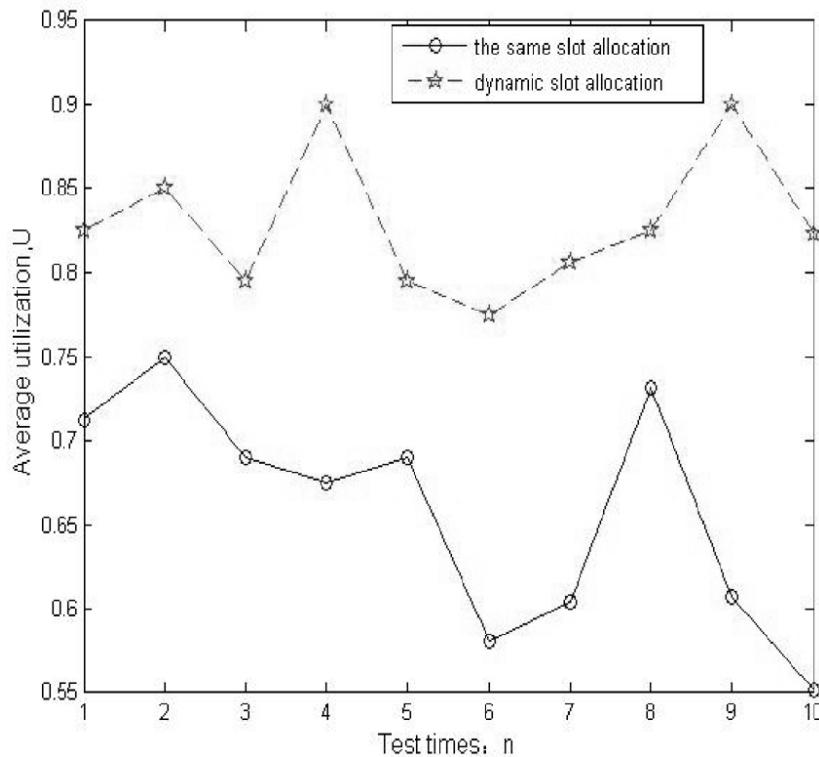


Figure 9 : The average utilization of the two cells

The result of simulation is showed by Figure 9. From Figure 9, it shows the average resource utilization of the two cells which have variable traffic asymmetry factor value. We can clearly see that the average resource utilization of the two cells by the strategy of dynamic slot allocation is higher than the method of same slot allocation.

Although the traffic load is asymmetric between uplink and downlink and it also is different from cell to cell, the average resource utilization tested is around 0.85 by dynamic resource allocation, approximately 0.15 higher than the way of same resource allocation. It reflects the strategy of DBSA which is introduced above is favorable for the mobile communication system in TD-SCDMA network to allocate resources and it obviously reform the communication performance.

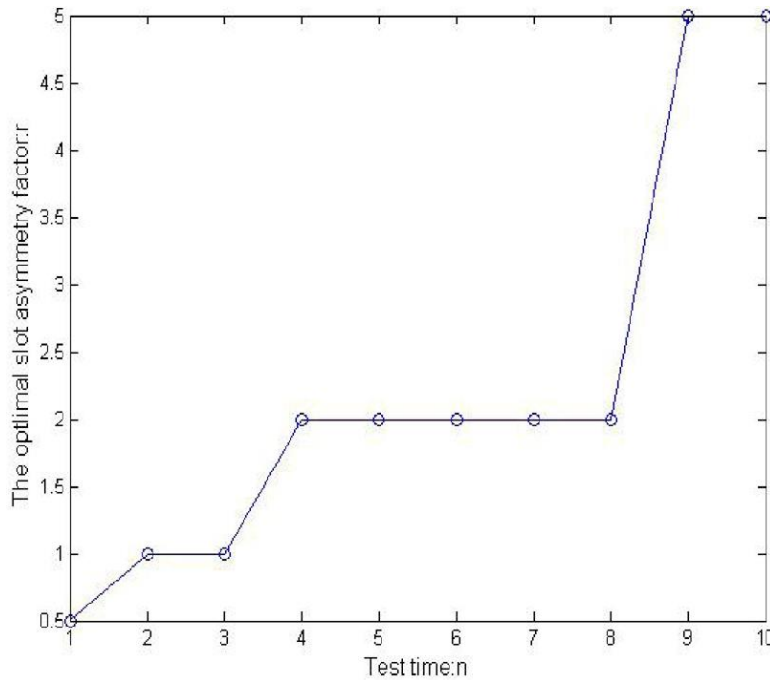


Figure 10 : The optimal slot allocation of CELL O

In Figure 10, we count the optimal slot asymmetry factor to maximize the utilization of CELLO. In the CELLO, the value of slot asymmetry factor increased gradually with the traffic asymmetry factor over time. We can find that the optimal slot asymmetry factor is approach the value of traffic asymmetry factor. And even the value of the two factors is not equal, we can choose one of two adjacent possible values, which maximizes the utilization, as an optimal one.

APPENDIX

```
clear all;
close all;
%configurations
Rc=1.28*1.0e6; %chip rate
Ts=1/Rc; %Sample period
N_frame=3; %No. of simulated frames
Range=8; %Range to the magnitude of filter output signal
%TD-SCDMA procedures
PN_starting=zeros([1,16]);
SF=16; %spreading factor
Data_Out=[];
Data_In=[];
for j=1:N_frame
    %time slot 1
    ovsf_No=3; %No. of the user.
    info=Data(44);
```

```
Data_In=[Data_In,info]; %Randomly generating data source
conv=Conv_Encoder(info); %Convolutional Encoding
qpsk=Qpsk_Mod(conv); %QPSK
ovsf_mod=Ovsf_Mod(ovsf_No,qpsk); %OVSF
PN_mod=PN_Mod(ovsf_mod); %Add PN
Data_Out=[Data_Out,PN_mod];

%time slot 2
ovsf_No=4; %Second user in the simulated frame
info=Data(44);
Data_In=[Data_In,info];
conv=Conv_Encoder(info);
qpsk=Qpsk_Mod(conv);
ovsf_mod=Ovsf_Mod(ovsf_No,qpsk);
PN_mod=PN_Mod(ovsf_mod);
Data_Out=[Data_Out,PN_mod];

end

Data_Out=Symmetricize(Data_Out);
%do the pulse shaping filter and over sample by 3 times
fc=1/Ts;
delay=20;
R=0.22; %roll off factor is 0.22
Fs=4*fc;
Ct_Out_0=rcosflt(Data_Out,fc,Fs,'fir/sqrt',R,delay); %raise cosine filter
freq_offset_1=1/3;
freq_offset_2=2/3;
for i=-30:30
    W_1(i+31)=sin((i+freq_offset_1)*pi)/((i+freq_offset_1)*pi);
    W_2(i+31)=sin((i+freq_offset_2)*pi)/((i+freq_offset_2)*pi);
end
%Over sample 1
Ct_Out_1=zeros(1,length(Ct_Out_0));
for i=1:length(Ct_Out_0)
    for j=-30:-1;
        if(i+j)>0
            Ct_Out_1(i+j)=Ct_Out_1(i+j)+Ct_Out_0(i)*W_1(j+31);
        end
    end
    for j=0:30
        if(i+j)<=length(Ct_Out_0)
            Ct_Out_1(i+j)=Ct_Out_1(i+j)+Ct_Out_0(i)*W_1(j+31);
        end
    end
end
end

%Over sample 2
Ct_Out_2=zeros(1,length(Ct_Out_0));
for i=1:length(Ct_Out_0)
    for j=-30:-1;
        if(i+j)>0
            Ct_Out_2(i+j)=Ct_Out_2(i+j)+Ct_Out_0(i)*W_2(j+31);
        end
    end
    for j=0:30
        if(i+j)<=length(Ct_Out_0)
            Ct_Out_2(i+j)=Ct_Out_2(i+j)+Ct_Out_0(i)*W_2(j+31);
        end
    end
end
```

```
end
end
Ct_Out=zeros(1,3*length(Ct_Out_0));
for i=1:length(Ct_Out_0);
    Ct_Out((i-1)*3+i)=Ct_Out_0(i);
    Ct_Out((i-1)*3+i+1)=Ct_Out_1(i);
    Ct_Out((i-1)*3+i+2)=Ct_Out_2(i);
end
%preparation for plotting the psd
IP3=5; %db
a3=-2/3*10^(-IP3/10); %amplifier
B=0.8; %bandwidth
N=256;
Res=B/N;
L=length(Ct_Out);
P0=0; %power
Amp_Out=Ct_Out_1+a3*Ct_Out_1.^3; % amplified signal
P0=Amp_Out*Amp_Out';
P0=(P0/L);
%plot the simulated PSD
[PSD_non_Amp,freq]=pburg(Ct_Out_1,64,2048,1.28*4,'twosided'); % Plot PSD
PSD_non_Amp=fftshift(PSD_non_Amp); %Shift zero-frequency component to center of spectrum
PSD_non_Amp=10*log10(PSD_non_Amp); % change to log scale
freq=freq-1.28*4/2;
figure;
plot(freq,PSD_non_Amp);grid on;
title(['Power spectrum density of TD-SCDMA signal'],'Color','b');
xlabel('frequency MHz');ylabel('PSD Magnitude dBm/MHz');
```

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Impact of Spiritual Intelligence on Quality of Life

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“We are not human beings having a spiritual experience. We are spiritual beings having a human experience”.

Pierre Teilhard de Chardin

Abstract- It was believed in the earlier part of the twentieth century that a person high on rational intelligence (IQ) will succeed in his life. Later, in mid 1990s, a theory was propounded that a person high on emotional intelligence (EQ), IQ being the same, has greater chances of faring well in life, for he is endowed with the capacity to manage his own and others' emotions better. Towards the end of the century, it was highlighted that spiritual intelligence (SI), also SQ for short, is the ultimate intelligence, necessary for effective functioning of IQ and EQ. SQ allows human beings to be creative, to change the rules and to alter situations, giving us the ability to discriminate. Employing SQ one is enabled to differentiate between 'right' and 'not right' in the given framework of a society or a situation, listening to inner voice. Our brains are hard-wired for activation and utilization of SI, but most of the people let it remain dormant, missing out a richer quality of being.

Quality of life (QoL or QQ) is perceived differently by different people, depending on their belief system. Life is infinitely a large canvas, all encompassing, major aspects being health (mental, physical, emotional and spiritual), finances, social well-being, job / occupation, family, reputation and the like. Life and its quality are influenced by application of human intelligences like IQ, EQ and SQ in different degrees.

Supported by the works of several renowned authors on emotional intelligence and spiritual intelligence, this paper is aimed at examining the impact of spiritual intelligence on quality of life among the executives serving in government organizations. For the purpose of conducting this study, a sample comprising 303 executives was selected with adequate representation at junior, middle and senior levels. All subjects were administered the questionnaires to assess IQ, EQ SQ and QQ. Detailed implications of this study will be discussed in the paper.

Index Terms- IQ, EQ, SQ, QoL or QQ

I. INTRODUCTION

Since the dawn of humanity, a man's endeavour has been to lead a prosperous, happy and peaceful life. In pursuit of improving his quality of life, illusions prompted him to chiefly amass wealth. The belief that materialistic possessions alone will bring happiness and respectability leads to disillusionment albeit, materialistic pursuit is a reality. The world is now moving rapidly towards a newer learning and awakening and beginning to build reliance on spirituality in varying degrees. A satisfying

life can only be led through achieving a balance between materialism and spirituality.

Multiple Intelligences

Cindy Wigglesworth (2012) defined intelligence as “Intelligence is made up of three parts: nature, nurture and results. Intelligence is an innate potential (nature) that is brought into form through practice (nurture / effort) and results in adeptness or appropriately reasoned behaviour or choice”. Howard Gardner defines intelligence as “The ability to create an effective product or offer a service. A set of skills that make it possible to solve problems. The potential for finding or creating solutions for problems, which involve gathering new knowledge”.

Howard Gardner proposed that a human being is endowed with multiple intelligences. Each person has a unique combination. The following are the nine intelligences, given in Table 1.

Table 1 : Multiple Intelligences

(a)	Bodily / kinesthetic
(b)	Logical / mathematical
(c)	Linguistic
(d)	Musical rhythmic
(e)	Spatial
(f)	Intrapersonal
(g)	Interpersonal
(h)	Naturalist
(i)	Existential

Zohar, Danah (2000) maintains that there are multiple intelligences but all of our possibly infinite intelligences can be linked to one of the three basic neural systems in the brain and all the intelligences are actually variations of the basic rational intelligence (IQ), emotional intelligence (EQ) and spiritual intelligence (SQ) and associated neural arrangements.

While cognitive intelligence is about thinking, emotional intelligence is about feeling and spiritual intelligence is about being.

Rational Intelligence (IQ)

It was discovered in the early 20th century. It is rational, logical, rule-bound, problem-solving intelligence which can be tested with Stanford-Binet Intelligence Scales. IQ was taken as a signpost of people's abilities. It was believed that higher a

person's IQ, higher the abilities but it is true no longer with other intelligences impacting the abilities of a man. Brewer, Mark, Dr (2008) endorses that people who successfully tackle the big issues of life are not always the ones blessed with great mental aptitude. These achievers possess something that is superior to sheer intellect.

Emotional Intelligence (EQ)

Goleman, Daniel (1998) referred to emotional intelligence as "the capacity for recognizing our own feelings and those of others, for motivating ourselves, and for managing emotions well ourselves and in our relationships". It describes abilities distinct from, but complementary to, academic intelligence, the purely cognitive capacities measured by IQ. Many people who are book smart but lack emotional intelligence end up working for people who have lower IQs than they but who excel in emotional intelligence skills.

A comprehensive theory of emotional intelligence was proposed in 1990 by two psychologists, Peter Salovey, at Yale, John Mayer, defining emotional intelligence in terms of being able to monitor and regulate one's own and others' feelings, and to use feelings to guide thought and action.

Goleman, Daniel has highlighted the following five emotional competencies (the term emotional competency includes both social and emotional competencies):-

(a) **Self-awareness:** Knowing what we are feeling in the moment, and using those preferences to guide our decision making; having a realistic assessment of our own abilities and a well-grounded sense of self-confidence.

(b) **Self-regulation:** Handling our emotions so that they facilitate rather than interfere with the task at hand; being conscientious and delaying gratification to pursue goals; recovering well from emotional distress.

(c) **Motivation:** Using our deepest preferences to move and guide us toward our goals, to help us take initiative and strive to improve, and to persevere in the face of setbacks and frustrations.

(d) **Empathy:** Sensing what people are feeling, being able to take their perspective, and cultivating rapport and attunement with a broad diversity of people.

(e) **Social skills:** Handling emotions in relationships well and accurately reading social situations and networks; interacting smoothly; using these skills to persuade and lead, negotiate and settle disputes, for cooperation and teamwork.

Spiritual Intelligence (SQ)

Webster's dictionary defines **spirit** as "the animating or vital principle: that which gives life to the physical organism in contrast to its material elements: the breath of life".

Wigglesworth, Cindy (2012) defines **spirituality** as "the innate human need to be connected to something larger than ourselves, something we consider to be divine or of exceptional nobility. This innate desire for that connection transcends any particular faith or tradition. It does not require a belief in a divinity by any description, nor does it preclude belief in God or Spirit or the divine".

Wigglesworth, Cindy (2012) defines **spiritual intelligence** as "the ability to behave with wisdom and compassion, while maintaining inner and outer peace, regardless of the situation".

SQ is the central and most fundamental of all the intelligences, because it becomes the source of guidance for others, being an integrating intelligence, linking our rational and emotional intelligences.

A man with high SQ not only responds appropriately in a particular situation or circumstance, but he also analyses as to why he is in that situation and how can better that situation. High SQ enables a person to operate beyond the boundaries. Zohar, Danah (2000) believes that "SQ gives us the ability to discriminate. It gives us our moral sense, an ability to temper rigid rules with understanding and compassion and an equal ability to see when compassion and understanding have their limits".

Brewer, Mark, Dr. (2008) states that "the spiritual intelligence is available to everyone- yet only a handful of people ever take advantage of it.

SQ and the Brain

Neurologically SQ is distinct from IQ and EQ. Whereas IQ and EQ are localized in opposite hemispheres, SQ is associated with hemispheric synchronization and whole-brain activation. The capability for SQ is hard-wired in the brain, but conscious intention is required to activate it. The processing mode for different Qs is different. IQ is processed in serial mode, EQ in parallel mode, and SQ is processed in synchronous mode. Bowell, Richard A. (2005) reinforces the studies bringing out that IQ is highly linear. One brain cell firing to another to form a neural tract is called synaptic transmission and is the basis for the formal logic of IQ. EQ is different to IQ. It weaves associative patterns. Context, memory, comparison, appropriateness- these are EQ skills. Why is a process of engaging our self with the unlimited fields of intelligence that we call SQ.?

Working of IQ, EQ and SQ

Ideally, all the three Qs should work together and support one another and the brains are designed so. Each Q has its own area of strength, and they can function separately. A person need not be high or low in all Qs simultaneously. While one person may be high in IQ but low in EQ and SQ, another may be high in EQ but low IQ and SQ. There are many combinations with varying degrees.

Development of Intelligences

We are born with basic wiring for each of these three intelligences. While rational intelligence is innate, EI and SI need to be developed through training. Though we are born with wiring for emotions and spirituality, but we are not emotionally and spiritually intelligent. In majority of the people, EQ and SQ are strongly correlated with age, meaning these intelligences tend to increase as the person grows older. But there is nothing guaranteed about EQ or SQ development. Not everyone gets better at these intelligences with age. People do have the capacity to enhance EQ and SQ with age but it does not occur by itself and needs efforts to increase these intelligences.

In most cases, SQ takes the longest to develop. One needs to be conscious and dwell on awareness to commence the journey to enhance SQ. As SQ begins to develop, EQ also grows, which in turn supports enhancement of SQ. A certain degree of

EQ is necessary for SQ to develop. SQ boosts EQ and virtuous cycle is formed.

People with high SQ feel more fulfilled, finding deeper meaning and purpose of their lives. They operate from positivism, put in their best efforts, deriving joy in helping others and improving the society by using a higher dimension of intelligence. Since they are able to employ their IQ and EQ better, they are creative, adding value to own others' lives.

Misconception on Spirituality

Most of the people are overwhelmed with the notion that embracing spirituality would impel us to denounce the material world, near and dear ones, and proceed to mountains or jungles and engage in rigorous routine of praying and meditating the whole day long. It is far from truth. Nothing precludes a man from embracing spirituality while leading a normal life of a house holder.

Embarking on a Spiritual Journey

Awareness to awakening kindles the desire to engender a shift in our thoughts. People may surely and gradually move from mundane way of life to a spiritual one. Draper, Brian (2009) states that "when it comes to embarking on a spiritual journey towards becoming more fully human, it is tempting to dream 'big' and it is good to want to change the world single-handedly; and change will only come about when we begin to demonstrate the positive benefits in our own lives. So we need to change our own world first. It is better to start small and change something - than to dream so big that you change nothing".

Spiritual Values

Buzan, Tony (2001) and Switzer, Bob (2011) emphasise that certain spiritual values are manifested in the behaviour of people who develop their SQ, in varying degrees. Certain salient spiritual values are compassion, humility, forgiveness, gratitude, etc. If a person adopts and practises these spiritual values or qualities, transition can be made to higher consciousness of personal living and other spheres, leading to development of spiritual intelligence.

Religion and Spirituality

Wigglesworth, Cindy (2012), defines **religion** as "a specific set of beliefs and practices, usually based on sacred text, and represented by a community of people".

Some people may high on SQ through following a religious beliefs and practices, others may be high on SQ being atheists. Contrarily, many people, though religious, are low on SQ. Draper, Brian. (2009) believes that "overly religious people are not always the most spiritual." There may or may not be a positive correlation between SQ and religion.

Zohar, Danah (2000) professes that "conventional religion is an externally imposed set of rules and beliefs. It is inherited from priests and prophets and holy books, or absorbed through the family and tradition. SQ is an internal, innate ability of the human brain and psyche, drawing its deepest resources from the heart of the universe itself.

Spiritual intelligence is the soul's intelligence. It is the intelligence with which we heal ourselves and with which we make ourselves whole. SQ is not culture-dependent or value –

dependent. SQ is prior to all specific value and to any given culture. It is prior to any form of religious expression that it might take. SQ makes religion possible (perhaps even necessary), but SQ does not depend upon religion".

Sponville, Andre Comte (2006) has logically argued that "People can do without religion but they cannot do without communion, fidelity and love. Nor can they do without spirituality. Atheists have as much spirit as everyone else; why would they be less interested in spiritual life? Being an atheist by no means entails being amnesiac. Humanity is one: both religion and irreligion are part of it; neither is sufficient unto themselves. Spirituality is far too important a matter to be left to fundamentalists".

Bowell, Richard A. (2005) has drawn a distinction among the three Qs stating that "IQ is the intelligence that seeks to understand the "what", EQ is the intelligence that seeks to understand the "how", and SQ is the intelligence that seeks to understand the "why" of things.

Quality of Life (QoL)

As per Wikipedia (http://en.wikipedia.org/wiki/Quality_of_life), the quality of life refers to general wellbeing of individuals and societies. The term is used in a wide range of contexts. Quality of life should not be confused with the concept of [standard of living](#), which is based primarily on income. Instead, standard indicators of the quality of life include not only wealth and employment, but also the built environment, physical and mental health, education, recreation and leisure time, and social belonging.

Quality of Life (QoL) is relatively a newer concept in the field of Organisational Behaviour (OB). It is yet to receive due care and attention. QoL is a difficult area to define, as it is impacted by a number of factors which themselves may be ill-defined, inter-related and to some extent overlapping and interdependent. Also QoL means degree of excellence of one's life that contributes to benefit to the person himself and the society at large.

Motives are arranged along a hierarchy. Those needs which have the greatest potency at any given time dominate behavior, affect quality of one's life and demand satisfaction. The behavior and QoL of a person depends upon the fulfillment of needs and motives throughout one's life.

QoL can be categorized into two factors and both these factors directly or indirectly affect the QoL of a person :-

(a) Satisfactory conditions include aspects such as:-

- (i) Group cohesiveness.
- (ii) Sharing of each other's experiences.
- (iii) Helping attitude.
- (iv) Understanding and sharing each other's problems.
- (v) Absence of conflict among members or type of relationship among members e.g. husband-wife, mother-father, parent-children, siblings etc;
- (vi) Absence of mental and physical illness.

(b) Satisfying conditions. Include factors such as:-

- (i) A sense of belongingness.
- (ii) Presence of positive attitude.
- (iii) Subjective feelings of physical, mental, psychological, social and spiritual well-being.

(iv) Absence of unhappy experiences.

II. METHODOLOGY

Objective of Study

The objective is to establish a relationship between SQ and QoL.

Rationale of study

Rationale of this study is twofold; one, to explore if QoL can be improved by enhancing SQ, and second, there is gap in knowledge in this sphere in the government organisations.

Hypothesis

The hypothesis is that SQ will positively relate to QoL.

Scope of the Study

The scope of the study is confined to the officers of the government organisations.

Sample

The sample constitutes 303 officers from the government organisations, given in **Table 2**, as under:-

Table 2 : Sample

Level	Males	Females	Total
Senior	81	0	81
Middle	159	27	186
Junior	33	3	36
Total	273	30	303

Table 3 : ScalesTools

The questionnaires to scale EQ, SQ and QoL, as depicted in Table 3 below have been utilised:-

Questionnaire	SQ scale	EQ scale	QoL scale
Developed by	Husain, Akbar (2011)	Sharma, Ekta (2011)	Dubey, BL (2011)
Items	31	60	20
Factors	2	5	2
Scale	Likert (5 to 1)	Likert (5 to 1)	Likert (5 to 1)
Reliability	.84 & .82	Highly reliable	.58 & .87

Procedure

The questionnaires were administered to the participants and responses quantified.

Statistical Tools

SPSS software was applied to the following data for analyzing the data, given in Table 4:-

Table 4 : Parameters

Parameter	N	Minimu	Maximu	Mea
Age (years)	300	23	56	39.6
Service (years)	300	0.3	34	16.3
QQ	303	58	97	82.3
SQ	303	70	126	91.2
Valid N (listwise)	300			

III. RESULTS AND DISCUSSION

Inter alia, three findings are discussed below:-

(a) **SQ and Age.** Not in all, but in most of the cases, it was found that officers in higher age brackets had relatively higher SQ as compared the younger group. This fact has also been substantiated by Wigglesworth, Cindy (2012). It may be positively reasoned that with age, job requirements and rigours of life, the officers in the higher age bracket are able to develop better EQ which supports development of SQ. Also, they begin to indulge in certain spiritual practices, leading to better SQ.

(b) **Gender Comparison : SQ.** It was observed that SQ was comparable for both, male and the lady officers, with that of the males being very slightly higher. It is probably because males generally go through more rigours in the government organisations than their counterparts. Loss and adverse situations bring a man closer to Higher Powers controlling the universe.

(c) **SQ and QoL.** QoL was higher in most of the cases where SQ was high. It can be pragmatically discussed that officers with higher SQ view life in a broader perspective, not relating to physical comforts alone. They relate to the entire spectrum of human experience with the backdrop of pleasant and difficult moments.

Recommendations to Improve SQ

Since SQ positively impacts QoL, it is imperative that we live a fulfilling and satisfying life by enhancing SQ because that is the underpinning factor. The brain is wired for SQ but it remains dormant and needs to be activated. It takes effort and time to develop SQ but it is worth the effort realizing its benefits. Some of the methods available are discussed in the succeeding text.

(a) **Meditation.** Several methods are available for meditation. One may choose that suits him the best. If much time cannot be invested in meditation, duration of 20 minutes is considered to be optimal. Sri Sri Ravi Shankar asserts that meditation improves and balances physical, mental, emotional and spiritual spheres of a man.

(b) **Prayers.** For those who believe in God, prayer includes respect, love, pleading and faith. Through a prayer a

devotee endows the doer ship of the task to God. Giving the doer ship to God means that we acknowledge that God is helping us and getting the task done. Prayer is an important tool of spiritual practice in the generic spiritual path of devotion. Prayer reduces worry and enhances contemplation.

(c) Tools to Empower. One may choose any tool to enhance his SQ and QoL, for it will lead him to satisfying and purposeful life. Among others, **Reiki** is a simple and easy - to - learn technique for better life and pleasant experiences.

(d) Observance of Spiritual Values / Qualities. A dual approach may be of enormous benefit for spiritual seekers. One, SQ may be enhanced by the techniques stated above and then manifest the spiritual values in day to day behaviour. Second, consciously, practise the spiritual values / qualities in everyday life and increase the SQ, leading to a positive virtuous spiral.

IV. CONCLUSION

Human life is the greatest gift that the God or that Infinite Energy bestows upon us. We ought to respect and love it, making the most of it. We being spiritual beings going through human experience, are obliged to develop our spiritual intelligence (SQ), living the highest quality of life (QoL).

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Social Support System in Cancer Care: Understanding Dynamics of Women Patients

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Abstract— The bio-medical model of treatment of cancer provides the importance of varied process of chemotherapy, radiation or surgery dominantly. In current world where massive importance is given to the HPV clinical trials for the women breast cancer, this paper attempts to look into the different social systems for the women cancer patients. As part of bio-psychosocial model these systems are important and critical in treatment. The participants in this are individuals under follow-up or over treatment; survived for at least 5 years. A retrospective understanding and analysis was done of the social systems available for the women based on the positive experiences shared during the unstructured interviews. The social systems ranged from immediate family to doctors, every system having unique, distinct yet interplaying roles to contribute to the quality of life of the women cancer patients.

Index Terms — Cancer, Care, Social, Support, System, Women

I. INTRODUCTION

Cancer is a term for diseases specifically characterized by abnormal cells divide without control and are able to invade other tissues [1]. This makes the health condition of having cancer fatal and thus requires early diagnosis. Cancer cells affect near and distant cells through the blood and lymph systems. It is complicated as it is not a single disease but a range of disease. There are more than 100 types [1].

Both sexes, male and female are susceptible of having cancer at any time of the life-span. In Canada, the Annual Canadian Institute Report 2012 reveals gender divide especially smoking related cancer statistics [2]. Coming to India, the Public Health projects have made an attempt to understand the gender differences in context of cancer in India. In 2006, the ‘Cancer Incidence and Mortality in Greater Mumbai: Mumbai Cancer Registry’ [3] identified 11033 new cases of cancer in a year 2004-05 of which 5350 were males and females being 5683 in number. This reflects the increased cancer morbidity among the women in Greater Mumbai. This generalized to the whole country with the existing distribution of female cancer patients as 51.5%. However, women are prone to certain cancer than cancer in general. The reason for this may vary from biological physique to social liabilities. The three most common cancers among women according to ‘Centre for Disease Control and Prevention’ are breast cancer (121.9), lung cancer (54.5) and colorectal cancer (38.7) [4]. In India, analogies as well as empirical descriptions identify women being largely diagnosed of breast, uterus, cervical and ovarian cancer. In all sites except breast and genital organs, high occurrences noted among men [3]. Thus looking at the other way around, women patients are seen in breast and genital units. In females, breast cancer is ranked first in incidence followed by cervix, ovary, lung and leukemia [3]. These medical complications are not merely a condition of disease but also result in incapacity of physical performance leading to psycho-social impairment.

The treatment, the disease of cancer through bio-medical approach, is only chemotherapy, radiation, X-ray or cobalt therapy with high density electron therapy and also surgery in extreme condition; a combination of all these may also treatment intervention. The patients after the treatment requires ample follow-up and after care by environmental systems. The bio-medical model for treatment negates to counter the psycho-social concerns of the patients.

Psycho-social concerns of women cancer patients

Individuals suffering from serious illness and disability often experience high levels of anxiety, depression, anger and hopelessness. Sarason and Sarason [5] were of the opinion that even in minor health illness temporary negative feelings does come.

Similarly, in cancer patients, the ‘tumor’ is the overt physically visible illness but the socio-emotional issues also begin with the day of diagnosis. The diagnosis is a big blow that the family along with the family receives; this sudden announcement of the having cancer in itself results in familial and individual tension. The patient tends to develop the fear of being typified as ‘non-entity’ in the entire social fabric [6]. Suddenly, the Quality of Life (QoL) gets highly compromised [7].

Health conditions and care get double marginalized by the social hierarchical status of gender. Women have a hidden oppression gender factor creating psycho-social problems, the major being premature menopause, pregnancy related issues, lack of interest and body image [8]. As a woman, she is expected to perform certain reproductive responsibility towards the future generation but her sexual complication contradicts with this responsibility. This can develop sense of worthlessness. Adding to the sense of

worthlessness is the inability to contribute productive work. Among women aged 24-64 years who tend to be sole care-takers of the house and the family and in many cases significant contributors to family income, this mortality burden of not producing and increased medical costs poses heavy economic burden on the families. A person becomes barren (economically and reproductively) for the family. In fact in India, the years of life lost (YLL) due to cervical cancer in India is 936.6, highest in world. The complications are not restricted to having cancer but also during treatment and living life with cancer.

The treatment procedure of cancer also creates tension among the patients considering the fact that they are in a constant fear of the unknown [9]. The panic towards the unknown extends to consequences, side-effects and future as a social being. This cumulated with the reactions of people during the diagnosis and treatment. Moreover heavy medical cost of treatment impoverishing the individuals [10] leads to psycho-emotional blockade in the process of recovery.

II. RESEARCH CONCERN

The bio-medical model considers cancer as 'abnormal growth of cells' and thus the treatment being medical and hospital based. Many clinical trials throughout the world revolve with the aim of proving HPV vaccine for treating cancer. The medical fraternity to the rare condition recognizes or mostly fails to recognize the factors outside hospital affecting the process of overcoming cancer; either treatment, living along or follow-up.

However Engels through the bio-psychosocial model conceptualizes influence of three basic components through systems. A system is a dynamic entity with constituents that continuously interrelate [11]. Associations among functions (physical, emotional, cognitive and social roles), symptoms (fatigue, nausea/ vomiting, pain) and supportive care needs (physical, psychological, patient care and support, health system and information, sexual) are interrelated and influence each other. [9]. In Mila Gustavassan - Lilius's work [7], the researcher has spoken about support systems as a construct that has been widely acknowledged to be important in adjustment to somatic illness and to predict better Health Related Quality of Life (HRQL).

Similarly, social systems around cancer patients could help in enhanced quality of life. Patients could develop their support systems- partner, peers or family. Under this paper an attempt has been made in identifying support systems established or created among female cancer patients in context of Indian society wherein cancer is still a socio-cultural taboo.

III. METHODOLOGY

The study was administered as a part of the social work field practicum at an organization called 'Indian Cancer Society: Parel'. But it is to be considered that no response or any part the process of research has been influenced by the organization.

The method of priori of qualitative methodology was applied in choosing the population of the research study. All the women working the organization were informed about the research. The women who voluntarily came in and agreed upon being participants were registered under this research. 32 women cancer patients participated in the understanding and identifying social systems. They have had cancer of different parts specifically breast, uterus and ovary. They had survived cancer; they could be divided in two categories: over-treatment or follow-up, surviving cancer for the minimum of 5 years. It is a retrospective case study design wherein the researcher through interviews and oral history looks into the historical and contemporary roles of social systems in their lives.

The life experiences of the participants describing the social systems have been analyzed on the parameters of 'Quality of Life (QOL)'. The QOL indicates the effectiveness of social support system. It is a multidimensional construct that encompasses perceptions related to physical condition, psychological state, social status and other factors [12], [13]. Herein on the subjective content of the interviews, the QOL has been categorized into five heads: perception on general health, perception on cancer, attitude towards self, attitude towards self and mental health.

As part of methodology, a varied range of secondary literature has been referred and analyzed for developing and understanding linkages between social systems in Indian Context.

IV. RESULTS

Identifying support systems

The study with the interview of 27 women and oral histories of 5 elder women surviving cancer put forward the opinions and narratives of self-claimed women cancer survivors. The responses of the participants varied in terms of identifying social systems. But significant contributing social systems with specific yet common roles were mentioned and thus listed in the study.

Out of 32 respondents, 25 of them lived at homes and 7 lived in 'Residential Centers for Cancer Patients' in the city. Out of the 25 women living at home, 18 were married and others never married. Adding to this never married number, the respondents from the residential homes never married either. But in these 'residential homes', it is mandatory for a relative to accompany the patients. The residential home with co-patients and relative over a period of time becomes a close-knit community of support. The caretaker who is the relative or any member of the family becomes the immediate support system for the patient to look forward to. However it is recorded that these patients being women, the family puts in an unproductive (economically) member of the family like an uneducated sister. On the contrary there also has been instances where attendants act as caretakers as for the domicile to explore scope of jobs in

the city. No matter under all circumstances, the caretakers' relation with the client determines the progress of general health cancer in specific.

"My brother lives with me in GBA (name abbreviated for confidentiality). He is one of the few members in the house who has been with me since diagnosis. Though he never comes for follow-up or even my workplace, but the fact that I have dinner with him together makes me happy" expresses the relief of having a support system in an emotionally-laden interview of a young lady of 33-year old.

On the contrary to this lady, the women living in residential homes were mostly looked after by other female member from the family who is also unmarried. The 7 participants living in residential homes were high praises to their caretakers as they had taken the risk of being with them against the complaints from other family members. As mentioned earlier no earning member would agree to be with the women patients.

The women living in houses with families could be categorized into: a. single women living with their parents b. married women living in their maternal houses and c. married women living with their spouses and siblings. This categorization has been done on the responses of the participants in identifying immediate environment being support system. Thus the primary support system for women living in families varies from their own parents to spouses. The system with which the woman patient had the most supportive relationship, she ended up being with that system as the immediate surroundings. Living with supportive families with positive interaction and clear communications has shown to be associated with low levels of stress-coping behavior, good psychological health, active adaptive to acute and chronic illness and high levels of adherence to treatment (Wambodt & Wambodt 2000). Thus it could under-consideration that the women living in these familial categories exhibited good responses to treatment process and follow-up because of their comfortable family system; be it with parents or spouse and children. "I did not have any problem of vomiting though I had 8 chemo as part of the treatment. I believe neither my parents nor my friends left me alone. My mother was sad and used to cry, but my friend was there to give me strength and my family too. Marrying was not an option for me, never will I but still I do not feel lonely" articulated a 45 year old cervical cancer survivor who identified peer circles in addition to family as an important part of social system.

Of 18 married cancer survivors, 11 lived with their husbands and the rest with maternal families. Living together or separated creates a difference in treatment adherence could not be analyzed; it was considered to be a sensitive issue to be discussed.

Dominantly the responses identified the 'workplace' as a social system. It being a rehab centre provides cancer patients especially women to have a common platform to discuss concerns on cancer, self, family and other. In cases of lack of familial support, the center support is of utmost important and thus can be considered as a secondary relationship. All 32 women identify this as a crucial support system through the co-patients as well as the medical social workers.

A unique but critical support system identified it the medical/ paramedical staff involved in the treatment or follow-up process. 5 out of 32 recognize the doctor-patient relationship. Motivation from the doctors and the nurses can become the ultimate complex binding of professionalism and principle of individualization enabling the patient to adhere to the treatment and follow-up.

Effects on Quality of Life (QOL)

The effectiveness of the support system has been classified into five dimensions of individual growth and development.

B.1 Perception on General Health

The interaction with the immediate support system as mentioned in the above section, determines the general health conditions of the individual. Accompanying the patient or fixing an appointment with the doctor influence the process of compliance among cancer patient in maintaining their general health graph. The respondents varied on aspects of identifying specific people persuading their health related quality of life. One of the respondents spoke of co-workers from the rehab- centre visiting her while she was suffering from fever; this made her feel good and significant. On similar line "being with my mother, parents have helped me maintain scheduled life and not just listen to orders. I can eat, drink and take no tensions to go to the doctor" says a participant who never married due to her breast cancer, who considers herself to be fit credits to her family.

B.2 Perception about Cancer

Cancer in the time of diagnosis was a sudden shock to all the participants; this was a common reaction for all. The participants spoke of the interactions with medical social workers and doctors reducing the burden of emotions and fear. Also the social worker's intervention on subsidized treatment or sponsored treatment lessens the self-guilt of financial pain on the family.

Perception on cancer, however as described by the participants was larger affected by the shared experiences of the co-patients in rehab-centre and residential homes. "I always used to wonder why me and why cancer; I must have done some sin to be punished and thus need to die. But I met at least five women cancer patients a day surviving cancer in the rehab-centre. They lived more months and years ...7-8 years; I could never believe before. But now I know I too can" a breast cancer survivor survived for 8 years now spots out the distinct role of co-patients (co-workers) in recovery process.

B.3 Attitude towards self

Sense of worthlessness and concerns about body image are of prime importance during the treatment that was spoken by all 32 participants. The earnings from the rehab centre directly implied into economic contribution and thus being productive. The engagement, interaction and the facilities of scholarships and sponsorship of continuing education or for children as well as for treatment helped in overcoming the situation of self-burdening on the family. "I earned. I am here so I get scholarship for my children; I have breakfast, three meals and milk. What else do I want: I am contributing and self-sustaining. My husband abandoned me anyways. NO changes in my body but he still he did." explains a woman living with her sister with her children.

The response also expresses the partner support towards physical concerns. She related physical changes to her abandonment. In spite of none, she was left. The sense of sexual infertility and physically deformed exists high among individuals being separated. For 17 women mentioned that the acceptance of themselves by their partners, peers or family members would help them lead the same life as before cancer; a life full of self-confidence.

B.4 Attitude of others

"My in-laws were of the opinion that I carried cancer germs in ovary from my maternal house. Do not know how much it is true but signs of their rejections, facial expressions and acts hurt me. Gradually my husband started talk to them about my condition and convinced mother-in-law to go to doctor with me. I was surprised she agreed and many a times later she repeated this" a female did experience in attitude of other family members with the support of immediate social system.

Support systems work in such a manner that they could influence each other. However all the women are of the opinion; the process of acceptance and positive attitude towards them by others is slow and sometimes miraculous. Mostly primary caregivers and attendants have a hope of recovery for the patients.

B.5 Mental Health

Out of 32 participants, 26 responded that having a peer or a partner to share gave them a sense of mental peace. The peer or the partner could vary from an old friend, co-patient or co-worker or even counselors/ social workers. It develops a peer importance defining social roles and status. All support systems indirectly affected the mental well-being; components of stress, tension and conflict are shaped by participants' social life at place of residence (home or residential homes), workplace (rehab centre), hospital and larger community.

"I wanted to end my life but I joined the rehab to re-visit myself. I started earning every day. That is when I realized I can do something. It brought me some sense of liberation, responsibility and worthiness" a 38 year old married suffering from severe depression leading to suicidal tendency a year back.

V. DISCUSSION

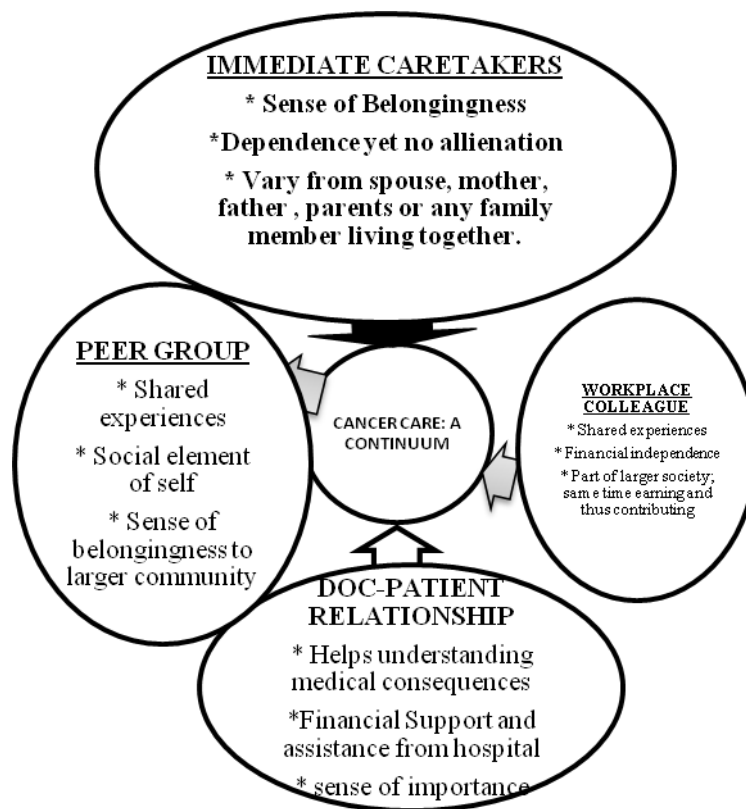
A cancer diagnosis often results in a reassessment of life that does not correspond directly with health status [14]. The life shakes to the extent to distorted relationships, defining newer economic, social and individual communication patterns. In this hassle of tumbled relationships, existing social systems are key and defining factor to determine the course of action of the patients with reference to cancer treatment and care. The result has prominently reflecting social systems helping in influencing and developing the positive attitude of patients maintain life style and structure.

Durkheim [15] in his analysis advocates; suicide rates were higher among individuals who were less socially integrated than among those who had many social ties. Drawing lines on similar grounds, social relationships for women cancer patients have developed them to develop spaces for self as individual and social being establishing an optimistic understanding.

The qualitative description of the participants identifies definite dominant social systems acting as active support mechanism and system for the patients.

1. Immediate Caretakers: Family member, parents or spouse
2. Doctor-patient relationship: Principle Doctor Investigator, associate doctors or nurses
3. Peer Group: Co-patients or friends
4. Workplace colleague: co-workers who have survived/ with cancer

Diagram 1: Social systems with significant roles for the women cancer patients



The definite roles and influences on the woman cancer patient have been explained in the diagram above. The different social systems interplay and also contribute uniquely to the conditions of life; these support the well-being of the individual cancer patient enhancing the Quality of Life (QOL). The relationship of living with husband, family or a person is related to a positive reflection on oneself. It cuts across the feeling of worthlessness but also institutes women cancer patients as companions or members of the household. Women, who were divorced, separated or never married reported higher levels of fatigue [14]. In this study women married or not, but sharing a household space with any person, husband, siblings, parents ascertain the sense of belongingness. This results in health mental health and also lesser fatigue. The inherent anthropological understanding that ‘man is social’ is retained making these women part of the society. Under such conditions of acceptance, there not scope for the feeling of rejection from social functioning to affect adherence in cancer treatment or follow-up. In fact it is significantly expressed that the family members or co-workers accompanying the patients during chemo-therapy diminishes the mental-emotional side-effects of the therapy; less fatigue, pain and nausea is witnessed among these women.

Starting from diagnosis, the major fundamental system associated is medical professional. They are the doctors, investigating and visiting doctors, nurses and ward boys, medical social workers, chemotherapist and in many case the physiotherapist. The patient-doctor relationship as the respondents usually uses for the whole set of professional in hospital setting, determines long term continuity towards treatment. The style of interaction, time spent on sessions and visits, tone of speech is critical in the relationship in creating and sustaining the rapport with the patient. Adherence to treatment has also been influenced by the co-workers and the professionals at the rehabilitation center. The colleagues accompany each other on scheduled chemo and radiation dates. The professionals, the medical social workers makes periodic visits to the place of treatment and also follows-up with patients. It is critical as researchers to recognize and realize the importance of rehab centre as a created and established social system by the women cancer patients. In generic workplace, the people at workplace are compassionate and helpful but in many ways hostile [16]. In the rehab center specifically for cancer patients, the co-workers and the professionals are extremely encouraging and empathetic.

The circles of social support system thus provide a prospect for identity building, befriending and helping self and others. Working in a rehab is a scope for facilitating self an emotional exchange among similar individuals with the sense of self-appraisal of being productive.

There are 11 women living with partners. Though under-discussed specifically in living with partners, it is reflected in regularity and activeness in the centre. Mila Gustavasson-Lilius et. al. [7] concluded female cancer patients who receive high appraisal of partner support display more optimistic appraisals. In this study overt establishments associated with these two variables could not be visible as the 11 married living with their husbands refused to speak in details about the familial conditions. But individuals have mentioned “their husbands being cooperative” in terms of accompanying them to treatment or other social visits or even general check-up. Also the study has not been able to indicate a direct correlation between partner systems and sense of being a woman among

women cancer patients. But abandonment creates a sense of risk and impaired body image among women which can point towards the negative impact of partner systems when negated.

VI. CONCLUSION

With reference to the positive experiences from the social systems, it can be derived that along with medical hospital based intervention in treatment and follow-up, the care and support of the social systems can accelerate the process of healing of women cancer patients. The family, parents, or partner system, each patient develop and live with a unique social system of their own. The most fundamental system being the immediate system in the nearest proximity; nevertheless every social system has definite yet complex roles interplaying within and across systems in the environment of society. The process of cancer treatment definitely contributes to the mental and spiritual well-being in Quality of Life of the individuals. Women being more vulnerable with social hierarchy, the social systems acceptance and understanding create a motivational impulse to live/fight, thus survive cancer.

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An anthropometric study on the children of Tripura: Nutritional and health coverage and redefining WHO percentile cut-off points

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Abstract: Objectives: To provide baseline anthropometric data on the problems of malnutrition among different sub-groups of Tripura's children aged up to 18+ years, consulting internationally recognized SD (standard deviation) system and to examine if there is any disagreement between the SD-and percentile-based cut-off points of malnutrition. **Methods:** A cross-sectional study of children's lengths/heights and weights, and calculating individual body mass index (BMI) were undertaken. The study included 9,498 children aged 0+ to 18+ years from randomly selected 16 areas of Tripura. Medians of lengths/heights and BMI by age and sex, SD prevalence of stunting, wasting/thinness, overweight-cum-obesity by age group (under-five, above-five and above-ten children), sex, locality and caste, and SD and percentile prevalence of stunting, wasting/thinness, overweight-cum-obesity by age group (under-six and above-six children) were evaluated. **Results:** The problems of stunting and overweight-cum-obesity were more prevalent ($p < 0.001$) among under-five children, and the problem of wasting/thinness more prevalent among above-five ($p < 0.001$) and above-ten children ($p < 0.001$) than the remaining groups. On the other hand, $< -2SD$ and $< 3^{rd}$ percentile based prevalence of stunting and thinness differed significantly ($p < 0.001$) among above-six children. **Conclusions:** Existence of under-nutrition among a group of children suggests undertaking intervention programs of health and nutrition for all children aged 0+-18+ years. However, for the assessment of under-nutrition, WHO (World Health Organization) percentile cut-off points of stunting and thinness for above-six children should be redefined for the agreement of their results with that of -2 SD cut-off points.

Index Terms: Stunting, overweight-cum-obesity, wasting/thinness, WHO growth standards/references

1. INTRODUCTION

Malnutrition is the greatest single threat to the world's public health and accounts for 11% of global diseases [1]. It includes both under-nutrition and over-nutrition. Malnutrition can be assessed anthropometrically, because malnutrition impairs growth and/or changes body composition that lead to abnormal changes in body dimensions [2]. The most preferred anthropometric indices are length/height-for-age and BMI-for-age. The former identifies stunting and reflects chronic under-nutrition. The later quantifies overweight-cum-obesity and wasting/thinness, and indicates acute malnutrition. Stunting results in the problems of childbirth in women and remains associated with poor intelligence and increased susceptibility to fatness [1, 3-4], whereas wasting makes the children susceptible to infections, and increases the incidences of stunting and low birth weight [1, 3]. Overweight-cum-obesity causes breathing difficulties, increases the risks of early markers of cardiovascular disease, hypertension, insulin resistance, fractures and psychological abnormalities in the children. In addition, all forms of malnutrition are associated with poor productivity, disability, premature death and problems of pregnancy [1, 5]. Malnutrition affects both preadolescent and adolescent children [2, 3, 6-7]. To

reduce the risks of malnutrition, early diagnosis of it and prompt undertaking of appropriate intervention programs are necessary.

In respect of malnutrition, there was a scarcity of baseline data on the children of Tripura. But because of socio-economic backwardness [8], children of Tripura were suspected to be victims of malnutrition. Consequently, a number of nutritional and health intervention programs have been undertaken for preschool and primary school children in the State since 1970 [8-11]. National Family Health survey-1 (NFHS-1) of 1992-93 reported a high stunting prevalence for under-five children of Tripura [12]. The study did not consider overweight-cum-obesity and did not include children aged 5+-18+ years. Besides, there was no internationally agreed on method for assessing nutritional status of adolescent children [13]. On the other hand, though the problems of stunting, wasting/thinness and overweight-cum-obesity are generally assessed consulting SD or percentile system [2,14-15], there was a scarcity of study exploring if there is any disagreement between these two systems. In this background, we aimed at 1) providing baseline anthropometric data on the different forms of malnutrition among different sub-groups of Tripura's children consulting SD system and 2) examining if there is any disagreement between SD and percentile-based cut-off points of malnutrition, undertaking a cross-sectional study on the lengths/heights and weights of

children aged up to 18⁺ years under a multi-purpose study during 1996-98.

2. MATERIALS AND METHODS

2.1. Study design and selection of population

Tripura is a sub-Himalayan hilly State of North-east India. Total population of Tripura was 31,99,203 (Census Report,2001) and most of them belonged to low socioeconomic status [8]. For this study, 13 rural areas (from 17 pre-selected villages of 17 rural blocks) and 3 urban areas (1 from Agartala Municipality, 2 from 4 preselected areas of 10 Notified Areas) were selected following multi-stage random sampling method. The selected rural areas were Taranagar, R.K.Nagar, Madhupur, Kunjaban, Purba Ramchandraghat, N.C.Nagar, Bhuratali, Jolaibari, Kalabaria, Dakshin Chandrapur, Rajkang-Rangkang, Manughat and Sonaimuri, whereas the selected urban areas included Agartala Municipality, Teliamura N.A. and Khowai N.A. Secondly, in each of the study area, schools ensuring children of both sexes and all available classes were chosen. For the pre-school children, nearby houses of the chosen schools were considered. Before conducting the study, permission of the Headmasters of the selected schools and guardians of the chosen families was taken. Then the lengths/heights and weights of the willing school and preschool children of the selected schools and houses were taken. The study was conducted during the period of 1996-98. However, data analysis got started after about one decade of their collection, when internationally agreed on methods for all children aged up to 18+ years were available [16-25]

2.2. Data collection

The heights of above-two children were measured using a metal anthropometer of 2 meters length. For under-two children, lengths from crown to heel were measured with an auto-recoiling hard steel tape which was identical to anthropometer in calibration. For length measurement, two flat hard board papers were kept perpendicular to the lying plane and parallel to one another touching respectively the tip of the head and the sole of the feet of the under-two children, and the distance between the two hard papers was taken as a measure of length. The measured lengths /heights were recorded nearest to 0.1 cm.

Weights of the bare-foot children were measured using a portable personal weighing scale (capacity: 125 kg. Calibration: 0.5 kg). Weights were measured nearest to 0.25 kg (interpreting positions of scale needle in the middle of two calibrations as 0.25 kg) and recorded making reasonable reduction for clothing that children used depending on age and sex. For an under-two child, difference between the weight of a child with mother and the weight of mother alone was recorded as the child's weight.

2.3. Data analysis

Data of the children were grouped according to their ages (for example, age 18+ years included data of 18- <19 years, and were considered equivalent to 18 years 6 months). BMI of every child was calculated from his/her weight and length/height. Medians of lengths/heights and BMIs for ages were assessed and expressed as percentages of WHO standard/reference medians of respective age and sex [16-24]. A child having length/height-for-age and BMI-for-age <-2 SD values or <3rd percentile values of WHO standards/references of respective age and sex [16-24] was classified as stunted or wasted/thin respectively as per WHO

criteria [14, 25]. A child of age group 0-<5 years having BMI-for-age >+3SD/>99th percentile value (for a child of age group 5-<19 years: >+2SD/>97th percentile) or BMI-for-age >+2SD/>97th percentile (for a child of age group 5-<19 years: >+1SD/>85th percentile) of WHO standards/references of respective age and sex [21-24] were considered as obese or overweight respectively as per WHO criteria [14, 25]. The incidences of stunting, wasting/thinness, obesity and overweight-cum-obesity were expressed in percentages by age group, sex, locality and caste. Chi-square (χ^2) test was performed to assess the significance levels of prevalence differences. For data sorting and graphical representation, Microsoft Office Excel 2007 and Microsoft Graph Chart software were used.

3. RESULTS

The study included 9,498 children (boys: 4930, girls: 4568) aged 0+-18+ years. The Table 1 shows age-wise medians of lengths/heights and BMIs by sex. Medians of our study were lower than the WHO standard/reference medians for most of the ages. Table 2 presents SD prevalence of stunting, wasting/thinness, and overweight-cum-obesity by age group, sex, locality and caste. Stunting was higher in children of under-five ($p<0.001$), rural areas ($p<0.01$) and in girls ($p<0.001$). Thinness was higher in children of above-five ($p<0.001$), rural areas ($p<0.01$), General caste ($p<0.001$) and in boys ($p<0.001$) and overweight-cum-obesity was higher in children of rural areas ($p<0.01$), STs (Scheduled Tribes) ($p<0.001$) and in boys ($p<0.02$).

Figures 1 and 2 show respectively comparison of median weights and lengths/heights among the boys and girls of Tripura and America. SD- and percentile-based prevalence of stunting, wasting/thinness, overweight-cum-obesity for under-six and above-six age groups is shown in Table 3. Figure 3 represents age-wise SD and percentile prevalence of stunting, wasting/thinness, and overweight-cum-obesity. Percentile results were significantly higher than that of SD results for stunting ($P<0.001$) and thinness ($P<0.001$) among above-six age group.

4. DISCUSSION

4.1. SD-based prevalence of malnutrition among the children of Tripura

An objective of our study was to gather information about the prevalence of stunting, wasting/thinness and overweight-cum-obesity following WHO SD system.

4.1.1. Stunting

Stunting i.e., low length/height-for-age is an indicator of past growth failure that have resulted from previous long-term or repeated short-term nutrient deficiencies and/or illness, and/or might be related to low birth weight, and poor economic conditions [1, 15]. The study showed a stunting prevalence of higher severity (Table 2) than that of NFHS studies (1992-93: 46.0%, 1998-99: 44.6%, 2005-06: 35.7%) for under-five (i.e., 0+-4+ years old) children of Tripura [12, 26-27]. Under-five stunting prevalence of our study was also more severe than that of the nation (1992-93: 52%, 1998-99: 45.5%, 2005-06: 48.0% [12, 27-28], and developing countries (1995: 33.5%, 2000:

Table 1. Medians of length(l)/ height (h), weight (w) and BMI by age and sex among the children of Tripura

Age (year)	Boys			Girls				
	Total	Median l/h (cm)	Median w (kg)	Median BMI	Total	Median l/h (cm)	Median w (kg)	Median BMI
0+	20	61.9 (91.6)	6.4	17.0 (98.3)	24	61.0 (92.8)	6.1	16.4 (97.0)
1+	21	73.0 (88.7)	8.5	15.8 (98.1)	20	70.9 (87.9)	7.6	14.9 (94.9)
2+	32	82.0 (89.2)	10.3	16.1 (101.9)	17	79.1 (87.2)	9.5	15.1 (97.4)
3+	34	90.0 (90.1)	12.0	14.8 (96.1)	25	85.1 (86.0)	11.0	14.8 (96.7)
4+	30	94.5 (88.6)	12.9	14.6 (95.4)	28	94.1 (88.6)	12.8	14.3 (93.5)
5+	39	99.5 (88.1)	14.5	14.1 (92.2)	39	99.0 (88.2)	14.0	13.8 (90.8)
6+	487	111.5 (93.8)	16.8	13.5 (87.7)	431	110.0 (93.2)	16.3	13.4 (87.6)
7+	431	117.0 (94.0)	18.5	13.5 (86.5)	433	116.8 (94.4)	18.0	13.3 (85.8)
8+	473	122.0 (93.9)	20.3	13.7 (86.2)	418	121.3 (93.7)	20.0	13.6 (85.5)
9+	425	127.0 (93.9)	22.5	14.0 (86.4)	421	126.8 (93.6)	22.0	13.9 (85.3)
10+	385	131.0 (93.3)	24.3	14.1 (84.4)	374	133.0 (93.8)	25.3	14.4 (85.2)
11+	503	136.0 (93.2)	27.0	14.7 (85.5)	439	139.2 (93.9)	29.0	15.1 (85.8)
12+	495	143.6 (94.2)	31.5	15.4 (86.0)	518	145.0 (94.2)	34.8	16.5 (89.7)
13+	432	152.1 (95.2)	37.3	16.0 (86.0)	385	146.5 (92.5)	38.0	17.4 (90.6)
14+	380	157.1 (94.5)	42.5	16.9 (87.1)	364	148.3 (92.2)	40.0	18.0 (90.5)
15+	315	160.2 (93.6)	44.8	17.2 (85.6)	300	149.4 (92.1)	41.3	18.6 (90.7)
16+	224	161.5 (92.7)	46.0	17.8 (85.6)	208	150.0 (92.2)	42.0	18.7 (89.5)
17+	136	161.6 (91.9)	47.9	18.4 (86.0)	73	149.0 (91.4)	41.3	18.5 (87.3)
18+	68	163.0 (92.4)	47.8	18.1 (81.8)	51	149.2 (91.5)	41.5	18.4 (86.4)
Grand Total	4930		4568					

NB. Medians of length/height and BMI as percentages of standard/reference median data of WHO [16-18,21-22] are given in parentheses. Here '+' indicates 6 (six) months.

29.6%, 2005: 26.5%) [6]. According to WHO epidemiological criteria [29], under-five stunting prevalence of our study was very high ($\geq 40.0\%$).

Stunting prevalence of Tripura had declined in above-five (i.e., 5+-9+ years old) children by 41% ($p < 0.001$) which subsequently had increased in above-ten (i.e., 10+-18+ years old/adolescent) children by 2.6% ($p < 0.05$) (Table 2). The decline of stunting prevalence among above-five children with its subsequent increase in above-ten children indicates a spurt of linear growth in above-five children, which however deteriorated in above-ten children. Stunting prevalence of above-five and above-ten children of Tripura was lower than that of the rural school children (range: 48-56%) of five low income countries (including India) in 1998 [7]. A high prevalence of stunting is of serious concern, whether it is associated with wasting or not. In case of high stunting prevalence, prevention strategy needs to aim at increasing food availability, dietary quality, hygiene, and antenatal care, adequate supply of potable water, and prevention and treatment of infectious diseases [1, 15].

4.1.2. Wasting/Thinness

Wasting (for under-five children)/Thinness (for above-five children) i.e., low BMI-for-age indicates recent weight loss or failure to gain weight because of inadequate food intake and/or illness, and is linked to child mortality and requires immediate intervention [1-2]. For Tripura, under-five wasting prevalence of our study was lower than that of NFHS studies (1992-93: 17.5%, 1998-99: 18.0%, 2005-06: 24.6%) [12, 26-27]. Under-five wasting prevalence of our study was also lower than

Table 2. SD-Based prevalence of stunting, wasting/thinness,

overweight-cum-obesity by age-group and sex among the children of Tripura

Group	Total No.	Stunting (<-2SD l/h, cm) (%)	Wasting /thinness (<-2SD BMI) (%)	Overweight-cum-Obesity (>+1SD/ >+2SD* BMI) (%)
Age-group				
0+ -4+ y	251	69.7	4.8	2.4
5+9+ y	3597	28.7 (S)	30.6 (S)	0.4 (S)
10+-18+ y	5650	31.3 (P<0.05, S)	24.8 (S, S)	1.4 (S, NS)
Sex				
Boys	4930	29.5 [27.9**]	31.9 [31.1**]	0.7 [0.8**]
Girls	4568	33.5 [34.9**] (S)	20.6 [18.0**] (S)	1.4 [2.0**] (P<0.02)
Locality				
Urban	1944	28.6 (P<0.01)	22.7 (S)	1.7 (P<0.01)
Rural	7554	32.2	27.4	0.8
Caste				
General	5922	32.9 (NS)	29.6 (S)	0.8 (NS)
SC	2555	32.3 (NS)	25.0 (S)	0.7 (NS)
ST	1021	20.4 (S, S)	12.1 (S, S)	3.3 (S, S)
Grand Total	9498	31.4	26.5	1.0

NB *= For under-five children only; **= For above-ten children only. SC=Scheduled Castes, ST=Scheduled Tribes, S=Significant ($p < 0.001$), NS=Not significant ($p > 0.05$). 1st mentioned significance levels are in respect of the previous counterpart of the group and 2nd ones (where applicable) are in respect of the furthest counterpart of the group.

that of the nation (1992-93: 17.5%, 1998-99: 15.5%, 2005-06: 19.8%) [12, 27-28] and all developing countries (1995: 8.3%, 2000: 8.2%, 2005: 8.3%) [6]. According to WHO epidemiological criteria [29], under-five wasting prevalence of our study was very low ($< 5.0\%$).

Our above-five thinness prevalence was higher by 25.8% ($p < 0.001$) than our under-five wasting prevalence, which subsequently had decreased in above-ten children by 5.8% ($p < 0.001$) (Table 2). The increase in thinness among above-five children with its subsequent decrease in above-ten children indicates that the spurt of linear growth of above-five children met acute nutrient deficiencies non-compensation of which perhaps led the spurt to be adapted to the prevailing nutrient deficiency causing an increase in stunting among above-ten children. Overall adolescent thinness prevalence of our study was lower than that of slum-dwelling adolescent school children of Mumbai (53%, $< 5^{\text{th}}$ percentile) and Bangladesh (67%, $< 5^{\text{th}}$ percentile of NCHS reference) [7]. It is important to note that a condition of low or no wasting does not indicate the absence of current nutritional problems that cause stunting [29]. In case of high wasting prevalence, efforts need to be directed towards providing adequate foods, prevention and treatment of infectious diseases [1, 15].

4.1.3. Overweight-cum-obesity

Overweight-cum-obesity is a condition of excessive fat accumulation. It results from high energy intakes and/or from decreases in physical activity, and is characterized by high BMI-for-age [5]. For Tripura, under-five overweight-cum-obesity

prevalence of our study (Table 2) was nearly close to that of NFHS study (2.2%) of 2005-06 [27]. Under-five overweight-cum-obesity prevalence of our study was lower than that of all developing countries (1995: 2.9%, 2000: 3.0%, 2005: 3.4%) [6]. Our study showed a decrease in overweight-cum-obesity prevalence among above-five children by 2% ($p < 0.001$) which subsequently had increased in above-ten children 1% ($p < 0.001$) (Table 2). Overweight-cum-obesity prevalence of our study was lower in the children of above-five and above-ten (Table 2) than that of Indian affluent adolescent school children (7.4%) [3] and that of global school and adolescent children (1.2-37.1%) [6]. Overweight-cum-obesity prevalence of our study showed a decrease among above-five and above-ten children (Table 2). The decline in overweight-cum-obesity prevalence among older children indicates that their calorie consumption was lower than their calorie requirements (Table 2).

A decrease in overweight-cum-obesity among above-five children with its subsequent increase among above-ten children indicates that the spurt of linear growth of above-five children was at the expense of surplus energy that in turn possibly increased the incidences of stunting among the affected children impeding their growth spurt. As a result of stunting, the same available energy perhaps started becoming sufficient again for the same children increasing the trend of overweight-cum-obesity among them subsequently.

4.1.4. Malnutrition by sex

This study showed lower stunting prevalence among adolescent boys and girls (Table 2) of Tripura than among Indian adolescent boys (39.5%) and girls (39.1%) [7]. It showed higher prevalence of stunting ($p < 0.001$) and overweight-cum-obesity ($p < 0.02$), and lower wasting/thinness prevalence ($p < 0.001$) in girls than in boys. The national prevalence of thinness (38.8%) and overweight-cum-obesity (1.7%) of adolescent girls of 1998-99 were higher and lower respectively [30] than that of our adolescent girls (Table 2). Our study indicates that girls were of lower growth spurt and more victims to chronic under-nutrition than boys. It might be the result of their long-standing lower access to food and health facilities because of intra-family gender biasness.

4.1.5. Malnutrition by locality

The rates of stunting and wasting/thinness of our study were lower ($p < 0.001$) among urban children indicating their better nutritional status than rural ones. These differences were possibly the reflection of cumulative effects of more favorable living conditions and opportunities of urban areas. Urban children were more affected by overweight-cum-obesity ($p < 0.01$) indicating their excessive energy intake and/or lower physical activity than rural ones.

4.1.6. Malnutrition by caste

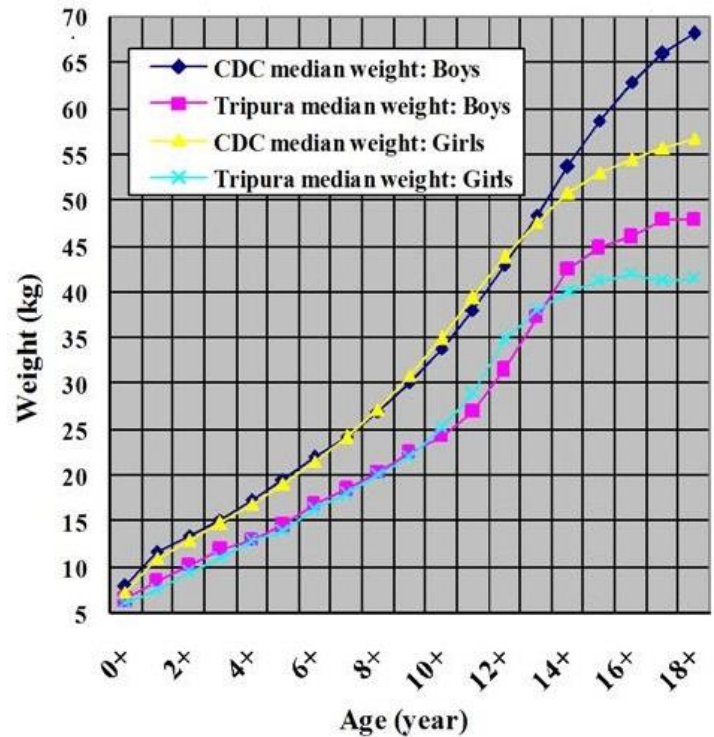
The children of General castes showed the highest prevalence of stunting and wasting/thinness showing their lowest growth status and nutrient availability. On the other hand, ST children of our study showed the lowest prevalence of stunting ($p < 0.001$) and wasting/thinness ($p < 0.001$) indicating their better growth status and higher nutrient availability than the other castes. There is report that STs of Tripura traditionally use a large variety of forest products as food [31]. The better nutritional status of STs might be partly due to their free access to these wild forest products. The study shows the highest rates

of overweight-cum-obesity among ST children ($p < 0.001$) reflecting dominance of surplus energy intake and/or lower physical activity among them.

4.1.7. Relative trends of boys and girls being taller and heavier

Our study shows that boys were both taller and heavier than girls in most of the ages, while the girls were both taller

Figure 1. Comparison between median weights of Tripura and America (CDC)



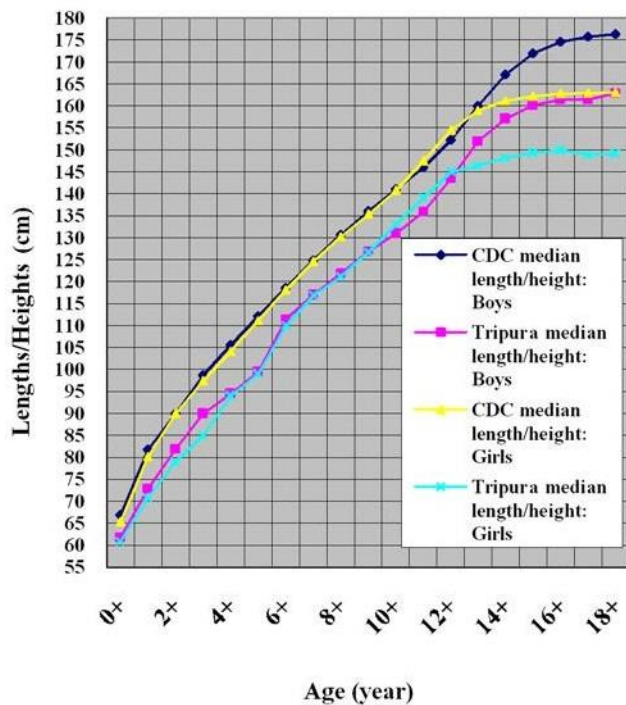
and heavier in the age groups 10+ to 12+ years and only heavier in the age group of 13+ years than boys (Fig. 2 & 3). Children of Tripura differed from the American CDC growth reference [32], girls being both heavier and taller instead of being only heavier in the age group 10+ years and being both shorter and lighter instead of being only heavier in the age groups 8+ and 9+ years than the boys. These findings indicate that Tripura's relative trends of boys and girls being taller and heavier were nearly identical to the American trends.

Our study also reveals the fact that in comparison to the CDC reference, age-wise median heights and weights of Tripura's children were lower in both the sexes. These indicate that CDC growth references also support the existence of under-nutrition among the studied children of Tripura.

4.1.8. Malnutrition on overall

This study reveals that the problems of stunting and wasting/thinness were quite high among almost all groups of children. Under-five children showed very low prevalence of wasting against very high prevalence of stunting. The stunting prevalence was highest among those who were under-five by

Figure 2. Comparison between median lengths/heights of CDC and Tripura



age-group, girls by sex, rural by locality and General by caste. The prevalence of wasting/thinness was found highest among above-five by age-group, boys by sex, rural by locality and General by caste. The decline of stunting prevalence by 41% among above-five children (in comparison to under-five children) indicates a spurt of linear growth in above-five children. The normal current nutritional status (i.e., wasting prevalence <5%) of the stunting dominated under-five children might have acted as a prerequisite for the initiation of this growth spurt among them at their above-five stage. However, the prevalence of overweight-cum-obesity among the children of Tripura was negligible. The overweight-cum-obesity problem was highest among those who were under-five by age-group, girls by sex, urban by locality and ST by caste. Overall, the ST children fared better than the General and SC children in health and nutrition. However, stunting, wasting/thinness and overweight-cum-obesity problems of Tripura showed a trend that was lower than or nearly similar to that of the nation and other developing countries, except for Tripura's under-five stunting that was higher. In this regard, it should be kept in mind that prevalence of these problems is not strictly comparable across time periods even for a given region as each round of study uses different sampling methodologies and includes different age groups [33].

The high prevalence of stunting and wasting/thinness in the children of Tripura after sustainable running of different health and nutritional programs for about two decades, questioned the effectiveness of the undertaken intervention programs. A recent study on 608 rural tribal children aged 6-15 years that showed higher prevalence of stunting (<3rd percentile: 23.7%) and thinness (BMI <5th percentile: 33.39%), and lower prevalence of overweight (BMI >85th percentile: 0.8%) than that

of our overall ST children [34], indicates that the situation has not improved even after about three and half decades of intervention. All these underline the necessity of a composite program involving supplementation of food, sustainable correction of micronutrient deficiencies, improvement of mothers' feeding and child caring behavior, provision of purified water and proper sanitation, strengthening of health care system and programs of regular physical activity, and regular monitoring and surveillance of undertaken programs [1, 5, 33]. On the other hand, high prevalence of under-nutrition among all groups of Tripura's children suggests undertaking intervention programs of health and nutrition for all of them. As the study was conducted about one and half decades ago, the under-nutritional problems of Tripura's children (as evidenced by the high prevalence of stunting and/or wasting/thinness) might have undergone a substantial change during this interval. Undertaking intervention programs based on our study, therefore, may not be appropriate to Tripura's children in present scenario.

The exemplary anthropometric data of our study on the distribution of under-nutritional problems (i.e., the distribution of stunting and wasting/thinness) across different groups by age, sex, caste and locality among the children aged 0+-18+ years (Table 2) document that till there prevail the conditions of under-nutrition (i.e., the conditions of stunting and/or wasting/thinness) among the children of a group, the children of remaining groups sharing the same conditions cannot remain healthy. This observation of our study underlines that the study on a group of children revealing under-nutrition is entitled to suggest undertaking intervention programs of nutrition and health for all children. Our study provides background for the subsequent studies involving even a single group of children to suggest something for all children. Thus arises one relevancy of our old study in present scenario.

In addition, this study provides baseline data on the problem of overweight/obesity for under-five and above-five children and on the problems of stunting and thinness for above-five and above-ten children of Tripura, that may help evaluate the effectiveness of the subsequent intervention programs.

4.2. Comparison between SD-and percentile systems

Another objective of this study was to examine if there is any disagreement between SD and percentile systems of WHO growth standards/references [16-24]. WHO recommends the use of both SD and percentile systems giving preference to the former, because (1) the SD system can provide useful summary statistics, (2) SD cut-off point intervals of similar magnitude always imply a fixed difference for height, weight or any other anthropometric measurement, and (3) all anthropometric indices show similarity in respect of percentage of children who remain below or above a particular SD cut-off point of an age among the reference/standard population [2, 29]. Percentile system is commonly used in clinical or community settings, because it indicates simply and clearly an individual's rank position within the context of standard/reference population [2]. For the normal distribution of a measurement, each SD value has a fixed corresponding percentile (or cumulative probability).i.e., 34.13% of the data would lie between 0 SD to -1 SD or 0 SD to +1 SD, 13.59% between -1 SD to -2 SD or +1 SD to +2 SD, 2.14% between -2 SD to -3SD or +2 SD to +3 SD and 0.14% below

Table 3. Comparison between SD- and percentile-based

prevalence of stunting, wasting/thinness, overweight-cum-obesity by age-group and sex among under-six and above-six children of Tripura

Growth status & group	Total No.	Prevalence (%)		Significance level of difference (χ^2 -test)
		<-2SD	<3rd percentile	
Stunting				
0+-5+ y	329	72.64	73.25	P>0.05
6+-18+ y	9169	29.95	34.14	p<0.001
[6+-18+y: Boys 4754	27.83	31.72	P<0.001]	
[6+-18+y: Girls 4415	32.23	36.76	P<0.001]	
Wasting				
0+-5+ y	329	6.69	7.90	P>0.05
6+-18+ y	9169	27.17	30.90	P<0.001
[6+-18+ y: Boys 4754	32.69	36.92	P<0.001]	
[6+-18+ y: Girls 4415	21.22	24.42	P<0.01]	
Obesity				
0+-5+ y	329	1.82	2.13	P>0.05
6+-18+ y	9169	0.08	0.10	P>0.05
Overweight-cum-obesity				
0+-5+ y	329	6.69	6.08	P>0.05
6+-18+ y	6169	1.00	0.94	P>0.05

-3SD or above +3 SD [25, 35]. Thus, -2SD cut-off value for stunting and wasting/thinness, and +1SD and +2SD values (for under-five children, +2SD and +3SD) for overweight and obesity correspond exactly to 2.28th, 84.13th and 97.72th (for under-five children, 97.72th and 99.86th) percentile values respectively.

But WHO has rounded those percentiles as 3rd, 85th and 97th (for under-five children, 97th and 99th) percentiles respectively [14, 25]. Therefore, there is a probability of percentile-based prevalence being higher for stunting, wasting/thinness and obesity, lower for overweight than the SD-based prevalence for them. Our study showed the trend of overestimation for the 3rd percentile cut-off points of stunting and thinness and the 97th percentile cut-off point of obesity and the trend of underestimation for the 85th percentile cut-off point of overweight (including obesity) in comparison to corresponding SD cut-off points. The study also showed that the 3rd percentile cut-off point causes significant overestimation of stunting (P<0.001) and thinness (P<0.001) among the children aged 6+-18+ years (Table 3 and Figure3).

5. CONCLUSIONS

Existence of under-nutrition among a group of children suggests undertaking intervention programs of health and nutrition for all children aged 0+-18+ years. However, for the assessment of under-nutrition, WHO percentile cut-off points of stunting and thinness for above-six children should be redefined for the agreement of their results with that of -2 SD cut-off points.

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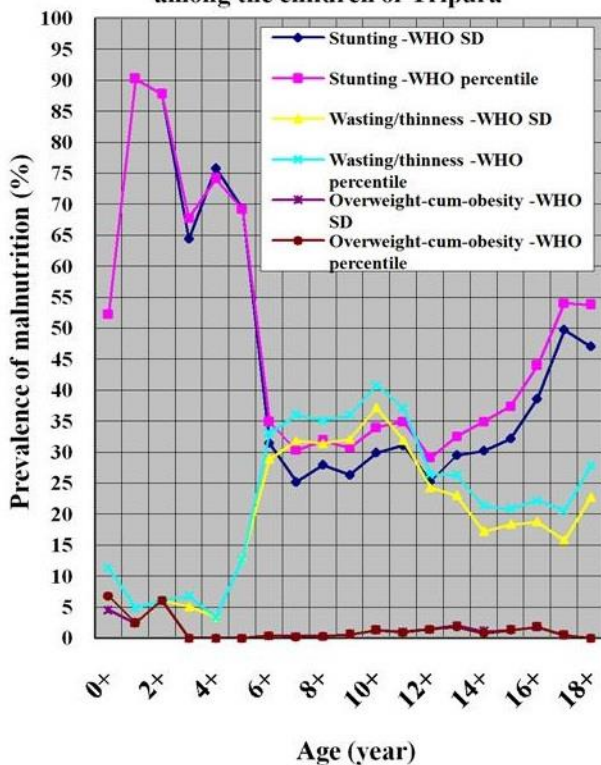
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Figure 3. WHO SD and percentile-based prevalence of stunting, wasting/thinness and overweight-cum-obesity by age among the children of Tripura



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Authors' Contributions

The plan of work and anthropometric study of 1/4th study areas were accomplished by IR and AKC jointly. Anthropometric study of remaining study areas, preparation of manuscript and statistical analyses were done by IR. Interpretations and conclusions expressed in this article are made by IR in association with AKC. IR and AKC are equally responsible for the parts of article critical to its main conclusions.

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The Structure and Properties of Chitosan/Nylon6/Polyurethane Ternary Blends

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Abstract- The ternary blends consisting of Chitosan (CS), Nylon6 (Ny6) and Polyurethane foam (PUF) were prepared by solution blending method. The Structural, thermal and morphological studies were performed by Fourier transform infrared spectroscopy (FTIR), Thermo gravimetric analysis (TGA), X-ray diffraction (XRD) and Scanning electron microscope (SEM). The FTIR results showed intermolecular hydrogen bonds took place between CS, Ny6 and PUF. TGA studies reveal that the thermal stability of the uncross linked blend is higher than cross linked blend. Results of X-ray diffraction indicated that the intensity of diffraction peak at $2\theta = 20^\circ$ of CS and PUF become lower in uncross linked blends. In EG-CS/Ny6/PUF blend the diffraction peaks of CS and PUF at $2\theta = 20^\circ$ become wider and shifted to 23° indicating the amorphous nature and weak interaction between the constituent polymers. Morphologies of these blends were viewed using scanning electron microscopy; the studies revealed that rough and heterogeneous surface for uncross linked blend and a distinct phase separation with high porosity for cross linked blends.

Index Terms- Ternary blends, Chitosan, Ethylene glycol, Cross-linking

I. INTRODUCTION

Recently, natural polymers have been studied as biological and biomedical resources due to their unique properties including non toxicity [1], bio degradability and biocompatibility [2, 3]. However, natural homopolymer by itself is inadequate to meet the diversity of demands for biomaterials. Biocompatibility had been considered as 'the ability of a material to perform with an appropriate host response in a specific application [1], taking into account the interactivity between the biomaterial and the host. Among the prominent applications for biomaterials are: controlled drug delivery [4, 5], orthopedic devices [6], sutures, cardiac pacemakers, and vascular grafts. Natural polymers such as konjac glucomannan [7], chitosan [8] and gelatin [9] have remained attractive primarily because they are economical, readily available, and potentially degradable and compatible due to their origin. Chitosan[Poly (1,4-b-D-glucopyranosamine)] is known to be non-toxic odorless, biocompatible with living tissues, biodegradable, and chemically functional. Due to these advantages, chitosan and its derivatives are seen in applications such as biomedical materials [10], biodegradable packaging and cosmetics. Chitosan has been well known as being able to accelerate the healing of wound in human [11,12]. It has also been documented that chitosan confers considerable antibacterial activity against a broad spectrum of bacteria [13, 14]. Owing to the advantages, some of the applications of chitosan have included wound dressings, gauzes, medical sutures [15] and metal ion-capturing materials for waste-water treatment [16].

The modification of chitosan by means of blending with other polymers may be a convenient and effective method to improve physical properties for practical utilization. Investigation of blends of chitosan with synthetic and naturally occurring macromolecules has attracted much interest in the recent years. It has been reported that the hydrophilic property of chitosan could be modified via blending with PEG and PVA [17, 18]. Chitosan was also blended with several polymers such as polyamides, polyurethane foam, poly (acrylic acid), gelatin, silk fibroin and cellulose to enhance mechanical properties [19-21].

Polyurethane foam (PUF) offers high porosity, low weight-to-volume ratios, good resilience abrasion resistance and moisture permeability properties along with high strength to weight ratio performance attributes. These properties have made PUF as one of the most common polymeric foam used on a global basis, which is reflected its multitude of applications [22].

Recently, Blending of synthetic with natural biopolymers has raised the attention of both the industrial and the academic world [23, 24]. Furthermore, cross linking treatment has emerged as another important strategy to improve the performance of the blends. In the present study we report on solution blending of chitosan with nylon6 and polyurethane foam with and without cross linking agent and subsequent characterization of the obtained blends using IR, TGA, XRD and SEM.

II. MATERIALS AND METHODS

A. Materials

Chitosan (92% deacetylated) was obtained from India sea foods, Cochin. Nylon6 was obtained from DuPont and had a molecular weight of 19,000. Polyurethane foam was obtained from Star foams, Ranipet. All the other materials chemicals are of AR grade from Sd-fine chemicals.

B. Preparation of ternary blend

The polymer solutions (1wt %) of Chitosan, Nylon6 and Polyurethane foam were prepared by using formic acid. The chitosan, nylon6 and polyurethane foam solutions of (1:1:1) weight ratios were blended together with and without cross linking agent (ethylene glycol) to form a homogeneous solution at room temperature with moderate agitation for 1h. Then the ternary blend solutions were poured onto cleaned Petri dishes and dried under vacuum in an oven at 70 °C for 10 h to ensure the removal of the solvent traces.

C. Sample Characterization

The FTIR spectra of the blends were recorded in the spectral range of 400–4000 cm^{-1} using Nucon Infrared spectrophotometer. The TGA analysis of the cross linked and uncross linked blend was performed using TGA Q500 V20.10 Build 36 instrument. X-ray diffraction patterns of blends were analyzed using an X-ray diffractometer (Model D8 avance Bruker, Germany) using a Ni-filtered Cu-K α radiation source power 12 kW, the Bragg's angle (2θ) in the range of 5-80° and scanning speed of $2\theta = 8/\text{min}$. The morphologies of cross linked and uncross linked blends were examined using a scanning electron microscopy (Hitachi – S3400N).

III. RESULTS AND DISCUSSION

A. Fourier transforms infrared (FT-IR) spectroscopy

The infrared spectra of pure chitosan, polyurethane foam and the blends are displayed in Fig.1(a-d). The typical absorption peaks of chitosan (Fig.1a) at 3427.83cm^{-1} correspond to stretching vibration of N-H and O-H; 2923cm^{-1} C-H stretching vibration and 1627cm^{-1} C=O stretching (amide I) and N-H bending (amide II) [25]. The spectra of PUF (Fig.1d) shows characteristic bands at 3442.66cm^{-1} , 2922.18cm^{-1} , 1743.04cm^{-1} and 1628.65cm^{-1} correspond to N-H stretching, CH_2 stretching, Urethane carbonyl and imine group respectively. The interferograms of the blends (Fig.1b &1c) were also observed with small changes in the intensity and wave number indicates obvious hydrogen bonding interactions among counterpart polymers [26].

B. Thermo gravimetric analysis

The TGA curves of CS, CS/Ny6/PUF and EG-CS/Ny6/PUF are shown in Fig. 2(a-c). Pure chitosan (Fig.2a) showed two discrete weight losses at around 100 °C and 272 °C, reflecting the loss of water by vaporization and degradation of CS chains respectively. The TGA curve of CS/Ny6/PUF exhibited two stages of degradation (Fig.2b); at the temperature ranges of 225 – 345 °C and 345 – 465 °C respectively, the thermal stability of the uncross linked blend is higher than pure chitosan due to strong hydrogen bonding between the polymers. On the other hand, the cross linked ternary blend EG-CS/Ny6/PUF (Fig. 2c) shows maximum degradation within the temperature range of 157 °C; due to weak hydrogen bonding and amorphous nature of the blend which is in agreement with XRD and SEM results.

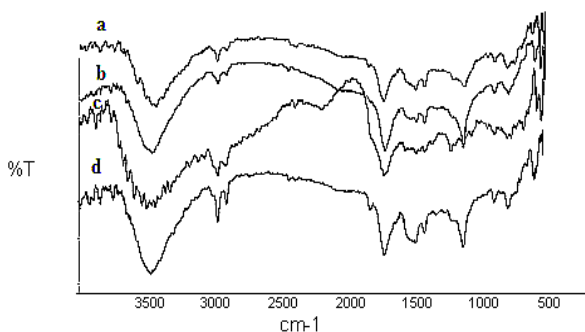


Fig. 1 FTIR spectra of (a) pure CS, (b) CS/Ny6/PUF blend, (c) EG-CS/Ny6/PUF blend (d)PUF

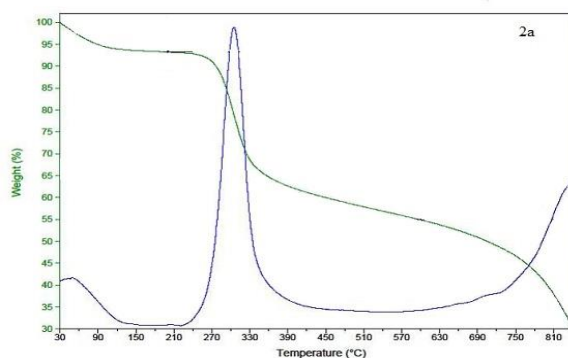


Fig. 2a TGA curves of pure Chitosan (CS)

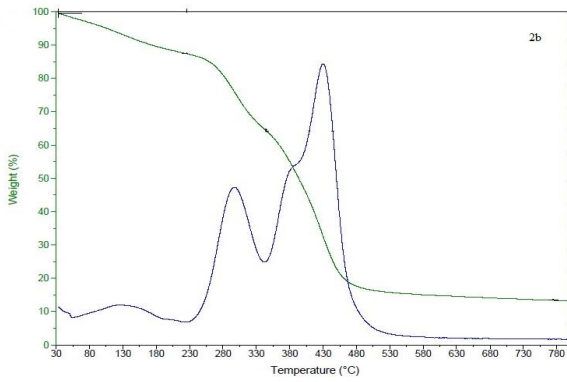


Fig. 2b TGA curves of CS/Ny6/PUF blend

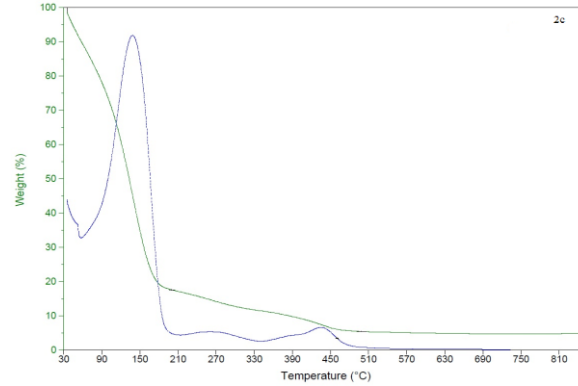


Fig. 2c TGA curves of EG-CS/Ny6/PUF blend

C. X-ray Diffraction

The X-ray diffraction spectra of CS, PUF, CS/Ny6/PUF and EG-CS/Ny6/PUF blends are shown in Fig. 3. The peaks (Fig. 3a) around $2\theta = 12^\circ$, 20° and 23° should be assigned to chitosan: the peak around $2\theta = 12^\circ$ corresponding to the hydrated crystalline structure; while the peaks around $2\theta = 20^\circ$ and 23° corresponded to the anhydrous crystalline and amorphous structure, respectively [27] and also PUF shows (Fig.3d) a wide diffraction peak at 20.45° and 41.55° indicating very low crystallization degree. The reflections for chitosan and PUF are diminished in the blend CS/Ny6/PUF and the intensity of diffraction peak becomes flat and broad gradually (Fig.3b), indicating the significant hydrogen bonding interaction among counterpart polymers.

The x-ray pattern of EG-CS/Ny6/PUF blend (Fig. 3c), in which the characteristic peaks of chitosan are less pronounced. The peaks of chitosan (20°) and PUF (20.45°) has been shifted to $2\theta = 23^\circ$; becomes wider and amorphous, indicating a weak hydrogen bonding interaction in EG-CS/Ny6/PUF blend.

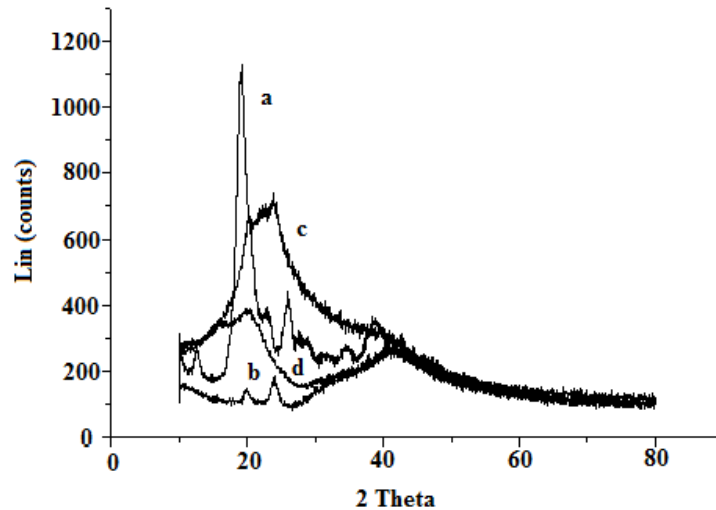


Fig. 3 XRD curve of (a) pure CS, (b) CS/Ny6/PUF blend, (c) EG-CS/Ny6/PUF blend (d) PUF

D. Morphology Characterization

The scanning electron micrographs of prepared blends are shown in Fig. 4(a–c). Pure chitosan exhibit uniform and dense micro structure without pore (Fig. 4a); whereas the CS/Ny6/PUF (Fig. 4b) blend morphology indicates heterogeneous rough surface resulted from the reorientation of polar functional groups toward to the top surface of ternary blend [28]. However, the morphology of EG-CS/Ny6/PUF (Fig. 4c) displayed a trend of self gathering due to limited compatibility; as a result of migration many holes were generated at the surface affecting the thermal stability of the blend, though they can form hydrogen bonding interaction.

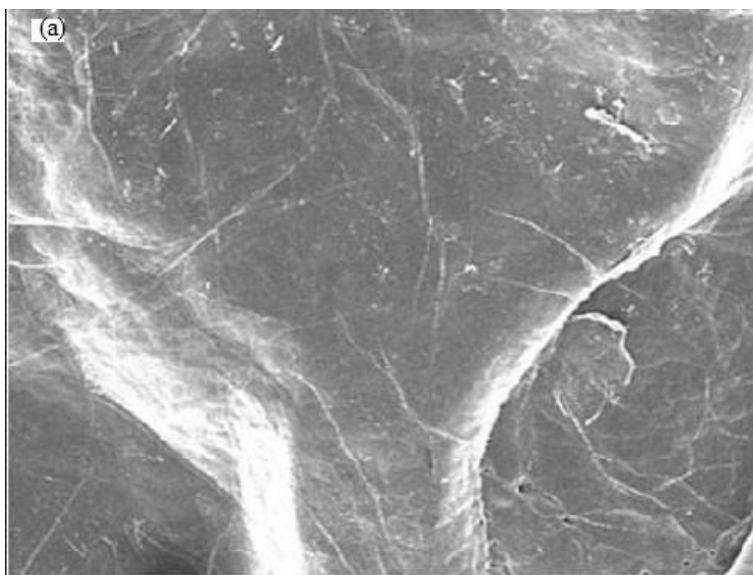


Fig. 4a SEM micrographs of CS

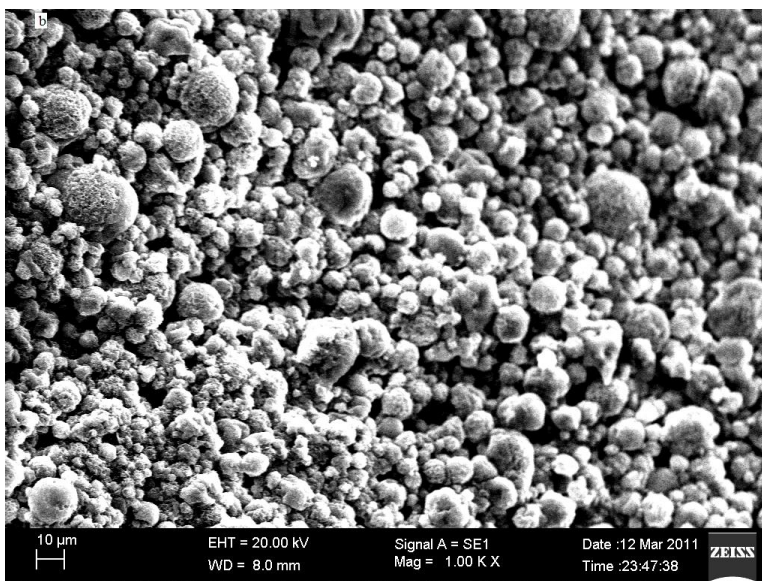


Fig. 4b SEM micrographs of CS/Ny6/PUF blend

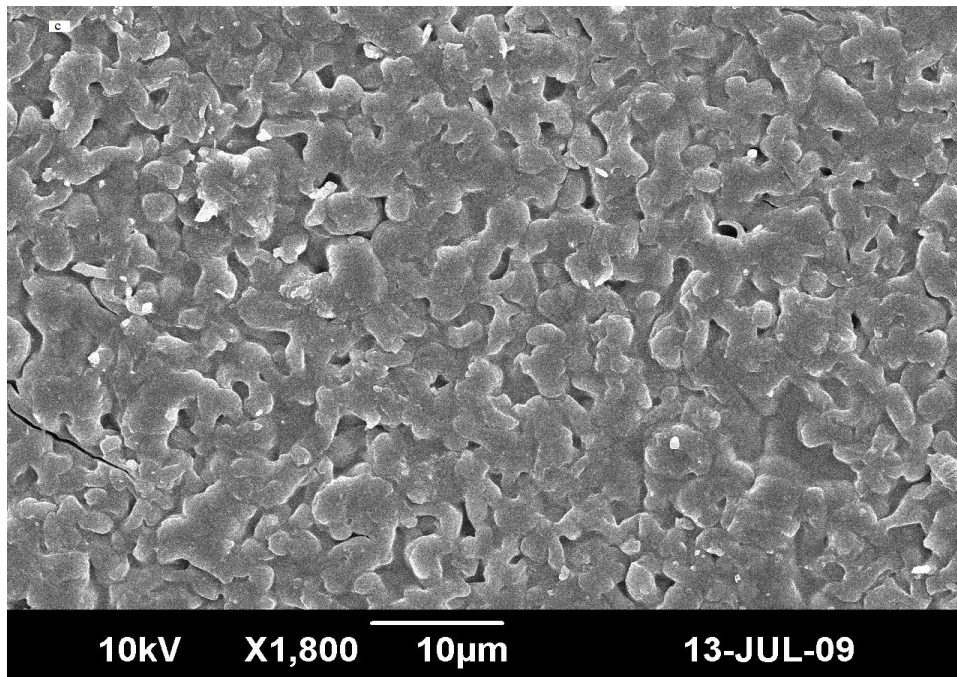


Fig. 4c SEM micrographs of EG- CS/Ny6/PUF blend

IV. CONCLUSION

Ternary blends composed of Chitosan, Nylon6 and Polyurethane foam with and without cross linking agent in 1:1:1 ratio were prepared. The FT-IR studies indicate the existence of inter-molecular interaction between the counterpart polymers. The XRD spectra results revealed that the decrease in crystallinity of pure CS; this is due to significant interaction among CS, Ny6 and PUF molecules. The TGA studies revealed the improved the thermal stability of the uncross linked blend whereas ethylene glycol cross linked blend show low thermal stability. The surface micro structure of the uncross linked blend show rough and heterogeneous surface whereas the ethylene glycol cross linked blend show distinct phase separation with high porosity indicating low compatibility between counterpart polymers.

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Utility of Interactive Whiteboards in Second Language Classrooms

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Abstract- Interactive White Boards are one of the electronic devices which is useful for teaching learning process, particularly for repetition of work, review work, storing the class teacher's work in the board as well as the direct use of internet etc. It is a large touch-sensitive panel that connects to a digital projector and a computer, displaying the information on the computer screen. In this experimental study the objectives consists of (i) to know the utility of interactive whiteboard program for second language classrooms; (ii) to apply the interactive whiteboard program and to find out their utility level for the second language classrooms at Bachelor of Engineering level. For that, the samples of 140 B.E. Students were selected among five different Engineering colleges namely; Government College of Engineering, Francis Xavier Engineering College, Infant Jesus College of Engineering, SCAD College of Engineering, PSN College of Engineering in Tirunelveli District of Tamil Nadu state of Indian Country. After the analysis, the conclusion was, the utility of interactive whiteboard between male and female as well as rural and urban B.E. Students significantly differ with each other. They are in need of more awareness and in service training of interactive whiteboard.

Index Terms- Interactive whiteboard, teaching process, students, language classroom, utility

I. INTRODUCTION

An interactive whiteboard is a large, touch-sensitive panel that connects to a digital projector and a computer, displaying the information on the computer screen. It resembles a traditional whiteboard and is used similarly. The computer connected to the interactive whiteboard can be controlled by touching the board directly or by using a special pen. Such input actions are transmitted to the computer instead of using a mouse or keyboard. Interactive white board is used in many Engineering colleges as replacements for traditional whiteboards or flip charts. They provide ways to show students anything which can be presented on a computer's desktop as educational software, websites and others. In addition, interactive white boards allow teachers to record their instruction and post the material for review by students at a later time. This can be a very effective instructional strategy for students who benefit from repetition, who need to see the material presented again, for students who are absent from classes, for struggling learners, and for review for examinations. Brief instructional blocks can be recorded for review by students they will see the exact presentation that occurred in the classroom with the teacher's audio input. This can help transform learning and instruction.

II. USE OF INTERACTIVE WHITE BOARDS IN CLASSROOMS

Interactive White Boards educational resources allow students to engage and interact with the technology to become active participants in learning. Students with special needs can particularly benefit from the Interactive White Boards presentation of multimedia content on a large screen as it can aid in both information processing and retention. Optimal use of an Interactive White Board involves both the teacher and students using it in a classroom situation. It can be used to i) allows presentation of students in more interactive and collaborative way; ii) show video clips that explain difficult concepts in any curricular area; iii) demonstrate how an educational software program works using their fingers and hands to draw an object; iv) display internet resources in a teacher – directed manner and v) create hand written drawings, notes and concept maps during class time and all of which can be saved for further references.

III. TECHNICAL CONSIDERATIONS

Interactive White Boards have five separate components viz., i) touch sensitive white board, ii) digital projector, iii) computer, iv) software and v) connectivity between the computer, white board and the projector. The computer and the associated white board software are fundamental to the process. The digital projector allows everything that is happening on the computer screen to be projected onto the white board where everyone can see it. The touch sensitive white board allows users, either the teacher or students, to interact with the information being displayed, i.e. to interact with the computer. Normally marker pens (electronic or ordinary) are used as input devices, but some white boards allows user's fingers as the pointing device, directly on the board.

IV. TYPES OF BOARDS

The surface of an white board is critical to its functionality and is a distinguishing factor between the different technologies used in the board themselves. The boards range in size from 37 inches diagonal to 80 inches diagonal and these can be fitted to a moveable stand enabling access in different locations. There are three different technologies viz., (i) Resistive membrane; (ii) Electro- magnetic pick up board and (iii) Infra- red scan board

V. INDIAN CLASSROOMS WITH INTERACTIVE WHITE BOARD

The impact of Interactive White Boards on teaching and learning enables teachers to demonstrate a wide range of concepts, while removing many of the time-consuming elements of writing on a traditional board. For instance, diagrams related to transcoding i.e. flow chart, bar chart, pie chart, can be easily drawn from the internet and annotated in real-time, increasing the pace of delivery and allowing more time for quality teaching. More important, however, is the transformational effects Interactive White Boards have had on learning. They appeal to different learning styles, and through the process of participation, they promote high levels of interaction, support links between learning episodes and encourage individuals to take ownership of their learning (Vijayakumar, 2012). It is clear from the research that to fully realize the benefits of Interactive White Boards must accompany the introduction of the technology. College teachers still differ vastly in their attitude and approach to implementing such technology (Senthilkumar, 2012).

Those who are more enthusiastic about the Interactive White Board tend to embrace its use and want to explore the opportunities that it brings to the classroom. It is therefore important that college teachers are aware of the Interactive White Board training available, both face-to-face and online. In addition, regular access to Interactive White Boards is essential as it enables teachers to practice their skills and become confident users of the technology. Similarly, providing access to software outside the classroom makes it far easier for teachers to prepare lesson content and explore its versatility (University of Stockholm, 2006).

Furthermore, as Interactive White Board use continues to evolve, the technology is increasingly being seen as a hub to which we can attach additional solutions. A technology that is providing particularly popular is Learner Response Systems, which allows individual students to participate through handheld devices and provides teachers with instant insight into their understanding. There is also a growing interest in visual presenters, which enable teachers to capture, display and annotate still and moving images.

VI. OBJECTIVES AND HYPOTHESIS OF THE STUDY

The objectives of the study are i) to know the utility of Interactive White Board program for second language classrooms; ii) to apply the Interactive White Board program and to find out their utility level for the second languages classrooms at Bachelor of Engineering level. The hypothesis of the study are ; i) there is significant difference between the utility of Interactive White Board for B.E Students with respect to the gender and ii) there is a significant difference between the utility of Interactive White Boards for B.E Students with respect to their locality.

VII. SAMPLE FOR THE STUDY

Explorative method was adopted with the convenience sampling size of 100 B.E Students were selected among 5 different Engineering Colleges namely: 1. Government College of Engineering 2. Francis Xavier Engineering College 3. Infant

Jesus College of Engineering 4. Scad College of Engineering 5. PSN College of Engineering in Tirunelveli district of Tamilnadu state of Indian country.

VIII. METHODOLOGY OF THE STUDY

For this research a second language class teaching was conducted by the investigator through Interactive White Board method and to explain the different uses with demonstrations. An utility of Interactive White Board questionnaire was prepared with four point scale by the investigator and that was found that with face validity and reliability (0.81) with 15 statements asking of Strongly Agree (SA), Agree (A); Dis Agree (DA) and Strongly Dis Agree (SDA). Two hours second language lecture was discussed through Interactive White Board and the questionnaire was distributed to the group of students and to collect it. The collected data was scored as 4 for SA, 3 for A, 2 for DA and for 1 for SDA and then interpreted with Mean, S.D. and 't' test through Statistical Package for Social Sciences (SPSS Ver. 19.0) and it explained in table-1 and the questionnaire was attached in Appendix

Table -1 : Utility of Interactive White Board of B.E Students (Gender wise)

Variable	Strength	Mean	S.D.	't' value
Male	70	15	1.732	7.138
Female	70	13	1.581	

Significant at 0.05 level

The table – 1, explains the utility of Interactive White Board between the Engineering students according to their gender wise. The acquire 't' value (7.138) is greater than the tabulated 't' value (1.97 at 0.05 level) and the acquired 't' value is significant. Hence, the utility of Interactive White Board between male and female Engineering Students are significantly differ each other.

Table – 2: Utility of Interactive White Boards of B.E Students (Locality wise)

Variable	Strength	Mean	S.D.	't' value
Rural	70	13	1.501	8.323
Urban	70	11	1.338	

Significant at 0.05 level

The table – 2, explains the utility of Interactive White Board between the Engineering Students according to their locality wise. The acquired 't' value (8.323) is greater than the tabulated 't' value (1.97 at 0.05 level) which is significant. Hence the utility of Interactive White Boards scoring between rural and urban Engineering students are significantly differ each other.

The findings of the study are : i) Interactive White Board program is differ utilization in students learning in second language classrooms at B.E level either in gender wise and in locality wise; ii) Interactive White Board program is effective in teacher education program and it improved competencies of the particular subject (English) and learning approach; iii) Interactive

White Board programs created more utilization awareness about use of technology in second language classrooms.

IX. CONCLUSION

The conclusions of the study are as follows i) the use of Interactive White Board program impacts positively on the B.E program ii) it improves effectiveness of practice teaching lesson through Interactive White Board preparations iii) it motivate the students to plan and implement practice lessons more efficiently through Interactive White Board preparations iv) the Interactive White Board class teaching effectively develop the students' knowledge in the part of video resources and the use of usage of YouTube, Wikis, Face book, Twitter and open educational resources. (Wany, J and Hartley, K 2003).

Interactive White Boards are being adopted in classrooms around the world. They have generally been well received, with many college teachers claiming they could no longer teach without one. A number of benefits are identified includes impact on presentation, on teaching practice, on the learning environment and on learning itself. To ensure maximum benefit, they are in need of awareness of Interactive White Board and also needs in service training in Interactive White Boards utilization.

The reality is that Interactive White Boards have now become an integral part of the fabric of many second language classrooms and offer teachers a valuable tool offering a number of benefits, both in terms of the practical advantages for teaching and learning. The utility of Interactive White Board will help college teachers to reap the rewards of the technology and ensure innovative and effective use in the classrooms.

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APPENDIX
Utility of Interactive WhiteBoards Questionnaire

No	Statements	SA	A	DA	SDA
1	Teaching students how to navigate the internet through IWB				
2	Teach editing skills using cut, edit and paste through IWB				
3	Save lessons to present to students who were absent				
4	Reinforce skills by using on-line interactive web sites				
5	Use individually in IWB and asked to save it				
6	Use the software to create lessons before teaching the subjects				
7	Create video files to teach as a subject review				
8	Take notes directly from PowerPoint presentations				
9	Students are enjoying the subject demonstrations				
10	Students are attracted by the different learning styles in IWB				
11	Students are interactive through NET in IWB				
12	Teachers use ready-made presentations Eg. Slide share				
13	Teachers teach avoiding inappropriate contents Eg. Facebook				
14	Teachers teach avoiding inappropriate contents Eg. Facebook				
15	Through open educational resources, they can open materials				

Effect of *Curcuma longa* (Turmeric) on biochemical aspects of House Fly, *Musca domestica* (Diptera: Muscidae)

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Abstract- *Musca domestica* found in every habitation causing nuisance, diseases which results in public health problems. Conventional methods used for fly control caused several problems such as pest resistance, effects on non-target organisms, pest resurgence etc. To overcome these difficulties, it is important to search for new ecofriendly alternatives. In present work an effort has been taken to solve these problems. For this a medicinal plant *Curcuma longa* (Turmeric) selected for screening its efficacy as biopesticide. It has medicinal properties such as anti-inflammatory, spasmolytic, antiparasitic, antibacterial, antiarthritic, carminative, Laxative, Tonic, Diuretic etc. Studied biochemical aspects reveal that enzyme activities were decreased to 0.22umole/ml/min in case of Amylase while 0.30 umole/ml/min decreased was observed in case of Invertase. While it also decreased carbohydrate and protein content significantly i.e. 9.26 and 22.01 mg/gm body weight. These results conclude that this plant has to be further investigated for developing a ecofriendly insect control pesticides which can used in IPM.

Index Terms- *Curcuma longa*, *Musca domestica*, Medicinal properties, Biochemical aspects, IPM.

I. INTRODUCTION

The Housefly *Musca domestica* L. is a worldwide known pest/vector causing public health problems (West, 1951). Their role as vectors of human and animal pathogens especially those responsible for enteric diseases are due to the habit of defecation and regurgitation on animal and human food (Howard, 1911). It spreads disease causing organisms, especially *E.coli*, *Shigella* and *Salmonella* spp. (Ahmad et al., 2007; Holt et al., 2007; Nayduch and Stuzenberger, 2001). Houseflies disperse to areas of human habitation and activity from areas commonly found around human and animal waste (Mian et al., 2002; Sulaiman et al., 2000).

Such notorious house flies known for their ability to develop resistance mechanisms to avoid and detoxify chemical insecticides. Resistance to DDT was detected in short duration after its introduction (Varzandeh et al., 1954; Perry, 1958). There flies also developed resistance to organophosphates, carbamate and pyrethroid insecticides (Boxster and Campbell, 1983; Plapp, 1984; Kaufman et al., 2001b; Butler et al., 2007) as well as growth regulators such as diflubenzuron and cyromazine (Shen and Plapp, 1990; Bloomcamp et al., 1987). Due to continuous use of pesticides resulted in efficacy losses (Sheppard et al., 1990) and development of cross resistance (Scott, 1989).

Plants are well known producers of diverse kind of chemical compounds and many products that are used for defend plant against different kinds of pests (Isman and Akhtar, 2007). Various properties such as killing and repelling pests, affecting insect growth and development, antifeedant and arrestant effects, antifungal, antiviral and antibacterial action against pathogens, were evaluated (Prakash and Rao, 1986, 1997). Acetyl cholinesterase inhibition and octopaminergic effects were detected after treatment of essential oils as fumigant (Isman, 2000). Also effects on behavior modification and contact toxicity for different life stages were evaluated by Koul et al. (2008). Palacios et al. (2009 a,b) studied the effects of 21 medicinal and edible plants against Housefly in which he detected limonene (92.5%) and 1,8-cineole (56.9%) as principle components of orange peel and eucalyptus leaves. Medicinal plants with pulegone, menthone, limonene and 1, 8-cineole were found most toxic to house fly. In another study 34 plants were evaluated for fumigant and toxicity efficiency by Pavela (2008). The principle components of peppermint oil were menthone and menthol (Palacios et al., 2009 b). The plant tissues extracted, climatic and growth conditions, variation in cultivation and the methods used for extraction and analysis affects the composition of oils from particular species. For this reason there have been considerable efforts to examine the effects on individual components that are common to those essential oils known to have insecticidal properties (Isman,2000; Koul et al,2008).

From all above it is evident that plant originated pesticides can prove great beneficial for pest/vector control. The present work aims at the assessment of bioactive potential of medicinal plant *Curcuma longa* (Turmeric) which found to have Anti-inflammatory, Spasmolytic, Antiparasitic, Antibacterial, Anti-arthritis, carminative, Laxative, Tonic, Diuretic properties (Warrier et al, 1994), against the Housefly. Data obtained was subjected to statistical analysis.

II. MATERIALS AND METHODS

1. Rearing Method:

M. domestica nucleus culture was obtained from Entomology Section, National Chemical Laboratory, Pune. Temperature maintained was 28±2°C and 58-68% R.H. Adults of *M.domestica* were reared in plastic jars of 35 cm height and 15 cm width, covered with muslin cloth. A cotton swab soaked in milk powder; yeast dissolved in water was given to adults as food and was changed after every 24 hours. This cotton swab also served as substrate for oviposition. The eggs were transferred to another jar on medium containing finely crushed

groundnut with water. The eggs were allowed to develop in this medium only up to pupal stage and were collected to keep in another container for adult emergence. Fresh emergence was transferred to separate containers to know the exact age of adults which is required for various bioassays.

2. Bioassays:

All test oils were dissolved in A.R. grade acetone and serial dilutions were made as per requirement.

2.1: Toxicity:

Larvicidal Assay:

Residual film technique was used to performed larvicidal assay (Tare, 1995). Uniform residual film was prepared on the Petri dish (4" diameter) both lower and upper dish. Ten prepupal larvae were introduced in each petri dish with desired concentration of the test plant oils while carrier solvent, acetone was used in control. Food was provided in all Petri dishes and mortality was observed after 24 hours. For each experiment five replicates were taken and each experiment was repeated five times. LC₅₀ was calculated using log probit analysis. (Finney 1971). Data obtained was subjected to statistical analysis.

2.2: Biochemical Assay:

For all Biochemical assays prepupal larvae known weight were used. These larvae were exposed to LC₂₀ concentration of test oil for 24 hours and then harvested and homogenized in 20ml of phosphate buffer of pH 6.8 and centrifuged at 8000 rpm in Ultra Centrifuge (Remi-CM12) for 10 minutes at 4°C. The supernatant was used for biochemical assays.

a) Amylase activity:

DNSA Method was used to determined amylase activity (Plummer 1988, Sumner 1925). 0.5 ml substrate (1% Starch), 0.5 ml phosphate buffer (pH 6.8, 0.2 M) and 0.5 ml enzyme extract constituted the assay mixture. This mixture was incubated for 10 minutes and 1ml DNSA was added. The mixture was then kept in boiling water bath for 10 minutes. After this it was cooled, diluted to 10 ml and optical density (OD) was read at 540 nm on UV spectrophotometer (Systronics-Model 119 PC Based). The enzyme activity was calculated using standard curves for glucose. Each assay was carried out eight times and for each set three to five replicates were taken. Data obtained was subjected to statistical analysis.

b) Invertase activity:

Invertase activity was determined by DNSA Method (Plummer 1988, Sumner 1925) which was used to detect invertase activity. In this case 5% sucrose was used as substrate instead of starch. For each set three to five replicates were taken and the assay was repeated eight times. Data obtained was subjected to statistical analysis. Standard graph was plotted for determination of enzyme activity.

c) Estimation of Total Carbohydrate contents:

Carbohydrate was estimated using Anthrone method (Plummer, 1998). 4 ml of anthrone reagent was rapidly mixed with 1 ml of a protein free supernatant. For ten minutes this mixture was kept in boiling water bath. The tubes were then cooled to read OD at 620 nm on UV spectrophotometer (Systronics-Model 119 PC Based) against the reagent blank. The amount of carbohydrate was calculated by using standard curve of glucose.

d) Estimation of Total Protein contents:

Protein estimation was determined according to Modified Lowry's method (Raghuramalu et al. 1983). Alkaline copper reagent, phenol reagent was prepared as per the method states. To 0.1 ml of larval extract, 0.5 ml of alkaline copper reagent was added in each tube, mixture was incubated at room temperature for 10 min which is followed by addition of 2 ml of phenol reagent. These tubes were heated for 5 minutes at 55°C and were cooled under running water. OD was measured at 650 nm on UV spectrophotometer (Systronics-Model 119 PC Based). Standard curve was used to calculate amount of protein using bovine serum albumin as standard. Amount of protein contents (mg) were calculated per gram body weight of larva. For each test minimum 10 replicates were taken. The test was repeated eight times. Data obtained was subjected to statistical analysis.

III. RESULTS AND DISCUSSION

Various plant products are used to kill or repel flies for several decades. Due to resistance problem caused by synthetic chemicals, research was focused on plant products so as to find alternative to these chemicals (Geden 2012).

The following result was obtained in the present study.

Table 1: Results of Biochemical Assays

Sr. No.	Assay	Control value	<i>Curcuma longa</i>
1.	Larvicidal Assay (ppm)	----	115.821 (0.269)
2.	Amylase Activity (µmole/ml/min)	0.51	0.73 (25.22*)
3.	Invertase Activity (µmole/ml/min)	0.46	0.76 (38.89*)
4.	Carbohydrate Content (mg/gm Body Weight)	25.89	16.63 (26.80**)
5.	Protein Content (mg/gm Body Weight)	68.39	46.38 (21.39*)

()=Chi Square, * = P < 0.001: Very highly significantly different, ** = P < 0.05: significantly different

Out of many plant products, some of them were found to be effective against insecticide resistant insects' pests (Ahn et al., 1997; Assabgui, 1997; Jacobson, 1989; Miyakado et al 1983). *Z. officinalis* essential oil found effective bioactive agent against *M. domestica* possessing larvicidal activity, LC₅₀ = 137 ppm, repellency 84.9 and 98.1 % oviposition deterrence both at 1 % concentration, (Morey and Khandagle, 2012).

Selected plant oil, *Curcuma longa* showed good biochemical activities against *Musca domestica* i.e. it decreased the Amylase and Invertase activity by 0.22 and 0.30 µmole/ml/min. Significant decrease was also observed with respect to carbohydrate and protein content (9.26 and 22.01 mg/gm body weight respectively). These biochemical aspects can be correlated with the toxicity assays (Ishaaya and Casida, 1975). The results conclude that the plant *Curcuma longa* has some potential to be explored further for development of an ecofriendly pesticide/insecticide for control of House fly. It can be used with other plant products or chemicals for integrated pest management programs.

IV. CONCLUSION

Thus from above all results it can be concluded that, the plant oil *Curcuma longa* has potential to be used in ecofriendly pest management. It can also be used successively in the integrated pest management programmes.

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Process Approach to Reading and its Implications for Teachers and Students

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Abstract- The present article discusses the process approach to reading and its incorporation in the teaching of literary texts. This is attempted because the main project of the thesis is related to the Teaching of English. The pivot of a prose lesson is reading and unless a text is read and understood properly, it will be very difficult to carry on group-work in the classroom. Hence, this article is highlighted the teachers of reading and their implication for teachers and students.

Index Terms- Aspects of reading, Interactive process, Language of the knowledge, Schemata, Teachers and Students.

I. SCOPE OF THE STUDY

The teaching of reading at the college level serves two purposes: one is Intensive Reading and the other Extensive Reading. The Intensive Reading focuses its attention on the comprehension of the text in depth, in addition to concentrating on the teaching of Vocabulary and Grammar. The Extensive Reading on the other hand, lays its emphasis on the context of the text. Learning vocabulary and grammar are only secondary. A good glossary is considered to serve more than what is necessary for this purpose. The range of reading is ultimately tested through writing. Hence it is necessary for the teacher to

enable students to read and understand what is read and then to write what he has understood.

II. FINDINGS AND RESULTS

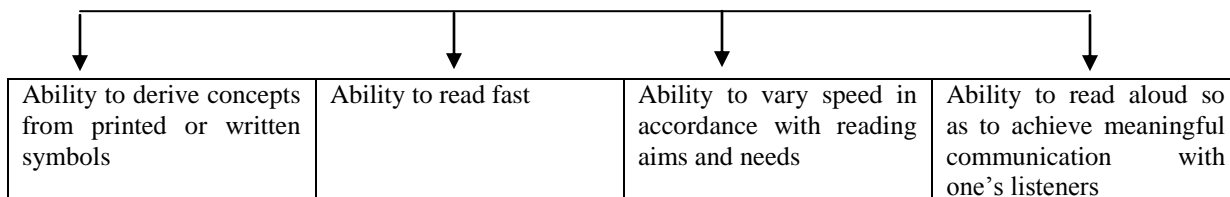
At the college level, students are expected to read essays, short stories, one-act plays, poems and novels. They are expected to read them in depth and answer questions about plot construction, characterization to an appreciation of literature. Therefore, in terms of Brumfitts' (1980) reading processes (as shown in diagram 1) the expected standard of reading at the college level refers to 'the intellectual skills and non-skills study'. In other words, they are expected to read 'between and beyond the lines'.

Reading and Writing form a group by themselves. The concept of reading and writing undergoes a change after 1970's before which they were considered in terms of products. Hence, the teaching of reading focused its attention on setting questions at the end of the lessons. Now they are considered in terms of the process involved. Liners are made to undergo the experience involved in the reading as well as writing skill.

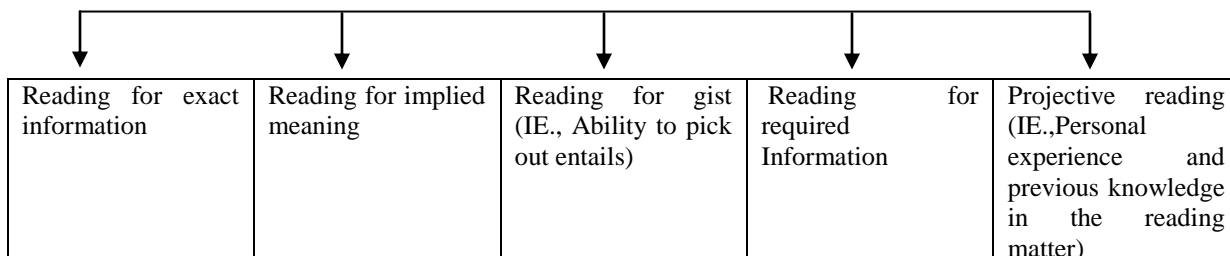
A look at the history of the development of the reading skill reveals the history behind the writing skill also. In the early 1965, these models attempted

III. READING PROCESSES

The Mechanical Skills

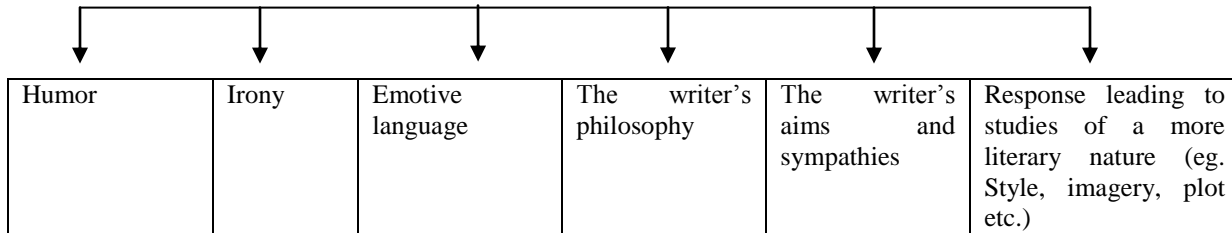


The Intellectual Skills



Non-Skills Study

Ability to respond to the language beyond plain statement



To describe how stimuli, such as word and word recognition responses become associated. Reading was thus described as a process of sight - sound - sense , and was considered to involve decoding or transforming or reconvertng written symbols into spoken language (Mathews 1966 quoted by smith 1973) Moreover, it was believed that meaning was contained in the text and it was the task of the reader to extract the right meaning, various types of comprehension questions were set at the end of the reading text. So, by nature, these questions were purported to test one's comprehension of the text. If the students were able to answer all the questions correctly, (it was believed that the text had fixed meaning and there was only one right meaning of the text). They were said to have acquired the skill of reading and reading was supposed to have a number of sub skills that would be mastered independently. This was called 'skills-an approach' to reading. Samuels and Kamil (in carrel et al 1988) state that during this period behaviorism because the emphasis was on directly observable events external to the individuals, little attempt was made to explain what went on within the recesses of the mind that allowed the human to make sense of the printed page.

After mid 60s, because of the emergence of cognitive psychology, the modes of reading began to show how processes such as memory and attention which went on within the recesses of the mind played a role in reading. Reading was no more considered to be extracted meaning from the text. It began to take into account the role of the reader. It was no more considered a passive skill but became an active skill and an interactive one. It was believed that the reader was not simply a passive object, fed with letters, words and sentences, but was also able to achieve at understanding without looking at every letter and word (Williams, 1984)

Goodman's idea of whole language approach to reading was popular in the 70s along with the smith's idea of reading that the redundancy inherent at all levels of language (letter features, within words, within sentences, within discourses) provides readers enormous flexibility in marshalling resources to create a meaning for the text at hand (quoted by Samuels and Kamil in carrel et al, 1988) illustrated that reading was a psycholinguistic guessing game.

Both Goodman and Smith exhibited how readers of all ages relied on the procedure preference for the meaning (as opposed to the graphic and grophophonc) cues available on the printed page. A subsequent development was the application of 'schema theory' to reading which depicted how the readers projected their views of the text in order to create meaning out of it. It has always happened in the field of ELT that whenever a new theory is proposed, it is always taken to its extremes. This happened in the field of structural and communicative approaches, and there

is now a talk of integrating these two approaches. Similarly when the schema theory was successfully applied to reading experts tended to associate reading with the contribution made by the reader in interpreting the message of the text. For, according to schema theory, a text does not by itself carry meaning; a text only provides direction for readers as to how they should retrieve or construct meaning from their own, previously acquired knowledge. This top-down processing of information was advanced by Steffe son, Joag dev and Anderson (1979), carrel and Eisterheld (1983) Johnson (1981, 1982) and Hudson 1982, quoted in a carrel, 1988.

The interactive approach to the reading of literary texts is concept-driven because it starts processing the information from the general level and then comes down to the word-level. Its counterpart, bottom-up processing is data driven because the information flows from the word level to the meaning level. The popularity of the top-down processing was such that, as carrel observes, lest the top-down view of second language reading be taken as a replacement for the bottom-up, decoding view, several researchers have recently emphasized that efficient and effective second language reading requires both bottom - up and top – down strategies operating interactively. Some of the main studies are by Rumel hart, 1977, 1980; Sanford and Garrod, 1981; Eskey and Grabel, 1988; Carrell and Eisterheld 1983 (quoted in a carrel, 1988).

In Britain, applied linguistics began to realize the weakness of the skills approach to reading and concentrated more on the interaction between the reader and the text. Lancer and Gardener (1979) have demonstrated that in skills approach different types of comprehension question fall to call upon different sub-skills. They have also stated that skills approach typically proceeds by giving subjects tests on their understanding of passages and yet doing a comprehension test and actually reading are not the same thing. Further knowing what a student has understood does not by itself help one to decide how he has or has not understood this and cannot provide information on how the learner might be helped to understand at a higher level, if he has failed to achieve that level. Moreover, the description of what a student has understood of the text is not the same as the description of how he arrives at such an understanding. Thus it is clear that for a complete understanding of reading the skills approach is inadequate and a knowledge of the process approach is inevitable.

The process approach considers that a text has meaning potential and it is left to the reader to make the meaning from it. As Lunzer (1979) puts it “ comprehension is not merely the outcome of a phonetic transcription of a written passage, rather it is present, at least in embryo, as reading process. Meaning occurs in the mind of the reader before words are decoded”. This pre-

supposes that the reader has to bring something to the text to make meaning out of it. What the reader brings to it goes by the name 'process' in the channel of reading. Its basic tenet is that reading is an interactive and interpretive activity. It is a kind of communication with the text. The fact that different readers get different things from the same that goes to prove that reading is a process of co-operation and negotiation.

Thus there is not much of a difference between 'Process Approach and Interactive Approach' to reading. Excepting that

they are two different labels, both lay their emphasis on what happens when a reader comes into contact with text. Definitely there is the interaction of different types: interaction between the reader and the text; interaction between different elements that constitute a text; interaction between bottom-up and top-down processes. This process has been very well illustrated by Lancer and Gardner (1929:16) in the diagram 1.

Diagram 1
Interaction between the writer and the reader

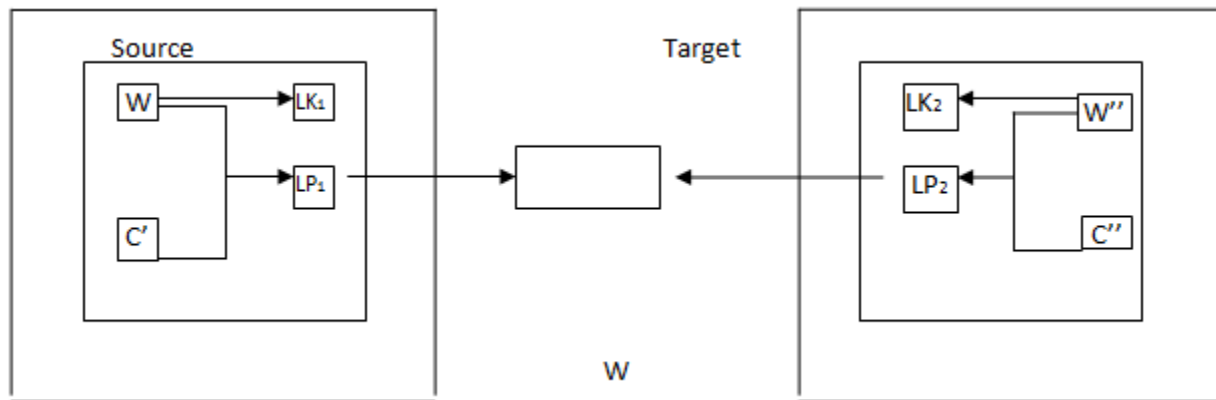


Diagram 1 shows that the difference between spoken communication and written communication. In the case of spoken communication, the speaker and the interlocutors share the common situation, that is, there is no time gap between the message produced and received. But in the case of written communication, there is a time gap. The writer produces a message at one time and place and this is received by one or more readers in another. There is however, a common experience of the world (w). The produce of communication that is the text is now permanent and not transient as in the case of spoken communication. This suggested by a double rectangle denoting the message (m). Unlike oral communication, here the verbal message cannot be supplemented, modified or emphasized by non-verbal behavior. Further, the lack of a common situation is made worse by a restriction of the context. That is, the context is limited to what has already been introduced by the writer; he cannot alter it when the reader reads it. So what the writer always does is to make his message complete and to introduce order into it. He affects this completeness and order by anticipating what knowledge (w'') the reader may possess and by trying to supply all the deficiencies of the reader at the right moment, which is called editing.

Editing takes place twice in the process of producing a message; once at the thought level and then at the textual level that is the language in which it is couched. The editing is very much done by the language processor (LP) which represents the capacity to select the relevant section of the total knowledge for a specific purpose. When the reader comes across this message, he uses his knowledge of the language (LK,) knowledge of the world and the context and tries to understand the message. Through his LP, he finds the message to be easy or difficult

according to the writer's estimation of the readers LK and W. If his expectations are high then the text may prove to be difficult for the reader who fails to live up to that expectation. On the other hand, if the writers' expectations are lower than the ability of the reader, the text is understood easily. That is why an arrow marked both ways is marked between M and LP.

The same idea is expressed in 'Interactive Approach' through an interaction between 'bottom-up' and 'top-down' processes. In the bottom – up processes, the data are the input from the text which moves to the brain. The upward movement triggers off certain past experiences or perception about the topic. In the 'top-down' process, it is an attempt by the brain to find an existing knowledge structure to superimpose on to the incoming data in order to more quickly facilitate the assimilation of the new information. Both the processes are to be complementary otherwise the message of the writer will not be correctly understood by the reader.

There are two major interactions involved in reading:

1. Between reader and text
2. Between different elements within the text or otherwise called 'textuality'

IV. INTERACTION BETWEEN READER AND TEXT

A reader does not go to a text without any purpose. He reads because he wants to read. So he brings the following to the text he reads (Wallace, 1986)

1. Purpose
2. Knowledge of the language

3. Knowledge of the world
4. Opinion

V. PURPOSE

Reading depends on the purpose of the reader as no reader comes to a text without any purpose. Consider the example of a newspaper from cover to cover. First of all, one skims through it to select items of interest. Then if one is interested in sports, one reads the sports page. Even here, one reads the news about one's favorite game. Further a reader's purpose decides one's speed of reading. For example there is a substantial difference between looking at a notice board and scanning advertisements for a particular type of flat on the one hand and reading an article of special interest in a particular journal on the other.

Based on the purpose of reading, texts can be divided into 2 major categories:

1. Language texts and
2. Reading texts.

Language texts are meant for learning a language whereas reading texts are meant for enjoyment as well as for getting facts, ideas, even feelings of family community. In the latter we are interested in what the writing meant (Nuttal, 1988). Thus a text is selected according to the purpose of the readers. This affects the reading process to a greater extent especially in interrogating and interpreting the text.

VI. KNOWLEDGE OF LANGUAGE

The second factor involved in reading is the knowledge of the language system that the reader brings to the text. A reader should have a clear idea of the writing system of the language, for it is the written material that he is to negotiate. Written discourse is a vast area that cannot be exhausted here and hence only 3 examples are given to indicate the quantity of knowledge expected of a reader with regard to the language system.

- a) Paralinguistic features of a written language refer to the punctuation marks. The punctuation marks play a vital role in indicating the nature of an idea complete or incomplete. They also express feelings and sometimes functions. For e.g. A newspaper headline during the world cup cricket tournament in 1984 was "Kapil's devils did it!" The exclamation mark at the end of the sentence conveys the feeling that something unexpected has happened. The reader must be familiar with such meanings.
- b) Knowledge of the sentence structure helps the reader predict world classes in a sentence. For e.g. In the sentence E.g.) Roma gave Krishna his pen. Here, the SV, IO, DO pattern predicts the second object.
- c) Similar the connecting devices used by the writers help the learners to relate an idea backwards and forwards in order to get its significance. For E.g.) The school was closed due to the students' strike, which was not liked by the parents. This refers to the whole sentence that goes before.

VII. KNOWLEDGE OF THE WORLD

The third aspect is the knowledge of the world or the 'schemata'. Widdowson (1983) defines schemata as "cognitive constructs or configurations of knowledge which we place over events so as to bring into alignment with familiar patterns of experiences and belief. They therefore serve as devices for categorizing and arranging information so that it can be interpreted and retained. Starting from Bartlett's experiments (Bartlett, 1932 quoted in Widdowson, 1983) it has had its usefulness in different fields. In the field of reading one can say that the reader places his schemata over what he reads in order to interpret it. One brings in one's knowledge of the world to interpret the text. As Carrell (1983) remarks "the text itself does not carry meaning. A text only provides guidance for listeners and readers as to how they should construct the intended meaning from their own previously acquired knowledge.

To prove this fact, Catherine Wallace (1988) cites an example:

The Great Britain pack has performed without distinction in the two tests so far. Their lack of pace has been starkly exposed by the mobility and speed of such players as Broadhurst, a magnificent open-side prop.

Despite all the words in this text are familiar to the reader and there is not much of a problem in the understanding of the construction of the passage, the reader is puzzled as to the message of the text once he is supplied the background knowledge, that is, the text is from a newspaper sports page and about rugby, football, then the text emerges meaningful to the reader. His knowledge about the game helps him to extract the meaning from the text. So what is necessary here is the knowledge of the source, genre and topic. The source refers to the medium from which it comes namely book or newspaper. The genre refers to the form of writing namely recipe, menu or newspaper editorial. A particular genre has both a distinctive content and a characteristic structure. It is this characteristic of the genre that makes readers predict the happenings in the text and confirm those predictions during the course of their reading.

Another aspect that helps the reader in his guessing is the cultural element. Knowledge of the cultural aspect of the text is a must for the reader to unearth the meaning from it. It refers to a very complex package of beliefs, knowledge, feelings, attitudes and behavior of the people. To cite an example (Wallace 1988) Sally's daddy said, "we are going to see Auntie pat in hospital". Sally and her daddy went to a shop to get some.....

A British reader would fill in the blanks with flowers, but an Indian reader would fill it with oranges, apples or Horlicks because that is the routine in his culture. The point that is made here is that a knowledge of culture helps a learner to predict what to follow and interpret the situation.

VIII. OPINION

The last aspect of reading is opinion, which means the views that readers have about the world in general and the text in particular. Some readers have their own likes and dislikes about authors. Such attitudes influence the readers before they open a book or a paper. They also influence reader evaluation of the content and the author's views.

The second interaction involved in the reading process is textual interaction or textuality.

IX. TEXTUAL INTERACTION

This refers to the interactive nature of the text. Recent research by Grabe (1984 and 1985) indicates that the linguistic elements of the texts combine interactively to help create textuality (what makes a text, a text as opposed to a collection of individual sentences) that must be processed by a reader. It is a known fact that writers purposely use and manipulate different combinations of linguistic variables in different text types and genres. This interaction of variables is what Grabe (1988) calls 'textual interaction' the interaction of linguistic forms to define textual functions.

The form-function interaction is mostly effected by cohesive and coherent devices. Debangrande and Dressler (In carrel, 1987) definite cohesion as "the ways in which surface elements of a text are arranged and mutually connected within a sentence". This is a broader definition than that of Halliday and Hasan (1976) who define it as a semantic one which refers to relations of meaning that exist within the text, which factor defines it as a text.

For them a text is a semantic unit, a unit not of form but of meaning and cohesion is expressed through the structural organization of language. The 3 strata of language:

1. The semantic (meanings) strata
2. The lexico-grammatical (form) strata and
3. Phonological or orthographic (expression) strata.

What they affirm is that meanings are realized as 'forms' and 'forms' are released as 'expressions'. In other words, meaning is put into words and words are put into found or writing. So it is the readers' responsibility to find out related elements in a text in order to comprehend the text. The relationship is expressed through five ways and each way is called 'a cohesive tie'. The five ways are referenced, repetition, substitution, ellipsis and conjunction. There is one more way, which is by 'other words'. They are dealt with below:

1. References

The following example illustrates 'references' (Hedge, 1988)

The Eskimos are descendants of hunters who moved from Siberia into Northern Canada at the end of the last Ice Age, about 12,000 years ago. They still live in this area where there are arctic weather conditions for eight or nine months of the year. In such a climate it is not possible to develop agriculture. The traditional Eskimo economy was therefore based on two basic activities. The first was fishing through holes in the ice or on the open water in canoes. The second was the hunting of sea animals such as whales and seals and land mammals such as caribou.

2. Repetition. (Halliday and Hasan, 1976)

Consider the e.g.

1. Wash and core six cooking apples. Put the apples into a fireproof dish.

Here the item functioning cohesively is the 'apples' which works by repetition of the word 'apple' accompanied by the definite article as an anaphoric signal

3. Substitution (Halliday and Hasan, 1976)

Consider the sentence

He lost his way in the galleries-the same thing happened to me.

Here the substitution, 'the same thing, refers to "I also lost my way in the galleries"'.

4. Ellipsis (Halliday and Hasan, 1976)

Consider the e.g.

1. At last Stan has tried. I don't think Bob has.
2. Are you dieting? I have been for some time.

The second verbal group in the above sentences is elliptical because in the first sentence 'tried' is omitted after 'has' and in the second 'dieting' is not mentioned after 'have been'.

5. Conjunctions (Halliday and Hasan, 1976)

Consider the sentence

E.g. For the whole day he climbed up the steep mountain side almost without stopping.

1. And in all this time he met no one. (additive)
2. Yet he was hardly aware of being tried (adversative)
3. So by night time the valley was far below his (casual)
4. Then, as dusk fell, he sat down to rest (temporal)

And, yet, so and then are conjunctions here. They create cohesion through their meanings rather than by specific reference to other items in the text. Each conjunction has a category according to its function in the text. The categories are given in brackets.

6. Other worlds

Sometimes vocabulary items give cohesion to the text. One of the ways is, choosing the words in order to give consistency to the impression or point of view that one is trying to express (Williams, 1984)

Dr. James stepped into the ward and the patient attempted to lift his bleeding hand so that the visitor might get a better view. James noticed how the wretch had also suffered damages to his elbow.

The words that affect the cohesion are the 'visitor' and the 'wretch'. The visitor refers to the doctor and the wretch refers to the patient. Besides cohesion the textuality or text is affected by coherence.

7. Coherence

A text may cohere via the interaction between text presented knowledge. For e.g. (Widdowson, 1978). Consider the following dialogue.

A: That's the telephone

B: I'm in the bath

A: o.k.

A reader of this dialogue between A and B can easily understand the reason left unstated by B (that he cannot attend to the call as he is in the bathroom) because of this knowledge of the world.

Beaugrande and Dressler (1981) are of the same view when they define coherence as follows:

Coherence concerns the ways in which the components of the textual world, that is the configurations of concepts and relations which underlie the surface text are mutually accessible and relevant. Concepts are configurations of prior knowledge. (Cognitive content) in the mind and relations are links between concepts which appear together in a textual world.

Sometimes the reader's interpretation of a text depends upon his knowledge of other texts. For e.g., The text 'Every little bit hurts' can be understood and appreciated better, provided the reader knows that 'Every little bit helps'.

It has been seen that heading is a co-operative enterprise where unless the reader and the text interact purposefully, there cannot be any comprehension of the text. This has greater implications for the reader, a term which include the learning and the teachers.

X. IMPLICATIONS FOR THE STUDENTS

Students can be encouraged to realize that reading starts even before they look at the page. This realization can be affected by focussing on what they actually do when they want to read newspaper, magazines and books in their mother tongue. Students never approach a text without purpose, both of their own and that of the author and read only what they are interested in. Further they do not read at the same time speed a novel and a notice in their mother tongue. May be because of their classroom experience where the teacher teaches the textbook, reading line by line and explaining every word, they may have developed an idea that there is only one style of reading. This idea should be eradicated from their minds and they can be made to learn that there are 4 styles of reading, namely scanning, skimming, extensive reading and intensive reading. Grellet (1981) lists 4 main ways of reading which are

1. Scanning where one goes through a text to find particular piece information.
2. Skimming which process is used by a reader while quickly going through a text to get the list of it.
3. Extensive reading which is used for reading longer texts, usually for one's pleasure. This is a fluency activity, mainly involving global understanding and
4. Intensive reading which procedure one adopts to read shorter texts, in order to extract specific information. This is more an accurate activity involving reading for detail.

The students can be made to realize that reading is a kind of interactive process where their contribution plays a major role. They should understand (Nuttal, 1987) that

The text functions like a do-it-yourself construction kit. The message in the writer's mind is the perfect piece of furniture planned by the designer. The process of breaking this down into a box with instructions for assembly is a little like the process of putting thoughts into words and organizing them into a coherent text.

XI. IMPLICATION FOR THE TEACHERS

The teachers must realize that there are 3 broad stages in reading an unfamiliar text: pre-reading, while-reading and post-reading. It is the pre-reading stage that often presents maximum difficulty while reading a text in a foreign language. It is of vital importance as it activates the student's expectations and predictive ability.

The teacher must expose the students to different types of texts in order to sensitize them to understand how their reading strategy changes according to their purpose of reading. Practically speaking, in Indian classrooms it is impossible, for the teachers expose the students to texts considering the student's taste. So what can be done is to arouse motivation through his handling of the text that is given to the reader so as to give learners a purpose in reading. This does not mean that he should not expose his students to different genres. A genre has distinctive content and characteristic structure. This is a week, the teacher must make it a point to expose students through different texts to different genre – how it is organized and what its contents are. It is also necessary for the teacher to point out the different purposes of headlines, captions, punctuation marks and diagrams, small prints etc. to the students. They must be trained in identifying the text and topic and recognize their purposes.

The teacher should start with a global understanding and move towards a detailed understanding rather than working the other way round. Because, it is the awareness of the general structure of a passage, that will allow the students to read more effectively later on. By starting with a longer unit and by considering the layout of the text, the accompanying pictures or diagrams etc. the students can be encouraged to anticipate what they are to find in the text. This is essential in order to develop their skills of inference, anticipation and deduction.

Reading is an active skill. It constantly involves guessing, predicting, checking and asking oneself questions. This should be taken into consideration when revising reading comprehension exercises. It is possible to develop the students' power of inference through systematic practice or to introduce questions which encourage students to anticipate the context of a text from its title and illustrations of the end of the story from the preceding paragraphs.

Students should be led to find out; first of all, whether the text aims at convincing reader, giving him information, asking him for something etc. One way of doing this is to set comprehension tasks. Comprehension tasks are different from comprehension questions in the sense that the latter tests one understands whereas the former guides the students through the reading process making them learn the strategies involved in reading.

XII. CONCLUSION

The brief analysis of the various aspects of reading shows that reading is an interactive process where the reader's intent, knowledge of the language, schemata and opinion play a vital role in the interpretation of the text, consequently the role of a teacher is that of an active participant in the reading process,

guiding, advising and evaluating readers' goals and accepting a variety of possible interpretations.

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Accuracy Assessment of Land Use & Land Cover Classification (LU/LC) “Case study of Shomadi area- Renk County-Upper Nile State, South Sudan”

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Abstract- This study was carried out in White Nile state to evaluate and tested the accuracy assessment (data quality) to monitor and assess the land cover land use mapping: The accuracy assessment model was used to measure of how many ground truth pixels are correctly classified. To achieve this objective sample points are located by Geographic Positioning System (GPS). Where, Landsat satellite imagery (ETM) year 2010 represented same results with the GPS and Geographic Information System (GIS). The result displayed an accuracy of 94.04 % with over all Kappa statistics (ka) of 91.26 %, however Remote sensing data, GPS data (ground truth), positional accuracy, logical consistency matching with the information on the map.

Index Terms- Accuracy Assessment. Ground-truth. Kappa. Pixels, land use/land cover

I. INTRODUCTION

The accuracy of spatial data has been defined by the United States Geological Survey USGS, 1990 as: "Accuracy assessment or validation is an important step in the processing of remote sensing data. It determines the information value of the resulting data to a user. Productive utilization of geo-data is only possible if the quality of the data is known. Furthermore, integrated processing of different types of geo-data cannot be effective if the data quality is not known. During the last two decades, numerous studies have been published concerning accuracy assessment of (LC) classifications (Congalton, 1996, Rosenfield, et al., 1986, and Foody, 1992).

The accuracy of any map may be tested by comparing the positions of points whose locations or with corresponding positions as determined by surveys of a higher accuracy. Tests shall be made by the producing Researcher or agency, which shall also determine which of its maps are to be tested, and the extent of such testing, (The National Map Accuracy Standards (1998).

The closeness of results of observations, computations to the true values or the values accepted as being true This research is conducted at Shomadi area- Renk County- Upper Nile State-South Sudan in 2010 (Map 1). The area has great potentiality of natural resources which favoured various land use types. Among these, the Mechanized rain-fed farming system, irrigation

agriculture, grazing, settlement sprawling, forest related activities, petroleum exploitation etc. The anthropogenic activity has exerted excessive pressure on the existing resources. As consequence, environment and socio-economic set up have been negatively influenced. But, no previous study is carried to assess this situation. Therefore, it became important study the area (Haroun, 2012)

Research Objectives

The objective of this study is to compare the predicted classification of each site with the actual classification as discovered by ground truth [McCoy, (2005), Congalton, (1996), Burnett, et al., (2003) and Habtamu, (2006)].

Having the Classified map following segmentation, accuracy assessment is carried out with two goals in mind, namely:

- To assess how well a classification is worked,
- To understand how to interpret the usefulness the classification.

Research questions

Based on the above mentioned objectives, the accuracy assessment seeks to answer the following questions:

1. The errors' frequency and how often do they occur?
2. The nature of the errors: what kinds of information are confused?
3. The magnitude of errors: how bad are they? e.g., confusing Mechanized rain-fed farming with traditional rain-fed farming is not as ' bad' an error as confusing forest with range; confusing similar soils is not as ' bad' an error as confusing very different soils.
4. The source of errors: why did the error occur? This allows us to refine the survey methodology.

Statement of the problem

The error matrix and kappa coefficient have become a standard means of assessment of image classification accuracy. This method of determining image classification accuracy resample classified imagery against ground truth field samples often obtained with a Global Positioning System (GPS). Accuracy assessment is further discussed in Chapter four, Results and Analysis. Thus, accuracy assessment is important for the judgment if they performed classification coincides with the nature attributes. Assess accuracy of a remote sensing output is one of the most important steps in any classification exercise!!

Without an accuracy assessment the output or results is of little value. In many studies, the created thematic maps do not coincide with the natural location maps. This happens due to error from the expressed number of sample units (pixels) assigned to a particular category relative to actual category as indicated by reference data.

39.45"E and longitudes 11° 43' 40.62" N - 32° 48' 16.59"E with total area of 169,283.79 ha. (Fig.1) (Haroun, 2012). The study area has huge potentiality of natural resources such as forest, range, animal resources, game, water resources, fertile soil and arable cultivable land, fisheries, etc. Therefore, it became attractive to investors.

II. STUDY AREA

The study area situated in Renk County-Upper Nile State-South Sudan. It lies at latitudes 11° 29' 11.76" N - 32° 43'

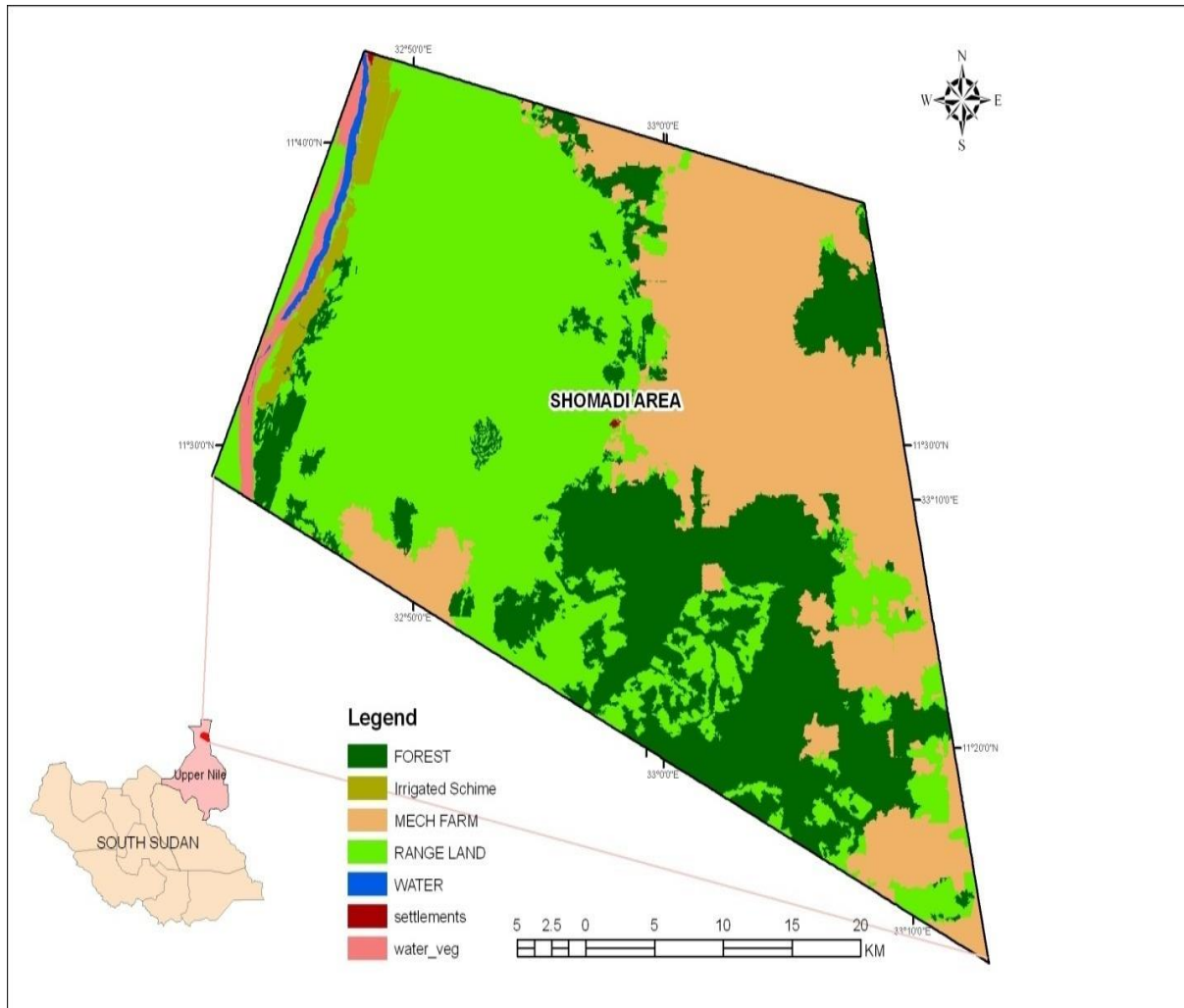


Fig (1) Location map of the study area

III. METHODOLOGY

Ground Control Point Establishment:

In parallel to the remote sensing work; field work is carried to collect data. The field data is collected by measurements approach. Before commencing the field measurement as a pre-requisite; reconnaissance in the form of three field trips. During these field trips, points are selected. Measurements to soil,

vegetation and fixing corner points for the boundaries of the study area. The details of all above are illustrated below:

During the second trip, both Ground Control Points (GCPs) and the Area of Interest (AOI) of study area are selected, demarcated & measured by Global Positioning System (GPS). This is done to get an accurate reading for the specific locations for samples positions. In each position 3-4 readings of the GPS are taken. Each Positional measurement is averaged. Alleviations are obtained in field in feet; then, converted to meters (1 Foot =

0.3048 meters). Alleviations are obtained in field in feet; then, converted to meters (1 Foot = 0.3048 meters).

Systematic sample is taken to evaluate the accuracy of the LULC classification as well as soil type of the study area. SPOT-5 map of 2010 and ERDAS imagery version 9.1 are used (Fig.2) The procedure for accuracy assessment: The accuracy assessment is carried out in the following manner:

- Reference data is collected by GPS. Class types are then determined at specific locations which are known as ground truth (Table 1).
- Reference data is compared to map to find out if the class type on classified map equals to class type determined from reference data (Table1).
- Sample size, sample number: In this study sample size of 288 is taken. Sampling method – the systematic-non aligned sampling (a grid provides even distribution of randomly placed GPS ground truth) method is used.
- The data is summarized and quantified by using error matrix (Table 1). The result is presented in a table which displays the followings:

Total Accuracy: Number of correct plots / total number of plots:

- Diagonals represent sites classified correctly according to reference data.
- Off-diagonals are mis-classified.
- The problem with total accuracy is that the summary value is an average which does not reveal if error is evenly distributed between classes or if some classes are really bad and some really good, therefore, it includes other forms, and these are: User's accuracy. It corresponds to error of commission (inclusion): example 1 mechanized farm and 3 forest sites included erroneously in rangeland category. Producer's accuracy this corresponds to error of omission (exclusion), example 7 swamp area (vegetation in wetland) and 1 water body sites omitted from irrigated agriculture category.
- ⇒ User's Accuracy: From the perspective of the user of the classified map, how accurate is the map?
 - For a given class, how many of the pixels on the map are actually what they say they are?
 - Calculated as: Number correctly identified in a given map class / Number claimed to be in that map class.
- ⇒ Producer's Accuracy: From the perspective of the maker of the classified map, how accurate is the map?
 - For a given class in reference plots, how many of the pixels on the map are labeled correctly?
 - Calculated as: Number correctly identified in ref. plots of a given class / Number actually in that reference class.
- ⇒ Kappa: Estimated as (\hat{K}). It reflects the difference between actual agreement and the agreement expected by chance.

Kappa of 0.75 means there is 75% better agreement than by chance alone

$$Kappa = \frac{\text{observed accuracy} - \text{chance agreement}}{1 - \text{Chance agreement}}$$

- Observed accuracy determined by diagonal in error matrix.
- Chance agreement incorporates off-diagonal.

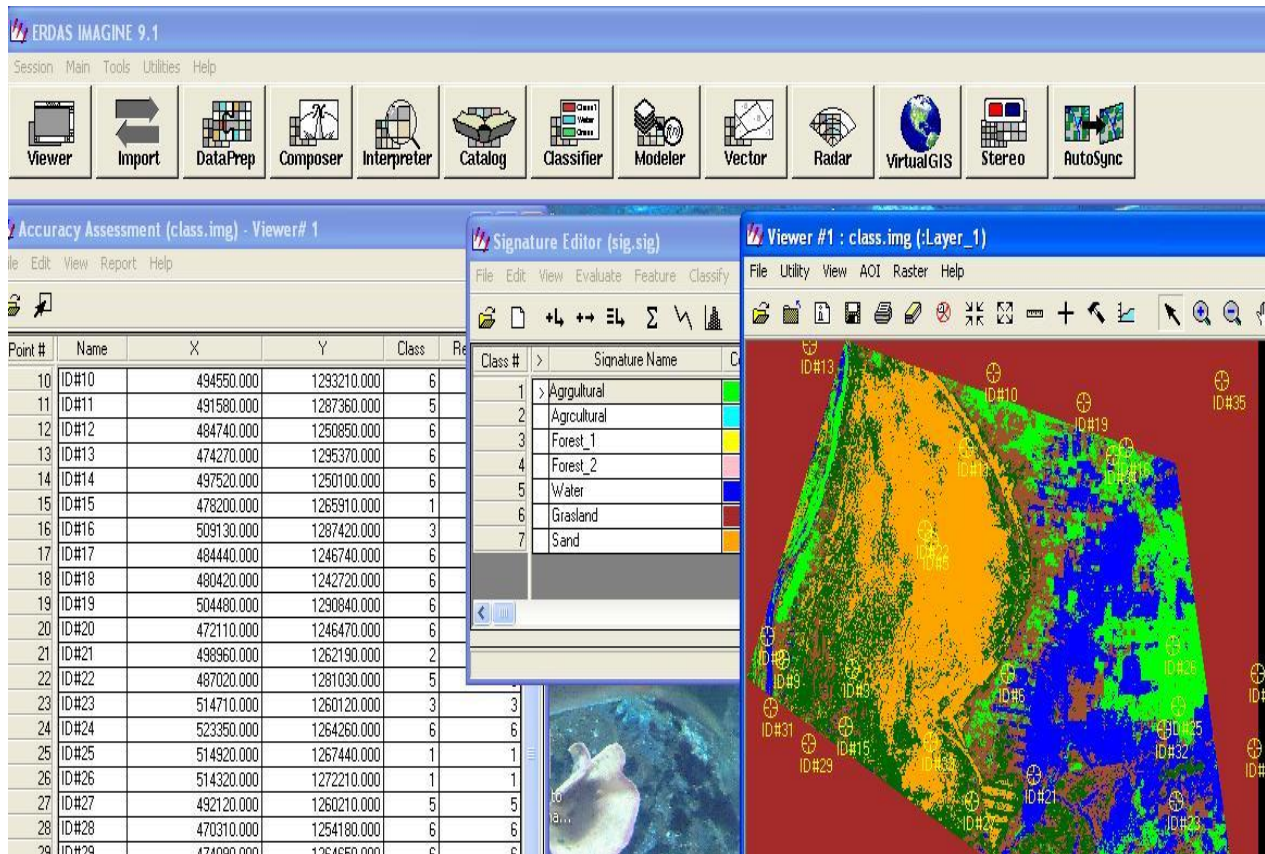


Fig.2: ERDAS accuracy assessment viewer

Reference Data: Geo-referenced Raster Image of year 2010									Percent	
Classification	Forest	Irrigate Agric.	M.rainfed Agric.	Range	Water bodies	Settel.	swamps	Total	CE	UA
									Forest	68
Irrigated agric.	0	04	0	0	0	0	0	4	0	100
M.rainfed Agric.	4	0	73	5	0	0	0	82	18.29	89.02
Range	3	0	1	119	0	0	0	123	21.14	96.75
Water bodies	0	0	0	0	02	0	0	2	0	100
Settlements	0	0	0	0	0	02	0	2	0	100
Swamps	0	0	0	0	0	0	03	3	0	100
Total	75	4	76	128	2	2	3	288	OA = 94.09%	
OE	9.34	0	3.95	8.5	0	0	0	0	Kappa=0.9126	
PA	90.66	100	96.05	92.74	100	100	100	100		

Table 1: Error matrix accuracy totals for the classified image (2012)

IV. RESULTS AND DISCUSSION

Table (1) which is shown above represents data of the results of accuracy assessment of SPOT-5 and field survey during 2010. It shows:

- Overall accuracy (OA), Kappa statistics (KS). Omission error (OE), Commission error (CE), Producer accuracy (PA) and User accuracy (UA).

$$\text{Overall accuracy} = (68+4+73+119+2+2+3)/(68+2+2+4+4+73+5+119+1+3+2+2+3) = 271/2988 = 94.09\%$$

$$K = \frac{288(68 + 4 + 73 + 119 + 2 + 2 + 3) - [(72 \times 75) + (4 \times 4) + (82 \times 76) + (123 \times 128) + (2 \times 2) + (123 \times 128) + (2 \times 2) + (2 \times 2) + (2 \times 3)]}{(288)^2 - [(72 \times 75) + (4 \times 4) + (82 \times 76) + (123 \times 128) + (2 \times 2) + (2 \times 2) + (2 \times 3)]}$$

$$= 451131/56027 = 0.9126$$

To evaluate the accuracy of the classification system, (288) reference test pixels are identified (please refer to Appendix C). The classified image of 2010 is verified with digital (LU) and (LC) maps. The assessment showed an overall accuracy derived from the stratified random sampling method for the 2010 classified images is 94.04% with an overall kappa statistic of 0.91,26.

Considering the categories accuracy, the stratified random method provided very high accuracy assessment in irrigated agriculture, water bodies, settlements and swamps, each with an accuracy of 100%. It also provided high accuracy of 96.05%, 92.74%, 90.66 % for mechanized rain-fed farming, rangelands and forest lands respectively. This reduction in accuracy is due to the similarity between range land grasses and the follow lands in the mechanized rain-fed farming. Moreover, the open forest vegetation is similar to range vegetation, thus conversion occurred between these (LU) and (LC) categories. Similar studies displayed different accuracy assessment. This is because the probability that a reference pixel correctly classified is determined by the producer's accuracy. The probability that a classified pixel from the (LC) map accurately corresponds with the referenced data is determined by the user's accuracy (Jensen, 2005), while the Khat Coefficient (K) or Kappa statistic measures the difference between the true agreement of classified map and chance agreement of random classifier compared to reference data (Lillesand et al., 2004). It is stated that Kappa values of more than 0.80 indicate good classification performance. Kappa values between 0.40 and 0.80 indicate moderate classification performance and Kappa values of less than 0.40 indicate poor classification performance (Jensen, 2005, Lillesand et al., 2004). Based on this judgment, this study has proved high accuracy assessment for the map of 2010. However, similar accuracy assessment are computed in different studies, among these a study by Doxani, et al., (2006) to investigate urban land cover change detection of Thessaloniki, a city in the north part of Greece during 2003 - 2006. Where Object- Oriented classification approach was used. The result showed an overall accuracy and Kappa coefficient of 70-75% and 65% respectively. Lucy (2011) studied change detection in Wanjohi area, Kenya. Object - oriented image classification was carried out using ERDAS imagine objective. An overall accuracy of about 88.33%

- A pixel accurate classified: it is a comparison to a reference, determines probability that a pixel represents the class for which it has been assigned.
- The total accuracy is measured by calculating the proportion class pixel relative to total tested number of pixel (Total = Total corrected/Total tested)

was achieved indicating the probability that a randomly selected point on the map was correctly mapped. The tree object accuracy was at 100%. 87. Another study on (LC) and (LU) change in Mbeere District, Kenya was carried out by Peter (2007). Where two (LC) maps corresponding to 1987 and 2000 Landsat images were produced. The overall accuracy of the two maps was above 85% and the overall kappa statistics was above 0.81. Different (LC) classes had differing producer's and user's accuracy levels indicating different levels of omission and commission errors. Woodland in 2000 had the lowest producer's accuracy of 74.4%, while settlement in 2000 user's accuracy of 77.8 % was the lowest.

V. CONCLUSION AND RECOMMENDATION

The goals of accuracy assessment can be expanded beyond consideration of the nature and frequency of errors in maps to include assessment of the magnitude of those errors and alternative measures of their frequency.

The result in general showed that there was considerable and urgent need to compare the information on the map with what is on the ground in order to avoid repeated mistakes and misinformation when dealing with map.

The satellite remote sensing, GPS and GIS technology helped to overcome the limitations of manual system. This technique has been useful to supply temporal and synoptic data of high quality in advance of land use, land cover mapping. This has also helped to monitor natural calamities as floods and drought.

The use of accuracy assessment in thematic maps can improve lands use, land cover characterization by allowing explicit acknowledgement of heterogeneity within map units and scale.

Based on these finding the following recommendation can be stated:

- 1- Developing national standard and national reference for assessing maps.
- 2- Researchers must use modern techniques and some more global analytical modules to assess and evaluates the maps.
- 3- Map accuracy linked to other factors must be taken when evaluation and design map muddle.

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Plague Outbreak Eradication Campaign under Colonial Mysore

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Abstract- Princely State of Mysore in India was under the British colonial rule during 1881 to 1947. This research article aims to document the role of Princely Mysore State in campaigning against the outbreak of plague. The methodology adopted is the historical perspective. Modus operandi adopted by the Princely Mysore state to counter the deadly epidemic is also highlighted. Plague bacillus took away the lives of over 20 million people in India during 1896-1918, merciless in its ravages and sweeping off thousands in a day. The plague outbreak reigned for two decades and took toll of a crore people in the Princely State of Mysore. Lack of medical facilities had brought very high mortality. Historically it has been recorded as the most pandemic & devastating disease in the early 20th century which shook the humanity. There was a serious shortage of medical facilities in Mysore state. To safeguard the people Princely government under the British colonial administration played an important role in disease prevention and adapted vigorous measures to eradicate the disease. The article also deals with the large sums of money spent by the State, the epidemic disease regulation passed, a separate intensive health campaign formed, health camps, special officers appointed, a laboratory, separate hospitals established and various precautionary measures adopted. Genesis of the devastating Plague disease, cause, effect and panacea are also dealt in the research article.

I. INTRODUCTION

Plague is an acute and deadly infection disease caused by the **Nitrobacteria Yesinia Pests**. The disease which can be transmitted to humans from animals, primarily carried by rodents (most notably black rats) and spread to humans via fleas. (a small wingless jumping insect) In Asia it was Bubonic plague caused mainly due to rodents and fleas. The infected bacteria multiply inside the flea. Infection in a human occurs where a person is bitten by a flea carrying the disease. ⁽¹⁾ In the early period of the 20th century, most scientists and historians came to believe that the 'Black Death' was an incidence of this plague. ¹ Plague bacillus took away the lives of over 20 million people in India between 1896-1918, merciless in its ravages, sweeping off very often thousand in a day and tens of thousands in a week. The magnitude of this calamity is not to be measured by its number alone, its ravage led to the Unsettling of the families of their victims and left numerous young children without proper guardians. One sad occurrence which in common with other parts of India beclouded Mysore in this period was the outbreak of the plague which defied all human efforts put forward for its suppression. Lack of medical facilities besides panacea against the disease had brought high mortality. Historically it has been recorded as the most pandemic and devastating disease in the early 20th century which shook the humanity. ²

II. PLAGUE APPEARANCE IN MYSORE

Between 1897 and 1923, Mysore state witnessed persistent plague affect. This fell disease prior to its appearances in Mysore states had broken out and was increasing virulence at Hubli in Darawad district frontier of the Bombay presidency, only 80 miles away from Mysore. It was therefore deemed essential that all possible precautions should be taken to prevent its entry into Mysore. Plague first made its appearance in the Bangalore city on the 12th August -1898 and spread with increasing virulence in every direction of Bangalore, Mysore, Kolar and Tumkur. Severity of the epidemic reached its height in the first year of the outbreak; there were nearly 15,000 attacks and more than 12,000 deaths.

III. PREVENTIVE MEASURES

Every possible help was given to people to effect speedy evacuation of infected places Preventative measures were adopted in the state to avoid the increasing number of deaths under the scheme of Frontier Plague Protection. Public health department played an important role in disease prevention, and it involved with several health activities. There was serious shortage of medical personal and medical facilities in India and especially in Mysore state. To provide more medical facilities and to protect the people both in rural and urban areas the princely state of Mysore adopted certain measures to prevent the disease. Various precautionary measures adopted under this enactment such as the formation of a separate Health campaign to overcome such diseases in a systematic manner. Special

¹ Wikipedia, Encyclopedia and life science library.

² Lord Curzon, governor general of India in his letter with appreciation the work of Mysore government.

health officers were appointed for the cities of Bangalore, Mysore and Kolar Gold Fields. A laboratory was also provided for the Health Department. (1) The establishments of railway and frontier inspection station and outposts. (2) The examination of passengers by rail and road. (3) The establishments of temporary plague hospitals, segregation and health camps.³

To protect the people of the state the government passed **Mysore Epidemic Diseases Act, II of 1897**.⁴ Government adopted vigorous measures to check the spread of the disease by making provision for the treatment of the disease in special hospitals. Government camps provided accommodation for those in contact and persons living in infected houses. Infected persons and houses subjected to systematic disinfection was taken care by Special Plague corps appointed by the government. Inoculation campaign took its headway.

New Extensions: A large number of houses were demolished after payment of compensation and congested portions opened out by the removal of many more in Bangalore and two large extensions Basavanagudi & Malleshwaram covering area of 1000 acres and capable of providing accommodation for 50,000 persons were laid out.

Financial support: A large number of **temporary health camps** were established throughout the state. Free issues of timber and bamboos were offered to the poor classes to enable them to camp out. Advances to government servants an years pay was sanctioned in the Bangalore city to enable them to build houses in the new extensions. Three months pay in certain infected taluks for putting up sheds was also on the anvil.⁵

IV. CURATIVE MEASURES

1. **Special Hospitals:** The permanent hospitals were established in the state called Epidemic Disease Hospitals at Bangalore in 1891, in 1898 at KGF and Mysore in 1926 working throughout the year to treat patients. In other places, establishments were entertained temporarily for the period required, whenever there was an outbreak of Plague. Bangalore city saw Dr.D.A, choksi a civil surgeon as chief plague officer appointed by the government. He was entrusted with the execution of plague measures in the city. The city was divided into 4 wards, each ward being placed under an assistant commissioner, who was assisted by a medical officer of the grade of an assistant surgeon. Rail passengers coming from infected areas to Bangalore were inspected at Yeshawanthpur, Bangalore cantonment and Kengeri station. Passengers found suffering or suspected were sent to Magadi road health camp for treatment or observation. Sheds were constructed at government expense. About 588 sheds were erected. The project consisted of two permanent buildings and three buildings with corrugated iron roofs supported on rails with corrugated iron sides & movable tatty doors. Five buildings were constructed with accommodation for 66 patients. Roof of Mangalore tiles, corrugated iron & bamboo tatty sides supported the disease contention.⁶

The plague operations in Mysore city were under the control of Mr.Madiah the Deputy Commissioner who was assisted by Mr. Wetherall as chief plague officer. The city was divided into 3 wards each under a ward officer of the rank of assistant commissioner. Health camps with 100 sheds were set up at Viranna's lines, 166 houses, at Gavikatte, Tavarekatte & other places -269 camps. In 1898 one road outpost at Srirangapatna and in 1899 additional road out posts were established on all other roads leading into the city. Mysore city railway station started Rail-way inspection in 1898. Passengers coming from infected areas were examined by a medical officer on duty & by a nurse besides a hospital assistant for the segregation & treatment of plague patients. **Erlangere plague camp** with hospital facilities was commenced. Further four wards were newly erected with accommodation for 16 patients consisting of Superintendent. One-woman apothecary, 2-hospital assistant's one nurse, 9 male wardens, 1 midwife & 14 female wardens were recruited. In Tumkur an old building with a few alterations was converted into a camp for the segregation of vegetarian Hindus. **A chatram** (charity hall) was set apart for accommodation of Mohammedan contacts. Sheds were set up in a field near railway station for others. A temporary hospital was built near each camp for the treatment of patients⁽⁶⁾ The Kolar district health camps were erected at all head quarters temporarily however some people preferred to erect their own sheds amidst social agony,

2. **Special officers:** Government appointed seven **plague inspectors** to supervise all the villages around the fields. A mid-wife & a plague nurse were also appointed to examine *gosha* (burkha clad muslim) ladies. Plague 1909.⁷ Closing up of rat holes were the methods adopted. Cyllin was used for plague-infected rooms, kerosene oil emulsion for the rest of the house as a disinfectant. Petroleum was used instead of cullin satisfactory. The temporary plague supervisors employed on frontier plague protection duty in the district of Shimoga and Chitaldrug were replaced by duly qualified Sanitary Inspectors. These officers have now been employed for the work in all the districts except Hassan, where a plague supervisor still continues. (1910.) Plague hospital capable of accommodating 50 patients consisting of one sub assistant surgeon, one lady apothecary, one hospital assistant, one compounder, 6 male wardens & 4 female wardens.⁸

³ Sham Roa, Modern Mysore Vol – II, Bangalore p. 233

⁴ Ibid

⁵ File No 190 of 1913 P 1-8 Medical Department, KSA Bangalore

⁶ Mysore Gazett, Government Press Bangalore, vol-III. Page no 1454

⁷ Reports of the chief plague officer in Mysore for the year 1889

⁸ Administrative Reports of Mysore State 1909, p.66., Divisional Archives, Mysore

3. **Special Buerocracy:** The Revenue Assistant commissioners, district medical and sanitary officers in the each district, assisted the Deputy Commissioner. In the taluk's the Amildars assisted by the local police, medical and sanitary officers were entrusted and looked after the plague operations. In Bangalore and Mysore the president of the respective municipalities assisted by health officers were in charge of the plague operations in 1908. Health officers were newly appointed for the Kolar Gold Field and the Plague supervisor employed in Kadur District.

4. **Sanitary measures:** The new extension, Basavanagudi at Bangalore which was opened in 1898, the amount spent for this is Rs 22,000 for widening and mettalling the roads and other sanitary improvements for arresting the spread of Plague government spent Rs.20, 023/-. In Tumkur Rs 15,323 was spent on opening out new roads, sinking fresh water well's and constructing drains etc. In Tarikere and Biran of Shimoga, 108 and 68 houses were demolished and to accommodate the deserving poor of the town, 50 sheds were built at government cost. In Kolar Gold Field new colonies on sanitary board of about Rs 8000 /- coolies were reported to have been housed. Chemical disinfection was introduced as on experimental measure.⁹

5. **Evacuation:** The people restored Evacuation voluntarily. Supply of shed materials, grants of the poor, grants of advances to officials for running up sheds. A few permanent sheds of corrugated iron roofing were constructed for the temporary occupation of people who had vacated their houses. In villages people used their own hutting materials and other places bamboos were freely supplied.

4. **Disinfection:** The unroofing of thatched houses and their exposure to sun and air on a layer of sand, lime washing of houses, chemical disinfection was mostly confined to the towns and villages. Kerosene oil emission was tried in Bangalore. Cleaning, whitewashing and fumigation with burning neem leaves were adapted to the effect of driving out large number of rats from their holes and of causing them to die rapidly.

5. **Destruction of Rats:** In the year 1908. 09,225,116 rats were destroyed in the state at the cost Rs 5,457/- cost per rat being 4 ½ paisa. Trapping method poisoned baits were also used in a small scale.¹⁰

6. **Chemical laboratory** was founded in 1895 at Bangalore to give laboratory support in order to investigate the outbreak of the epidemic diseases. Chemical analyses and experiments of Plague bacilli in rats, mice and pigs were conducted.

7. **Vaccine institute** was established in the year 1890 and started manufacturing plague vaccine in 1920 under Dr, Haffkine, the Director of Public Health Institute

V. SPECIAL RELIEF

To effect speedy evacuation of infected places and induce the inhabitants every possible help was given such as the supply of shed materials gratis to the poor and at the cost price to others. Grant of small advances of money was given in case of officials. Chemical disinfection was carried out generally & disinfection by desiccations was introduced as on experimental measure. Arrangements were made for the distribution of **Multi vitamin tablets**. The **30 medical units with the special officers** of medical were deputed to tour frequently in the affected areas to take immediate action in case of outbreak of Epidemics.

The intensive anti-rat campaign in epidemic hit areas was continued and arrangements were made for getting Sanitary Inspectors trained for this work in the Health Training Centre, Closepet. A conference of the Director of Public Health of Madras, Bombay, Hyderabad, Mysore, Bangalore and Coorg was held at Davanagere. The various measures for the control of Plague were discussed.¹¹

The posting of a skeleton staff of sanitary inspectors for special duty in the distress areas of Tumkur, Chitaldurg and Kolar District sanctioned. Cyanogas fumigation was undertaken in the infected localities as a further measure of control.¹²

VI. CONCLUSION

There was a marked decrease in the incidence of plague with this rapid implementation of the modern system of anti-plague measures after 1950 its completely eradicated.

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Antimicrobial Activity of Alcoholic Extract of Leaves and Flowers of *Madhuca Longifolia*

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Abstract- The alcoholic extract of leaves and flowers of *Madhuca longifolia* were screened for antimicrobial activities against *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Aspergillus oryzae* and *Aspergillus niger*. In general, commercial antibiotic and antifungal drugs causes side effects. However, herbal remedies often do not produce any side effects. Therefore, alternative medicine become popular remedy to various types of ailments. In conclusion, *Madhuca longifolia* extracts have revealed significant antimicrobial activities against test organisms used for the study.

Index Terms- *Madhuca longifolia*, Antimicrobial.

I. INTRODUCTION

M*adhuca longifolia* (Koen.) Macbr. (Syn. *Bassia longifolia* J. Koenig ex. L. *M. longifolia* (Koen.) Macbr. var. *longifolia*) is a large, shady, deciduous tree, both wild and cultivated, dotting much of the Central Indian landscape. The tree is valued for its flowers, fruits, seeds and timber. The expectorant flowers are used to treat chest problems such as bronchitis. They are also taken to increase the production of breast milk. The distilled juice of the flowers is considered a tonic, both nutritional and cooling. The tree wins in fame due to the liquor distilled from the flowers, which is used to make vinegar. The leaves are applied as a poultice to relieve eczema. In Indian folk medicine, the leaf ash is mixed with ghee (clarified butter) to make a dressing for wounds and burns. *Madhuca* preparations are used for removing intestinal worms, in respiratory infections, and in cases of debility and emaciation. The astringent bark extract is used for dental-related problems, rheumatism and diabetes.

II. MATERIALS AND METHODS

Plant material

Plant parts of *Madhuca longifolia* were collected from 25-30 year old trees, from a temple owned grove, in a Village, Rajendrum Arcot of Thanjavur district, Tamilnadu. The identity of the plant specimens was confirmed by the use of local Floras and standard references. The botanical identity was also authenticated by Dr.M.Jegadeesan, Professor and Head, Department of Environmental and Herbal Sciences, Tamil University, Thanjavur. Herbarium specimen of *Madhuca longifolia* are deposited at Tamil University Herbarium (TUH288).

Preparation of extracts

Fresh leaves and flowers of *Madhuca longifolia* were collected and macerated with 50% ethanol for 7 days with occasional shaking to get alcoholic extracts. The alcoholic extracts were concentrated in a rotary flash evaporator and dried in desicator.

Antimicrobial activity

Antibiotics are an essential part for combating harmful bacterial infections *in vivo*. During the last decade, infectious diseases have played a significant role in the death of millions around the world, especially in developing countries like India. Because of the mutagenic nature of bacterial DNA, the rapid multiplication of bacterial cells and the constant transformation of bacterial cells due to plasmid exchange and uptake, pathogenic bacteria continue to develop antimicrobial resistance, thus rendering certain antibiotics useless. An increased number of pathogens have also developed resistance to multiple antibiotics (Multiple Drug Resistance), threatening to develop complete immunity against all antimicrobial agent and therefore be untreatable. Thus search for novel antimicrobial agents is of the utmost importance.

Plants have been used for centuries as remedy for human disease because they contain components of therapeutic values. They are natural sources of antimicrobial agents primarily because of the large biodiversity of such organisms and the relatively large quantity of metabolites that can be extracted from them. The acceptance of these traditional medicines alternative form of health care has lead researchers to investigate the antimicrobial activity of medicinal plants. A lot of work has been done which aim at knowing the different antimicrobial and phytochemical constituents of medicinal plants and using them for the treatment of microbial infections as possible alternatives to chemically synthetic drugs to which infectious microorganisms have become resistant. The present study was aimed at evaluating the antimicrobial properties of *Madhuca longifolia* extracts using *in vitro* models.

III. DETERMINATION OF ZONE OF INHIBITION

The paper disc diffusion method was used to determine the antimicrobial activities with alcoholic extracts of *Madhuca longifolia*. Muller Hinton Agar media was prepared, sterilized and used as the growth medium for bacterial culture. 20 ml of the sterilized medium was poured into each sterilized Petri dish, covered and allowed to solidify. The plates were then seeded with the test organism (bacterial culture) by sterile cotton swabs.

For fungal culture Saboraud Dextrose Agar was prepared and transferred into sterile Petri plates and solidified. The medium plates were then swabbed with fungal culture. The sterilized paper discs were soaked in the prepared solutions of the extracts with different solvents and were dried at 50°C. The dried paper disc was then placed on both plates (Muller Hinton and Sabouraud Dextrose agar) seeded with test micro organisms. The plates were then incubated for bacterial culture at 37°C for 24 hours and for fungus the plates were incubated at room temperature for 48 hours and the zone of inhibition were measured.

IV. PREPARATION OF TEST SOLUTION

The alcoholic extracts of *Madhuca longifolia* were prepared in 5 successive dilutions namely.

50 µg/ml
100 µg/ml
150 µg/ml
200 µg/ml
250 µg/ml

and were subjected to antibacterial and antifungal activities.

V. ORGANISMS USED

Bacteria

Gram positive

Staphylococcus aureus

Bacillus subtilis

Gram negative

Escherichia coli

Pseudomonas aeruginosa

Fungi

Aspergillus oryzae

Aspergillus niger

ANTIBIOTIC DISCS

Ciprofloxacin 5 µg/disc - bacteria
Clotrimazole 10 µg/disc - fungi.

VI. RESULT AND DISCUSSION

Alcoholic extracts of leaves and flowers of *Madhuca longifolia* were screened for antimicrobial activities against *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Aspergillus oryzae* and *Aspergillus niger* at dose level ranging from 50 µg/ml to 250 µg/ml (Table 1)

Alcoholic extracts of *Madhuca longifolia* leaves inhibited all the bacterial strains tested. All the doses (50 µg/ml to 250 µg/ml) showed zone of inhibition against all the bacteria, even at a dose of 50 µg/ml of extract exhibited significant zone of inhibition comparable to standard antibiotic (ciprofloxacin) against *B. subtilis*. For *S. aureus* leaf extract exhibited maximum inhibition (20 mm) which was greater than that of standard. For all other bacteria 100 µg/ml concentration of the extract was sufficient to produce effective inhibition. Alcoholic extract of

Madhuca longifolia leaves also effectively inhibited growth of two fungi (*A. oryzae* and *A. niger*) comparable and even more than that of standard antifungal agent Clotrimazole. For *A. oryzae* 100 µg/ml concentration produced equal inhibition as that of standard. And for *A. niger*, 150 µg/ml concentration revealed equal inhibition as that of standard.

Alcoholic extracts of *Madhuca longifolia* flowers also showed effective inhibition against all the bacteria and fungi tested. At 50 µg/ml concentration, flower extract showed effective inhibition as that of standard drug against *B. subtilis* and *P. aeruginosa*. For *S. aureus* the extract gave maximum inhibition at 100 µg/ml concentration. Against *E. coli* 150 µg/ml concentration showed maximum inhibitory zone. Flower extract of *Madhuca longifolia* showed maximum inhibitory activity against *A. oryzae* at 100 µg/ml concentration while against *A. niger* at 150 µg/ml concentration which were comparable to standard antifungal agent Clotrimazole. Thus both leaves and flowers of alcoholic extracts of *Madhuca longifolia* were found to be inhibitory against all the bacteria and fungi tested.

Antibacterial and antifungal activities of alcoholic extracts of leaves and flowers of *Madhuca longifolia* could be attributed to the presence of biological compounds like 2-Furan methanol, 4H pyran 4-one, 2,3-dihydro 3,5-dihydroxy-6-methyl, Thiophene, 2-Furancarboxyaldehyde-5-(hydroxymethyl) and 1,4-tetra decanediol

The use of medicinal plants play a vital role in covering the basic health needs in developing countries and these plants may offer a new sources of antibacterial, antifungal and antiviral agents with significant activity against infective microorganisms

VII. CONCLUSION

The present study indicate that madhuca longifolia extracts have broad inhibitory activities to pathogenic microorganism and to act as potential antimicrobial agent from natural sources. In general, commercial antibiotic and antifungal drugs causes side effects such as liver, kidney and gastrointestinal tract toxicity. Severe hepatotoxicity had also been reported in patients undergoing antifungal drug therapy. However, herbal remedies often do not produce any side effects. Therefore, alternative medicine become popular remedy to various types of ailments. In conclusion, *Madhuca longifolia* extracts have revealed significant antimicrobial activities against test organisms used for the study.

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Table 1

Antimicrobial activity of alcoholic extract of leaves and flowers of *Madhuca longifolia*

S. No.	Name of the organisms	Zone of Inhibition (mm)										Standard (Ciprofloxacin/Chlotrimazole)
		<i>Madhuca longifolia</i> (leaves)					<i>Madhuca longifolia</i> (flowers)					
		A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	
1.	<i>Staphylococcus aureus</i>	10	12	15	18	20	10	12	10	10	10	18
2.	<i>Bacillus subtilis</i>	10	15	15	15	15	10	10	10	10	10	10
3.	<i>E. coli</i>	8	10	10	10	10	5	5	8	8	8	10
4.	<i>Pseudomonas aeruginosa</i>	10	10	10	10	15	10	10	8	10	10	15
5.	<i>Aspergillus oryzae</i>	5	10	10	10	10	10	10	10	15	15	10
6.	<i>Aspergillus niger</i>	5	5	10	10	10	8	8	10	10	10	8

A1-50 µg/ml of *Madhuca longifolia* leaves B1-50 µg/ml of *Madhuca longifolia* flowers
A2-100 µg/ml of *Madhuca longifolia* leaves B2-100 µg/ml of *Madhuca longifolia* flowers
A3-150 µg/ml of *Madhuca longifolia* leaves B3-150 µg/ml of *Madhuca longifolia* flowers
A4-200 µg/ml of *Madhuca longifolia* leaves B4-200 µg/ml of *Madhuca longifolia* flowers
A5-250 µg/ml of *Madhuca longifolia* leaves B5-250 µg/ml of *Madhuca longifolia* flowers

Impact of Calotropis Gigantea Leaves via Different Routs of Administration in Normal and Alloxan Induced Diabetic Rats

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Abstract- The present study was carried out to evaluate the anti-diabetic activity of water extract of Calotropis gigantea leaves in alloxan n induced diabetic rats for 0, 20, 60, 120, 240, 360 minutes. The water extract at the dose (0.7 gm/kg) exhibited significant anti-hyperglycemic activity. Oral and intraperitoneally administration of the plant produced significant hypoglycemic effect in normal as well as hyperglycemic rats. The water extract of Calotropis gigantea leaves showed hypoglycemic effect in normoglycemic and hyperglycemic rats after both oral and intraperitoneal administration. The effect could be comparable to that of well-known hypoglycemic compound like metformin and glibenclamide used at 11.3 and 0.13 mg/kg, respectively.

Index Terms- Calotropis gigantea; Asclepiadaceae; Alloxan monohydrate ; Route of administration

I. INTRODUCTION

Diabetes mellitus is an endocrine disorder characterized by hyperglycemic effecting nearly 10% of the population all over the world. Insulin and oral hypoglycemic agents like sulphonylureas and biguanides are still the major players in the management of the disease. However, complete cure of the disease has been eluding physicians for centuries and the quest for the development of more effective anti-diabetic agents is pursued relentlessly. Many herbal products, including several metals and minerals have been described for the cure of diabetes mellitus in ancient literature. Herbal preparations alone or in combination with oral hypoglycemic agents sometimes produce a good therapeutic response in some resistant cases where modern medicines alone fail. There is increasing demand by patients to use natural products with anti-diabetic activity due to side effect associated with the use of insulin and oral hypoglycemic agents [1]. The World Health Organization has also recommended the evaluation of the effectiveness of plants in condition where there is a lack of safe made drugs.

Currently available treatment for this disorder is far from satisfactory and expensive. Calotropis gigantea leaves (Family : Asclepiadaceae) is a small tree variety found throughout India. It is commonly called Swallow – Wort. Leaves contain the cardiac glycoside; Calotropin; Uscharin; Calotoxin; Calactin; Uscharidin and gigantol [2-3-4]. It is used widely used for healing of wounds; anthelmintic; expectorant; useful in leprosy scabies ring worm of the scalp; piles, eruptions on the body; asthma; prevention of insulin resistance [5], hepatoprotective [6], anti-

diarrhoeal [6], antipyretic and analgesic [7-8], anti-inflammatory[9] and wound healing activity [10]. The calotropin Uscharin and gigantol show digitalis – like action on the heart.

The preliminary phytochemical studies reveal the presence of flavonoids; glycosides; alkaloids; tannins. The focus of the present study is to evaluate water extract of Calotropis gigantea leaves material at various doses in normal and alloxan induced diabetic rats. However, no scientific data are available regarding the effect of water extract of Calotropis gigantea leaves on blood glucose level. The present study is undertaken to explore the effect of water extract of Calotropis gigantea leaves on the blood glucose level of experimental animals and to determine the probable mechanism of action. The effect of water extract of Calotropis gigantea leaves on fasting blood sugar level has been evaluated as compared to the standard drug glibenclamide, both in normal and diabetic albino rats. The effect of Calotropis gigantea extract on glucose uptake by rat hemi-diaphragm and the glycogen content of the liver, skeletal muscle and cardiac muscle are evaluated to study its probable mechanism of action as a hypoglycemic agent.

II. EXPERIMENTAL

2.1. Material required:

Alloxan monohydrate was purchased from Sigma Chemical Co St Louis, USA. All other chemicals were obtained from local sources and were analytical grade. Calotropis gigantea was collected from the forest area of Ghaziabad, U.P., India in March 2008. The plants was identified from the School of Pharmacy, Vishveshwariya Institute of Medical Science, Greater Noida, Gautam Budha, Nagar, India. They were assigned voucher specimen Ref. VIMS/CONSULT/2009/02/10.

2.2. Methods:

2.2.1. Preparation of water extract:

The leaves of Calotropis gigantea was air dried and powdered in a grinder. 300g of Powder mixture of the plant parts was extracted overnight with 360 ml of water with magnetic stirring in cold room (4°C). The water extract was separated and the residue was re-extracted with water. The water extract was concentrated to produce semisolid mass and dried in lyophilizer (Mini Lyotrap, Serial No J8199/5, LET Scientific Ltd UK).

2.2.2 Preliminary phytochemical screening:

The extracts were subjected to preliminary screening for various active phytochemical constituents [11].

2.2.3. Animal and experimental set-up:

Colony bred, healthy male wistar albino rats of either sex weighing 150 – 200 g were taken for the study. The animals fed on standard laboratory diet with water ad libitum and housed at room temperature. The rats were kept fasting overnight with free access to water during the experiment in the ambience. The animals were divided into eight groups of six animals each. 1 ml of blood was taken from the orbital sinus of each rat with the help of a capillary tube for the estimation of blood sugar. The institutional Ethical Committee approved all experiment protocols.

2.2.4. Hypoglycemic effect in normal rats [12-13]:

Groups of six rats each (fasted for 18 hrs) received 10 ml/kg infusion, intragastrically or intraperitoneally (i.p.) Blood samples were drawn by puncture from the tail immediately before administration in the time intervals of 20, 60, 120, 240 and 360 min later. Control group received an equal volume (10 ml/g) of normal saline, glibenclamide (0.13 mg/kg) and metformin (11.3 mg/kg), calculated on the basis of the daily doses [14].

2.2.5. Hypoglycemic effect on alloxan-diabetic rats [15]:

Chronically hyperglycemic rats were obtained by i.p. injection of 150 mg/kg of alloxane dissolved in distilled water

[16]. After 8 hrs administration, the hyper-glycemic rats were selected (plasma glucose level 2-2.8 g/L) and used in the experiments. The same experimental protocol described above was then adopted.

2.2.6. Glucose tolerance test (GTT) in rats [17-18]:

A polyethylene cannula was injected into the jugular vein under ethyl carbonate anesthesia. Another catheter was injected into right carotid. All rats received orally 10 ml/kg of 25% glucose solution. One group of animals received the plant infusion (10 ml/kg) through the venous catheter, while the control group received normal saline. Blood samples (0.2 ml) were taken from the carotid catheter at time intervals of 5, 10, 20, 30, 40, 50 and 60 min after injection. The coefficient of glucose assimilation (K_G) was determined with the formula.

$$K_G = (\log C - \log C_{1/2}) / t_{1/2} = 0.639 / t_{1/2}$$

Where : C = glycaemia (g/L); $t_{1/2}$: Time for the blood glucose concentration $C_{1/2}$.

2.2.7. Statistical analysis:

Results are reported as mean ± SEM statistical analysis was carried out using analysis of variance (Anova). The difference of the means was calculated using Newman – Keuls test. P values of 0.05 or less were taken as significant.

Table 1.

Effect water extract of Calotropis gigantea leaves on plasma glucose levels after intragastric (p.o) and intraperitoneal (i.p.) administration to normoglycaemic rats.

Treatment	Route	Plasma glucose (g/L) at time (min) after treatment					
		0	20	60	120	240	360
Control	p.o.	0.96±0.07	0.99±0.05	0.99±0.08	0.98±0.09	0.90±0.16	0.95±0.06
(Saline.10 ml/kg)	i.p.	0.94±0.08	0.98±0.04	0.96±0.06	0.89±0.08	0.93±0.09	0.93±0.08
Glibenclamide	p.o.	0.96±0.09	0.69±0.11*	0.46±0.07++	0.57±0.07+	0.73±0.06	0.83±0.05
(0.13 mg/kg)	i.p.	0.98±0.08	0.73±0.1*	0.48±0.06++	0.63±0.05+	0.75±0.06*	0.93±0.13
Metformin	p.o.	0.93±0.13	0.99±0.05	0.73±0.06*	0.65±0.1*	0.54±0.08+	0.75±0.06*
(11.3 mg/kg)	i.p.	0.80±0.05	0.93±0.04	0.79±0.05*	0.57±0.06+	0.71±0.05*	0.74±0.05
C. gigantea	p.o.	1.02±0.06	0.93±0.05	0.59±0.06++	0.58±0.14++	0.51±0.07++	0.83±0.13
(0.7 g/kg)	i.p.	0.67±0.08+	0.98±0.07	0.68±0.06++	0.56±0.22++	0.54±0.19++	0.63±0.09+

^avlues are mean ± SEM, n= 8; *p< 0.05; +p<0.01; ++p<0.001 vs. Control; Anova and Newman - Keuls test.

Table 2.

Plasma insulin in normoglycaemic rats after intragastric (p.o.) and intraperitoneal (i.p.) administration water extract of Calotropis gigantean leaves.

Treatment	Route	Insulinmia (12.42 µU/mL) at time (min) after treatment					
		0	20	60	120	240	360
Control	p.o.	58.08±4.41	68.56±10.26	63.11±8.42	56.64±11	60.06±10	72.32±6.16
(Saline 10ml/kg)	i.p.	88.88±14.96	71.89±8.25	60.41±7.89	61.57±9.15	67.27±8.01	84.94±7.91
C.gigantean	p.o.	82.06±14.35	68.96±8.52	54.14±9.56	51.88±3.03	63.17±19.04	75.03±19.42
(0.7 g/kg)	i.p.	64.22±8.56	78.07±12.62	90.19±7.16*	73.02±16.9	121.42±10.01++	113.37±20.52+

Values are mean ± SEM, n= 8; *p< 0.01; ++p<0.001 vs. Control; Anova and Newman - Keuls test.

Table 3.

Effect water extract of Calotropis gigantea leaves on Plasma glucose levels after intragastric and intraperitoneal (i.p.) administration to alloxan-diabetic rats.

Treatment	Route	Plasma glucose (g/L) at time (min) after treatment					
		0	20	60	120	240	360
Control	p.o.	2.82±0.2	2.57±0.14	2.14±0.72	2.20±0.45	2.35±0.39	3.00±0.48
(Saline 10ml/kg)	i.p.	2.71±0.2	2.61±0.18	2.59±0.65	2.15±0.5	2.28±0.49	2.92±0.51
Glibenclamide	p.o.	2.88±0.2	2.15±0.26	1.44±0.39+	0.91±0.08++	1.44±0.22++	1.70±0.34+
(0.13 mg/kg)	i.p.	3.01±0.03	2.36±0.35	1.21±0.47*	0.88±0.11*	1.44±0.22*	1.70±0.34
Metformin	p.o.	2.96±0.1	2.66±0.2	1.21±0.09+	0.99±0.06+	1.37±0.25+	2.00±0.47
(11.3 mg/kg)	i.p.	3.01±0.09	1.30±0.4	0.74±0.41*	1.63±0.25*	1.50±0.35*	1.80±0.30*
C. gigantean	p.o.	2.90±0.08	2.02±0.53*	1.05±0.16++	1.01±0.07++	1.03±0.12++	0.92±0.20+yx
(0.7 g/kg)	i.p.	2.86±0.3	1.74±0.25+	1.60±0.22+	0.79±0.3++	1.189±0.21++	1.32±0.19++bx

Value are mean ± SEM, n= 8; *p< 0.05; +p<0.01; ++p< 0.001 vs. Control; ^bp<0.05 vs. glibenclamide; ^xp<0.05; ^yp<0.01 vs. metformin; Anova and Newman - Keuls test. Ajay¹

Table 4.

Blood glucose in glucose loaded (0.25 g/kg) rats before and after the intravenous administration water extract of Calotropis gigantea leaves.

Treatment	Blood glucose (g/L) at time (min) after load							
	0	5	10	20	30	40	50	60
Control (0.25g/kg glucose)	0.99±0.08	1.26±0.08	1.47±0.11	1.59±0.14	1.71±0.09	1.69±0.11	1.46±0.08	1.33±0.07
Calotropis gigantea (0.7 g/kg)	0.98±0.09	1.15±0.1	1.35±0.06	1.48±0.1	1.51±0.08*	1.31±0.1+	1.25±0.11+	1.16±0.13++

Value are mean ± SEM, n= 5; *p< 0.05; +p<0.01; ++p<0.001 vs. Control; Anova and Newman - Keuls test.

III. RESULT AND DISCUSSION

The infusion of Calotropis gigantea exhibited a remarkable hypoglycemic action 20 min after oral and i.p. administration to normal rats. (Table 1.). Blood glucose level reached a mean value of 0.59 and 0.68 g/L, respectively as compared to 0.99 g/L and 0.96g/L. respectively obtained in the control group. The lowest hypoglycemic effect was observed after 2 hr of administration. After 4 hrs of administration, the blood glucose level reached nearly to the initial glycemic values for orally treated animals, while i.p. administration still showed hypoglycemic effect even after 6 hr. Calotropis gigantea hypoglycemic effect was comparable and sometimes higher than that obtained with 0.13 mg/kg of glibenclamide or 11.3 mg/kg of metformin. After i.p. administration, the variation in insulin plasma levels showed an opposite trend to that of glucose (Table 2). The increase became significant after 1 hr of administration and persisted for at least 6 hr. Plasma insulin reached a maximum level (12.42 µIU/mL) 4hr after i.p. administration. On the other hand, no variation in blood insulin level was found in normal rats orally treated with the water extract of Calotropis gigantea leaves. When compared with control, Calotropis gigantea (Table 3) significantly reduced the blood glucose levels in diabetic rats. The maximum decrease observed 2 hr after the administration in plasma glucose level recorded as 1.01 g/L (-69.96%) and 0.79 g/L (-53.29%), respectively after oral and i.p. treatment. In a glucose tolerance test, intravenous treatment with Calotropis gigantea plasma glucose level significantly reduced at time intervals of 40, 50 and 60 min as compared to plasma glucose level induced in control by a glucose load administration (Table 4). Glycemic values returned to basal levels more rapidly than in control group. The coefficient of glucose assimilation (K_G) showed significant increase in treated rats compared to control (8.17×10^{-3} vs 6.96×10^{-3}).

IV. CONCLUSION

The Calotropis gigantea showed hypoglycemic effect in normoglycemic and hyperglycemic rats after both oral and intraperitoneal administration. The effect could be comparable to that of well-known hypoglycemic compound like metformin and glibenclamide [19] used at 11.3 and 0.13 mg/kg, respectively. As far as the mechanism of action is concerned, in the light of the obtained results it can be speculated that Calotropis gigantea activity could be due to enhancement of peripheral metabolism of glucose. An increase of insulin release can not be excluded. Further studies to identify the active constituents of Calotropis gigantea and their mechanism of action are in progress.

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Implementation of Real Time Bus Monitoring and Passenger Information System

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Abstract- In the daily operation of a bus system, the movement of vehicles is affected by uncertain conditions as the day progresses, such as traffic congestion, unexpected delays, and randomness in passenger demand, irregular vehicle dispatching times, and incidents. In a real-time setting, researchers have devoted significant effort to developing flexible control strategies, depending on the specific features of public transport systems. This paper focuses on the implementation of a Real Time Passenger Information (RTPIS) system, by installing GPS devices on city buses. The Real Time Bus Monitoring and Passenger Information system is a standalone system designed to display the real-time location(s) of the buses in city. This research will enable the tracking devices to obtain GPS data of the bus locations, which it will then transfer it to centralized control unit and depict it by activating symbolic representation of buses in the approximate geographic positions on the route map. Specific software's will be used to interface the data received to the map. The main Objectives of this research work are :

1. RTPIS rolling display on bus stops – expected time of arrival in real time.
2. Web based interface for control room to monitor buses in real time.
3. Mobile application for end user to find out bus schedules and RTPIS.

Index Terms- GPRS, public transportation system, RTPIS, ETA, link updater.

I. INTRODUCTION

In the daily operation of public transport systems, mainly that of buses, the movement of vehicles is affected by different uncertain conditions as the day progresses, such as traffic congestion, unexpected delays, randomness in passenger demand, irregular vehicle-dispatching times, and incidents. Many passengers are often late to work, students are late for classes because they decide to wait for the bus instead of just simply using an alternate transportation. A variable message sign showing the showing the bus arrival time at bus stops could reduce the anxiety of passengers waiting for the bus. Disseminating arrival time information through other interfaces such as smart phone could make the public transit system more user-friendly and thus increase its competitiveness among various transportation modes. With the advent of GPS and the ubiquitous cellular network, real time vehicle tracking for better transport management has become possible. These technologies can be applied to public transport systems, especially buses, which are not able to adhere to predefined timetables due to reasons like traffic jams,

breakdowns etc. The increased waiting time and the uncertainty in bus arrival make public transport system unattractive for passengers. A Real-Time Passenger Information System (RTPIS) uses a variety of technologies to track the locations of buses in real time and uses this information to generate predictions of bus arrivals at stops along the route [1]. When this information is disseminated to passengers by wired or wireless media, they can spend their time efficiently and reach the bus stop just before the bus arrives, or take alternate means of transport if the bus is delayed. They can even plan their journeys long before they actually undertake them. This will make the public transport system competitive and passenger- friendly. The use of private vehicles is reduced when more people use public transit vehicles, which in turn reduces traffic and pollution[1].

II. LITERATURE SURVEY

A considerable amount of money is spent on IT-based applications such as real-time, at-stop displays on public transport, but actual knowledge about the behavioral effects these have on customers or potential customers in real life is quite sparse. This paper presents a review of relevant literature, focusing specially on user response to public transport information via telephone, mobile devices, the Internet and at-stop displays. A number of studies have been initiated in the past to address the bus arrival time prediction problem.

Lin and Zeng [2] proposed a set of bus arrival time prediction algorithms for a transit traveler information system implemented in Blacksburg, Virginia. Four algorithms were introduced with different assumptions on input data and were shown to outperform several algorithms from the literature. Their algorithms, however, did not consider the effect of traffic congestion and dwell time at bus stations. Kidwell [3] presented an algorithm for predicting bus arrival times based on real-time vehicle location. The algorithm worked by dividing each route into zones and recording the time that each bus passed through each zone. Predictions were based on the most recent observation of a bus passing through each zone. However, this algorithm was not suitable for large cities where both travel time and dwell time could be subject to large variations. Generally speaking, these models are reliable only when the traffic pattern in the area of interest is relatively stable. One of their main limitations is that it requires an extensive set of historical data, which may not be available in practice, especially when the traffic pattern varies significantly over time [4].

III. ARCHITECTURE AND MODELLING

The main parts of RTPIS are application simulators, bus simulator and central data processing server. The architecture is shown in figure. These parts are briefly described in the subsequent sections

A. Application simulator

Pune Navigator has 3 applications as, the bus stop billboard display, the mobile application and the control room application. These services will request for the real time updates to the centralized server. The mobile application is android based application.

B. Bus simulator

The main functions of the bus simulator are as follows.

- To download names and coordinates of stops and points of interest from the server.
- To compute current location, direction.
- To transmit the computed information to the central server using GPRS.

It operates as follows – the GPS receiver in this unit computes the current location of the vehicle which is stored in bus simulator. The latitude, longitude of the buses is transmitted periodically to a central server using GPRS. The bus simulator unit initially downloads the names and coordinates of stops and POIs on the current route from the server. The Real time bus analyzer and computation contains the algorithm which calculates bus arrival time for each bus going through the corresponding route.

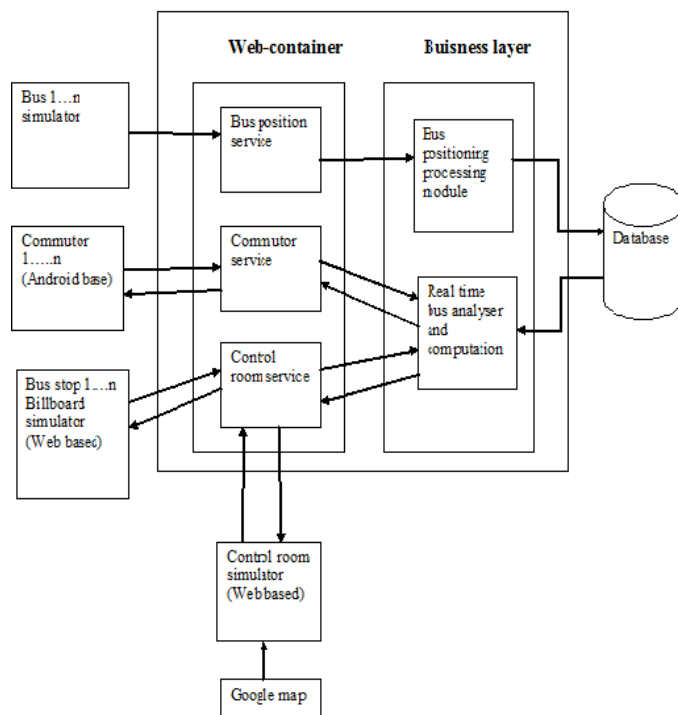


Fig.1 Architecture

C. Server

The server is at the center of RTPIS. The functions of the server are listed below.

- To maintain a database of all the routes, the buses that ply on a route, the stops along each route etc.
- To continuously receive location and speed from the vehicle units of all the buses.
- To calculate the ETA of all the buses at their next and subsequent bus stops.
- To reply to the android Google based queries requesting ETA of buses running between the the two specific stop from users; a GSM mode connected to the server transfers these queries to the server which processes them and reply the time.
- To host Internet web pages, which allow administrator to track buses in real time, see the route map of any route, and get the ETA for any route-stop Pair and plan trips from any source to any destination stop, at any time.

The server maintains a database of information pertaining to the buses, routes and stops in the form of tables. The server database can be organized in many ways, to reduce memory requirement, improve access speed, or reduce the number of queries. To improve the query speed, the tables related to buses are partitioned into static and dynamic ones. The Bus table stores static data while the bus position and log tables store dynamic data. The relation between the unique bus id, bus type (ordinary/luxury/...) and route number is stored in the Bus table. The position updates from the bus are stored in the Bus Position and the Bus Position Log tables. The direction is calculated in the vehicle unit by comparing time-separated position values with route details. The status of the bus changes to invalid, when its driver signals a breakdown. This helps the transport company to take suitable actions. The bus is excluded from ETA calculations based on this field. The Bus Position Log table stores a copy of the position update.

IV. IMPLEMENTATION

A. ALGORITHM

1. Route creation

A novel method has been developed to automate the process of creating new routes and populating the database, with little human intervention. To create a route, A bidirectional graph has been used. This graph will be used in ETA for calculating the estimated time of arrival. The bus stops will be represented as nodes and the route will be in the form of chain of links. A particular route will be identified by its unique id.

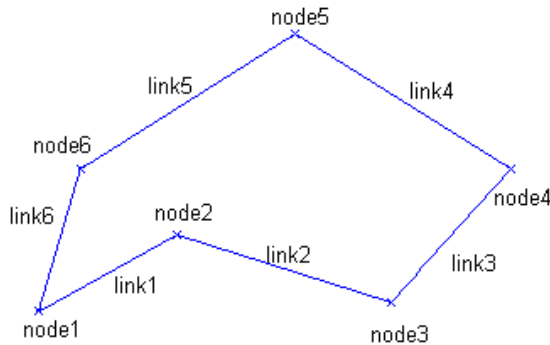


Fig.2 Route creation

2. ETA prediction

Arrival time prediction forms the core of any RTPIS system. The algorithm can be very simple, involving only a bus schedule table, zone based or could be very complicated, involving Artificial Neural Networks, space-time correlation and time series modeling. Bus schedule table and past location data can be used to predict arrival time.

This system provides a platform for executing any ETA algorithm, though here the implemented algorithm is simple one that adapts to changing traffic conditions. This algorithm works by recording the time it takes to traverse each link. Predictions are based on the present and past observations of a bus passing through each link. The past observations get lesser weight as time progresses; this reflects current traffic conditions better.

The predicted ETA at bus stops is bounded by an upper limit of one round trip time of the route, though the ETA can be predicted infinitely into the future by simply adding integral number of round trip times to the smallest ETA.

The ETA algorithm has two parts:

1. Link updater, which estimates the travel time for each link
2. ETA calculator, which calculates the ETA for every bus stop.

3. Link updater

Link updater calculates the link travel times required by the ETA calculator. Whenever a bus position update is received from the vehicle unit, the link updater calculates the travel times for all links traversed by the bus from the previous known position. The link updater requires distance of each link. The distance between two positions having latitude, longitude values is calculated by the following formula.

$$dlon = lon2 - lon1$$

$$dlat = lat2 - lat1$$

$$a = (\sin(dlat/2))^2 + \cos(lat1) * \cos(lat2) * (\sin(dlon/2))^2$$

$$c = 2 * \text{atan2}(\text{sqrt}(a), \text{sqrt}(1-a))$$

$$d = R * c \text{ (where R is the radius of the Earth)}$$

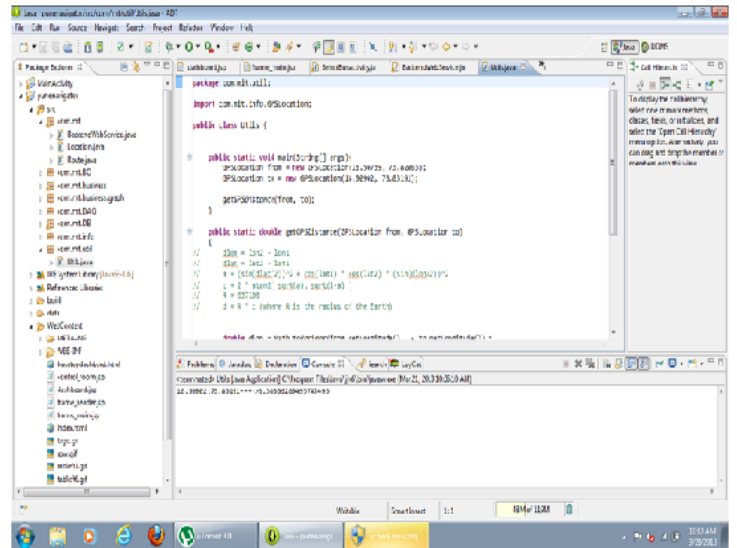
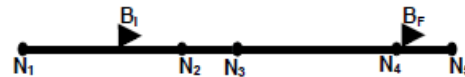


Fig. 3. Distance Calculation

The weighted average of the previous value and the actual travel time obtained for the current bus is stored as the link travel time in the Link table. For an update rate of two per minute used in trial runs, these weights give a good approximation of the average values, as well as track the recent trends. The link travel time is also common to all routes containing the link, so as to get the latest time estimate. This is the reason for sharing links between routes during route creation.

Link updater locates the bus position along the current route of the bus. The link updater then calculates the time required to reach the end of the current link and updates the estimated end time information in the Bus Position table. If the bus enters a new link, the entry time for the new link is stored in the Bus Position table against the bus and the travel time for all the crossed links is calculated. This time is also the exit time for the previous link. The time difference between the exit time and the previously recorded link entry time gives the link travel time for the crossed links. The travel times for links are a function of their lengths. Thus, when more than one link is traversed between updates, the individual link travel times are computed as fractions of the total travel time, with the fraction for link *i* being the ratio of the length of the *i*th link to the sum of lengths of traversed links. This makes sure that among the traversed links, shorter links have smaller travel times and longer links have larger travel times. The computed link travel times are averaged with their previous values and the Link table is updated.



1. Get bus id and route id
2. Get schedule id.
3. Provide this information to bus simulator.
4. update database.

4. *ETA calculator*

This program takes the current bus position, link travel times and estimated time to link-end to predict the ETA for all bus stops. ETA at a stop is the time taken for the nearest bus to reach the bus stop. It is calculated as the sum of travel times of the links, starting from the current bus position, up to the given bus stop.

B. SERVER UTILITIES

1. *RTPIS at bus stop*

The real time arrival information of buses at bus stops will be provided in the form of rolling displays. It will help the passengers to make efficient use of time. When this information is disseminated to passengers, they can spend their time efficiently and reach the bus stop just before the bus arrives, or take alternate means of transport if the bus is delayed [2]. This unit will periodically fetch the required ETA from the server via GPRS.

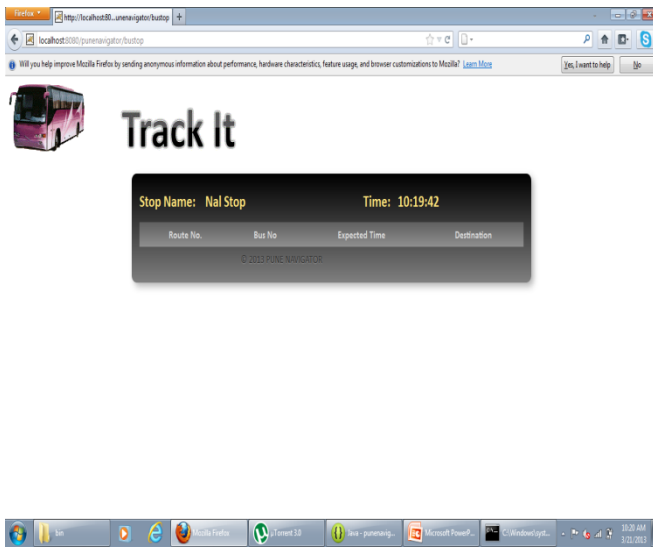


Fig. 4. Bus stop billboard

2. *Smartphone Application*

In today's world, everyone wants technology on fingertips. This system is providing a mobile application which will help the passengers to get bus arrivals at a particular stop. In this whole map of the city will be displayed and the passenger have to just give source and destination point. It will fetch the ETA of the requested route and provide the real time information to passenger. This will make the public transport system competitive and passenger- friendly.

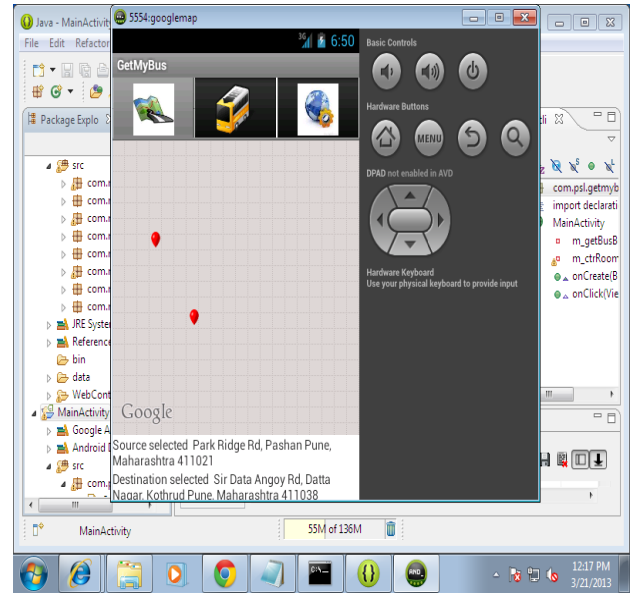


Fig. 5. Android Application

3. *Tracking Buses*

The whole map of the system will be provided to the administrator. Through this web page, user can view the present position of all the buses on the route map. This is done by getting the position of all the buses of a route from the database and then plotting it on the route map[5].

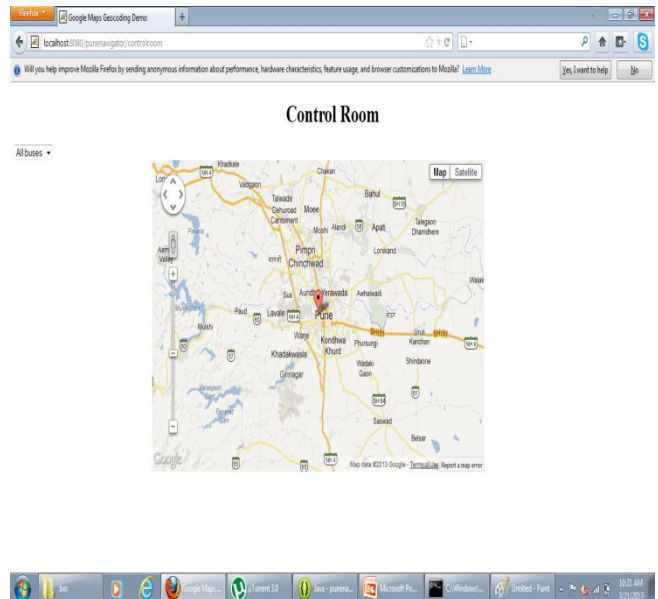


Fig. 6. Control room display

V. FUTURE SCOPE

As this system uses a combination of processing elements: PCs, Mobile Phones etc., there is a possibility of the overall system malfunction due to a particular type of attack, it is termed as Denial of Service (DoS) attack by malicious agents who might try to disrupt the function of the system. A Distributed Security

Scheme for Ad Hoc Networks can be used and to prevent this kind of attack. Such methodology will be studied to make this Real Time Passenger Information System more robust. A novel data hiding technique, based on Steganographic mechanism can also be used for security purposes. Here, the advantage lies in the fact that computationally costly encryption-decryption mechanism is avoided, thus making it suitable for a heterogeneous combination of processing elements, which are being used in present system. Here, many processing elements e.g. Mobile phone etc. lacks the processing power and battery power, which is required for traditional encryption-decryption system.

VI. CONCLUSION

In this paper, the partial implementation details of Real Time Bus Monitoring and Passenger Information System are stated. The RTPIS tracks the current location of all the buses and estimates their arrival time at different stops in their respective routes. Estimates are updated every time the bus sends an update. It distributes this information to passengers using display terminals at bus stops, web based GUI and smart phone application which is android based. This research serves the needs of passengers, vehicle drivers and administrators of the transport system. With the advent of GPS and the ubiquitous cellular network, real time vehicle tracking for better transport management has become possible.

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Prospects and Challenges of Corporate Governance in Ghana

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Abstract- The relevance of corporate governance principles in the management of corporate organisations cannot be underestimated. The increasing influence of principles of corporate governance across the globe has been greatly linked to the recent corporate frauds and scandals. These frauds and scandals largely resulted from the failure of authorities of countries to effectively implement the legal and regulatory frameworks pertaining to corporate governance. Ghana is archetypal in regards to the failure of authorities to enforce the laws and regulations in relation to corporate governance. During the enforcement of the laws and regulations of corporate governance, some vitally important issues are either overlooked or deliberately deserted. This paper attempts to examine the legal and regulatory framework of Ghana in regards to corporate governance and points out the importance of complying with good corporate governance. It also highlights prevailing issues of corporate governance practice in Ghana. It finally makes some recommendations, which are considered the major contribution of this paper.

Index Terms- Prospects, Challenges, Corporate Governance, Ghana

I. INTRODUCTION

Good corporate governance has been highlighted to be vital to corporate organisations especially in transition and emergent economies. The effectiveness of a company's corporate governance structure has a far-reaching effect on how well it functions. A corporation that embarks on good corporate governance practice offers essential information to its equity holders and other stakeholders to minimize information asymmetry. Financial scandals that are currently happening across the globe and the recent collapse of major corporate organisations in the US, Europe and other parts of the world have made corporate governance to take on the centre stage for academic and professional discourse. Thus what does corporate governance really mean?

Corporate governance could be defined as 'the application of a set of powerful micro-policy instruments in an organisation to ensure an efficient and effective use of resources in achieving the main objectives of its capital providers, succeed in the competitive market, as well as maximizing its positive influence on other stakeholders and at the same time, minimizing its negative impacts on them' (Castellini & Agyemang, 2012). Corporate governance is the connection among various participants-such as Chief executives, shareholders, management

and employees- in determining a firm's direction and performance (Monks & Minow, 1996). It has also been defined by Lamm (2010) as the use of formality, thoroughness and transparency to an amalgamated structure of corporate policy in order to ensure that only prudent risks are taken by the corporate organisation to achieve shareholder value as well as to succeed in the market. From the aforementioned definitions, we contend that corporate governance is represented by laid down structures and procedures to mitigate the level of agency costs in a corporate organisation.

The capability of a corporate organisation to entice or attract capital providers is subject to how effective its corporate governance practice is, since this will induce capital providers to invest with the hope that, they are investing in a credible company that will safeguard their investments, and in the end reward them appropriately. By all, not to be rewarded today or tomorrow, but also to be rewarded in five, ten, twenty, or fifty years later. Also, an effective corporate governance practice improves the reputation of a corporate business by making it more attractive to customers and suppliers (Lipman & Lipman, 2006). Kaen (2003) posits that the actual value of a corporate business is what capital providers or investors will make available to the corporate business on the basis of its anticipated returns to its owners.

Currently, countries are encountering different challenges in their attempt to developing/designing effective corporate governance principles that can be actively implemented as well as reliable. These challenges if not appropriately dealt with could thwart the administration of corporate organisations and other vitally important institutions in the concerned economy. In order to overpower these challenges, the constituent elements of good corporate governance are needed to be appropriately highlighted. The common constituent elements of good corporate governance are efficiency, probity, responsibility, transparency and accountability (CACG Guidelines, 1999). However, due to the prevailing economic meltdowns across the globe, there is no doubt that the implementation of the principles of good corporate governance is vitally significant to ensuring good corporate governance in every economy. It is against this backdrop that this paper attempts to highlight some confronting challenges in regards to corporate governance practice in Ghana. It also brings out some recommendations that can help improve corporate governance practice in Ghana.

The remainder of the paper is as follows: section II examines the legal and regulatory framework pertaining to corporate governance in Ghana. The prevailing condition of corporate governance is highlighted in section III. Section IV

addresses the importance of corporate governance principles. Finally, section V, deals with the conclusions and recommendations of the paper.

II. LEGAL AND REGULATORY FRAMEWORK OF CORPORATE GOVERNANCE IN GHANA

The regulatory framework for an effective corporate governance practice in Ghana is contained in the Companies code 1963 (Act 179), Securities Industry Law 1993 (PNDCL 333) as revised by the Securities Industry (Amendment) Act, 2000 (Act 590) and the listing regulations, 1990 (L.I. 1509) of the Ghana Stock Exchange. In the context of this paper, the regulatory framework of Ghana for effective corporate governance has been divided into six major sections, namely: 1) the mission, responsibilities and accountability of the board; 2) committees of the board; 3) relationship to shareholders and stakeholders, and the rights of shareholders; 4) financial affairs and auditing; 5) disclosures in annual reports; and 6) code of ethics. It may be useful now to proceed to discuss in detail the various sections of the regulatory framework of Ghana.

Section i: The mission, responsibilities and accountability of the board of directors

This section specifies the principal objective of the board of directors of a corporate entity. The board of directors is to ensure that the corporate entity is properly managed in order to safeguard and enhance stockholders value and to meet the corporate entity's obligation to: 1) stockholders; 2) the industry in which it operates; and 3) the law. However, it also states that the interests of other stakeholders are significant as a derivative of the duty of stockholders.

Furthermore, this section brings out the primary responsibility of the board of directors. That is, they are to ensure that good corporate governance prevail within them. This section also clearly states the principal duties of the board:

- 1) The strategic guidance of the corporate entity in keeping its goals.
- 2) Overseeing or supervising the management of the business.
- 3) Identification of risk as well as the implementation of systems that manage risk.
- 4) Succession planning and the appointments, training, remuneration and replacement of senior management.
- 5) Supervision of internal control system.
- 6) Maintenance of the corporate entity's communications and information dissemination policy.

The principle also reflects the sovereign rights of shareholders, since the boards of directors, who are to ensure that effective corporate governance prevails, are accountable to shareholders.

Again, this section of the principle brings out how the size of the board should be. It states that, the board's size of every corporate entity ought to be arrived at with the belief of promoting the board's effectiveness as well as ensuring appropriate representational needs. However, no specific number is set with regard to membership but goes on to mention between 8-16 members. The method of appointment to the board should be

formal and transparent, and that shareholders should be provided with adequate information on all persons to be appointed. These information includes: name, age and country of residence; whether appointment is executive and if so the specific area of responsibility; working experience; shareholding in the corporate entity as well as its subsidiaries; family ties with any director and/or substantial stockholder of the corporate entity; and any conflict of interest.

The leadership structure of the corporate organisation is clearly stated in this section of the principle. It states that there should be a separation of the roles of the chairperson and the CEO. In addition, in the event of this separation, the relationship between the CEO and the Chairperson with their respective responsibilities should be formally defined or stated.

The section, in addition, specifies the composition of the board. It states that the board should include a balance of executive directors and NEDs with a complement of independent NEDs being at least one third of the total membership of the board. The appointments of the NEDs should ordinarily be a matter for the board as a whole and the selection procedure ought to be based on merit. It defines the independence of a director based on the following criteria, he/she: is not a substantial stockholder of the corporate entity; is not an employee of the corporate business, is not a professional advisor or consultant to the corporate entity; is not a supplier or customer; no contractual connections with the corporate business; and free from any other relationships with the corporate entity, which may interfere with his or her ability to carry out his/her responsibilities independently. This section also specifies that all directors (i.e., Executive and NED) should have unrestricted access to all corporate business' information, records and documents.

In order for the board to discharge its duties effectively, this section states that the board should meet regularly and in the case of listed corporate entities, it should be at least six times a year. It further states that board committees are required to meet frequently in order to properly discharge their duties in an efficient and effective manner. However, the attendance of directors, particularly NEDs, at these meetings should be a major factor to let them continue to remain on the board.

Section ii: Committees of the board

The section directs the board to constitute committees as it may deem appropriate to help it in carrying out its duties. It further stipulates that the constitution of such committees may include non-members of the board on a condition that the responsibility for any decisions or recommendations made shall remain only with directors who are members of the committee. In addition, the board's committees and their members should be published in the company's annual report.

The committees mentioned under this section are: the audit committee and remuneration committee. The audit committee should compose of at least three directors, of whom the majority should be NEDs. The membership of the committee should be those with adequate knowledge on finance, accounts and the basic elements of the laws under which the company operates. It further states that the chairperson of the audit committee should be a NED.

Furthermore, this section points out the primary functions of the audit committee. These are to:

1. recommend the appointment of the external auditors of the corporate organisation;
2. liaise with external auditors for the purposes of upholding and ensuring audit quality, effectiveness, risk assessment/evaluation, interaction with internal auditors and dealing with situations governing the resignation of an external auditor;
3. review adequacy of systems of internal control and of the degree of compliance with material policies, laws and the code of ethics as well as business practices of the corporate organisation;
4. provide a direct conduit of communication between the board, and the external auditor, internal auditors, accountants and compliance officers (if any) of the corporate organisation;
5. report to the board of all issues of significant extraordinary financial transactions; and
6. help the board in developing corporate strategies that would improve board control and operating structures of the corporate organisation.

Nevertheless, this section states that the audit committee: should have an authority to investigate any issue under its term of reference; be provided with the necessary apparatus to perform such investigation; and should have full access to regular and timely information. In addition, audit committee should also carry out an annual review of the corporate entity's internal control over financial, operational and compliance issues and report on the same to shareholders in the annual report of the company.

Section iii: relationship to shareholders and stakeholders

This section stipulates that corporate governance structures employed by the board should not be geared towards stakeholders' benefit at the expense of shareholders but should endeavour to increase shareholder value by monitoring and maintaining stakeholder relationships effectively and professionally.

In addition, this section emphasises the rights of shareholders. These include: secure methods of ownership registration; convey or transfer shares; obtain timely and regular information on the firm; partake in voting; elect board members; share in the profits of the corporate business. Furthermore, shareholders have the right to partake in, and to be satisfactorily informed about decisions concerning fundamental changes such as: amendments of the statutes, or articles of incorporation or similar governance documents of the firm; the authorization of additional shares; variation of class rights; and extraordinary transactions that in effect result in the sale of the corporate business.

This section also points out the principle of equitable treatment of all shareholders. This principle: 1) requires equity ownership over and above specified thresholds to be disclosed; 2) ensures that market for corporate control of listed firms functions in an efficient and transparent way; and 3) specifies the rules and procedures governing the acquisition of corporate control with the goal of ensuring impartial treatment of all stockholders. In addition, minority stockholders are given the opportunity to obtain effective redress for violation of their

rights. All shares issued unless otherwise specified rank *pari passu* (of equal step) with other share of the same class and in the case of ordinary shares, one share bears one vote. The section further forbids and punishes insider trading and self-dealing.

Section iv: financial affairs and auditing

This section deals with the financial governance, financial reporting and disclosure of price sensitivity information responsibilities of the board, duties of external auditors, audit report, departures or deviations from standards, rotation of audit personnel and removal or resignation of an auditor.

The financial governance responsibilities of the board of directors under this section describe four main responsibilities, including:

1. maintaining satisfactory records for protecting the assets of the corporate organisation;
2. making sure that the statutory payments payable by the corporate organisation are executed on time;
3. making sure that the structures of internal control are present for monitoring risk, adherence to financial governance structures and compliance with the law; and
4. ensuring that the financial statements of the company are audited at such regular intervals as described by law, regulations or internal policies of the company by experienced and well-qualified auditors.

Also, the financial reporting responsibilities of the board of a company are defined in this section:

1. the accurateness of information contained in financial statements;
2. making sure required accounting policies have been consistently employed in the preparations of the financial statement;
3. making sure the annual financial statements of the company are presented according to the financial standards of Ghana National Accounting Standards (GNAS) and other accounting standards;
4. ensuring annual and interim financial statements of the company are dispersed to stockholders and regulators within the time frames described by law and regulation;
5. making sure annual and interim financial statements are prepared effectively in a sense that it can facilitate comparability;
6. making sure the report of auditors on financial statements are faithfully reproduced to the users of such statements; and
7. ensuring that a balanced and comprehensible evaluation is provided in the financial and operating results of the company in financial statements.

Moreover, the disclosures of price sensitive responsibilities of board of directors of listed companies are also described in this section. These include: 1) disseminating price sensitive information to the market and stockholders in a timely way; 2) requesting a temporary suspension in the securities of the company where a disclosure may cause unpropitious price movements in the market for the company's securities.

The role of the external auditor of a company is also defined in this section. It states that the external auditor should be a primary

source of an objective, independent and effective opinion on financial statements of the company. This section urges the auditor to apply diligence, objectiveness and independence in the execution of his or her duties. In addition, the external auditor is to make sure that the audit of the company is conducted in accordance with the one required by the Institute of Chartered Accountants, Ghana (ICAG). This section further asserts that, the external auditor is required to indicate in his or her report if financial statements audited have been prepared in accordance with the GNAS standards.

Furthermore, the external auditor is required to specify any departures from accounting standards and should contain the auditors' opinion as to whether or not the departure is not intentional and also give reasons for such departure. Meanwhile, in order to ensure a continued effectiveness of audit, personnel including the audit partner should be frequently rotated or changed in order to offer fresh procedures in regards to audit work. Finally, the section put forth that the withdrawal, resignation or refusal to stand for re-election by an auditor should be followed by an explanation, which the corporate organisation ought to dispatch to stockholders.

Section v: disclosures and annual report

This section mandates the presentation of annual audited accounts of a corporate entity before its shareholders as specified in the principles. It requires shareholders to be provided with information on: 1) the financial and operating outcomes of the corporate business; 2) the objectives of the corporate business; 3) major share ownership and voting rights; 4) material predictable with factors; 4) material issues regarding employees and other stakeholders; and 5) board members and key executives, and their remuneration.

Also, this part of the code does not rule out the establishment of remuneration committee with NEDs as majority of its members. In addition, executive directors who serve on the remuneration committee must exclude themselves from matters concerning their own compensation packages. It goes on to declare the primary function of the remuneration committee. These are: 1) instituting an official and clear procedure for mounting policy on executive compensation; 2) making sure that a suitable structure is instituted to give performance-oriented incentives to managers; and 3) inspecting executive service contracts with an idea of discovering any unwarranted losses the corporate organisation may encounter in occasions of early service termination. The membership of the remuneration committee and their policies should be disclosed during annual general meetings to shareholders in their annual report. The reports ought to contain at least the aggregate amount of fees, basic salaries, benefits in kind, allowances, pension contribution schemes, paid bonuses, paid compensations for office loss to directors and executive officers.

Section vi: code of ethics

The section on code of ethics points out that every corporate organisation is directed to have its own code of ethics and statement of business practices, which should be implemented as part of the mechanisms that ensure effective corporate governance. Boards of directors are responsible for the formulation of such document. However, its content is applicable

to the board and all employees. The board is also required to introduce a mechanism that monitors adherence and discipline deviations or breaches.

Principles of corporate governance in Ghana: A Reflection

From the above discussion, it can be deduced that the principles of corporate governance of Ghana reflect shareholder perspective of the Anglo-American model of corporate governance. This is because the principles reflect the sovereign rights of shareholders, since the board of directors who are considered to be the principal mechanism to ensuring effective corporate governance has to account to shareholders. Also, the principles mirror the principles of corporate governance of CACG. Furthermore, the principles emphasise the traditional view where the board is regarded as representatives of shareholders. Finally, they obviously state the elements or factors that determine the effectiveness of the board as a mechanism for corporate control. These elements are the composition of the board, independence of the board, the leadership structure (CEO-Chairperson separation), board committees such as the audit committee and remuneration committee, and access to timely and regular information by directors

III. IMPORTANCE OF GOOD CORPORATE GOVERNANCE PRINCIPLES

The increasing consciousness of good corporate governance practice across the length and breadth of the globe is extremely important. With effective corporate governance regime, there is little or no doubt that corporate authorities will be able to take decisions that will meet all stakeholders' interests. It also offers a framework of probity, transparency, responsibility, accountability, checks and balances. Good corporate governance regime can absolve the harm that emanates from corporate deficiencies and address issues such as poor business leadership, unrelenting poor firm performance and a common wearing away of confidence in and around corporate organisations. It provides a framework for evaluating corporate organisations. In lieu of that, it makes possible for comparative analysis among all sectors of an economy. In addition, it forms the cornerstone for corporate governance guidelines for corporate organisations. In wrapping up on this sector, there is certainty that corporate governance guidelines promote effective and efficient allocation of resources, help corporate organisations in attracting capital at low cost and assist corporate organisations in maximising their performance as well as their capability in meeting community needs.

IV. ISSUES PERTAINING TO CORPORATE GOVERNANCE IN GHANA

Following Agyemang and Castellini (2013), this section will be analysed on the basis of a study conducted by these two authors on corporate governance practices in four large publicly-held corporate organisations in Ghana. The authors employed a qualitative case study methodology in their study. This paper used their analysis in the sense that, the researchers wanted to get an in-depth appreciation of how corporate governance practice

prevails in large corporate organisations in Ghana. And since their research provided us with such appreciation, we considered it appropriate to use their analysis for our study. We therefore, present the prevailing condition of corporate governance based on their findings.

The shareholder perspective of corporate governance put forth that, the objective task of an organisation ought to focus only on those who have monetary share of the organisation. It considers organisations as devices for shareholders to maximize their investment returns, on the basis that theoretically, they (ie. shareholders) are residual claimants (Jensen & Meckling, 1976). As a result, effective corporate governance was defined in this study as to how the ownership structure and the board structure serve as good corporate governance mechanisms in reducing agency problem in an organisation, by narrowing the gap between the interests of shareholders and managers

Ownership Structure and Ownership control

In their study in four publicly-listed corporations in Ghana, they found out that controlling shareholders function as monitors and controllers of managers. Controlling shareholders exert control over decisions of management via their incessant access to and selection (and the authority to dismiss) of key persons in the organisations, their frequent access to information and their activeness in decision-making processes of the organisations. With these possibilities, controlling shareholders induce management to take decisions that will maximize shareholder value and consequently, help reduce agency problem. In all organisations, controlling shareholders have the ultimate say on decisions during annual general meetings, in view of the fact that, they have the control rights. This allows them to pervasively influence decisions of management and as a result, management has to take actions to maximise shareholder value. The authors argued that the revelation of this ownership concentration in all four organisations studied, is a feature that cuts across all Ghanaian organisations listed on the Ghana Stock Exchange, and a number of organisations that are not listed. This revelation from the cases investigated in regards to the role of large shareholders is in line with the extant literature on corporate governance. Denise and McConnell (2003) opine that large shareholders have the incentive to use up resources to monitor and control management in order to make sure that their interests are met. Large shareholders are observed as vital corporate governance mechanism in the developing world in that; they strongly influence the course of effective corporate governance (Berglof & Claessens, 2004).

Board Effectiveness

In regards to the board, the authors study concentrated on elements that are regarded vital in agency theory to determine board effectiveness in connection with board control. The elements examined in their study were: board composition, leadership structure of the board, director independence, meetings of board, board audit committee and board remuneration committee.

Board Composition

The findings of their study indicate that in all organisations, the Non-executive directors form the majority of their boards.

The degree to which board composition determines board effectiveness in connection with board control function is assessed to be low in three organisations of their study. In these three cases, boards do not get involved in the crucial elements of control in the organisations since controlling shareholders execute such operations. This observable fact from these three organisations confirms the findings in the extant literature that the existence of large shareholders has the propensity to weaken other corporate governance mechanisms (Berglof & Claessens, 2004). It is only in one case that board composition was evaluated to settle on board control to a large extent. The board's Non-executive directors do carry out all the crucial elements pertaining to board control in the organisation. This enhances the debate in the extant body of knowledge that boards can be effective governance mechanism (Berglof & Claessens, 2004; Denise & McConnell, 2003). However, their study highlights that boards can only become effective corporate governance mechanism only if large shareholders allow them (by means of absencing themselves from performing control-related operations) to carry out their control function in the corporate organisation.

The finding in regards to the number of Non-executive directors relative to the board size in all organisations studied meets the recommendations of the principles of corporate governance of Ghana, which states that at least one-third of board members should be Non-executive directors.

Director Independence

In all organisations studied by the authors, the extent to which director independence drives board effectiveness relative to board control is high. Such director independence has the propensity to transform into effective and efficient control of management. However, their observable facts also show that although directors are independent of management, the subject of director independence in relation to controlling shareholders continue to be challenging. The prevailing condition where controlling shareholders are given rights to select directors, present a conundrum to director independence. This observable fact is in line with the extant body of knowledge in that; large shareholders in general, jeopardize director independence since large shareholders tend to have an authoritative command in relation to director appointment (Berglof & Claessens, 2004). In their conclusion, they argued that the aspect of director independence in all four organisations met the recommended guidelines by the principles of corporate governance of Ghana.

Board leadership Structure

Their findings also reveal that the extent to which the division of the roles of the Chief Executive Officer and the board chairperson settles on board control is low for all four organisations studied. In regards to the suggested guidelines, the authors highlighted that the division of the roles in all four organisations meets the requirement of Ghana's principles of corporate governance since one person does not perform the two roles. However, they argued that this separation in all four organisations do not conform to the guidelines of the principles in that, board chairpersons in these organisations are not independent of controlling shareholders.

Board Meetings

The study also revealed that the extent to which board meetings settle on board effectiveness in regards to board control function is low for three organisations and high for one. They argued that, as with other determinants of board effectiveness, board meetings do not pave important way to board effectiveness with respect to board control in three organisations because their boards do not exert board control. In the remaining organisation, their findings highlighted that, board meetings settle on board control in that, they (ie. board meetings) represent platforms that offer the board to exert control over management and corporate decisions.

Their study showed that it is only in one of the four organisations studied that its board has put in place performance evaluation mechanism to assess the performance of directors, the CEO and the board. In their conclusion, they contended that three organisations do not meet the recommendation of the principles of corporate governance of Ghana.

Board Audit Committee

Their study revealed that the role of the board audit committee in driving board control is low for three organisations and high for one. They argued that, as with other determining forces of board effectiveness, the establishment of board audit committees does not necessarily lead to board effectiveness in relation to board control function in three organisations in that, controlling shareholders perform extensive control over the organisations. This is in line with the extant literature that the ownership structure has influence on internal mechanisms of corporate governance (Berglof & Claessens, 2004). They also contended that, as a matter of fact, the ineffectiveness of board audit committees of these three organisations due to the presence of controlling shareholders makes the principles' recommendation with respect to board committees irrelevant. They furthered that, since the board is ineffective due to the extensive control over its activities by the controlling shareholders, it could be envisaged that any committee established by the board will be ineffective.

Board Remuneration Committee

Two of the organisations studied by the authors have established board remuneration committee. They however, argued that the role of the remuneration committee in determining board control is low for one of the two organisations and high for the remaining one. They continued that the establishment of board remuneration committees does not foster board control in these organisations (ie. low-scored organisations) in the sense that, their controlling shareholders perform extensive control over their operations. This is in line with the extant state of knowledge that the ownership structure has influence on internal mechanisms of corporate governance (Berglof & Claessens, 2004).

V. CONCLUSIONS AND RECOMMENDATIONS

Enforcing existing laws and regulations for effective corporate governance

It has been established that although Ghana has sufficient laws and regulations with respect to corporate governance, the

major challenge is the absence of active devices for their effective enforcement. Without an effective enforcement of the rules and regulations in regards to corporate governance, it will be very difficult for developing and transition economies to develop a strong and vibrant capital markets, which are currently regarded as important for sustainable economic development for countries (Shleifer & Vishny, 1986; Berglof & Claessens, 2004). On the basis of this issue, the recommended strategy to ensuring effective enforcement of existing laws and regulations is by recognising that the structure and capacity of the laws, and legal and regulatory framework are essential components of the corporate governance system. In achieving this, the following mechanisms have been suggested by this study: improving the regulatory framework by making the laws accessible to all equity holders and the populace; fashioning effective mechanisms for law enforcement as well as strengthening enforcement mechanisms (by providing training, logistics, equipments and so on); taking on alternative dispute resolution strategies; creating a conducive environment by keeping up the possible will to execute policies; creating an independent and intrepid judiciary; and encouraging the media to report issues of corporate governance and become more critical/judicious on issues of corporate governance.

Protection of Minority Equity holders

An important aspect that was noted within the work of Agyemang and Castellini (2013) was the need to safeguard small equity holders against the abuses of large equity holders. Safeguarding of small equity holders is currently a very important issue in developing economies (Berglof & Claessens, 2004) of which Ghana is no exception. The protection of small equity holders basically demands that the implementation of existing rules and regulations be improved. It also requires a concurrent implementation of other strategies including the gaining of greater access to information, reviewing the current rules and regulations, educating small equity holders and the enforceability of existing recommendations and guidelines/principles.

Availability of information to small shareholders will enable them to challenge both management and large shareholders in relation to corporate decisions. This challenge will go round to prevent a potential diversion of corporate resources. Mechanisms for easy access to information by minority shareholders include the development of highly regarded bodies such as a well-focused investigative financial body, brokerage firms and financial think-tanks that could assist in enhancing corporate governance practice. Empowering professional accounting and auditing bodies such as the ICAG should in addition, form part of the effort to improving corporate governance practice.

In order to protect the right of minority shareholders, they should be educated. This will make them aware of their rights to further reduce abuses from large shareholders. Educational campaigns can be carried out to bring about an understanding of their rights. Security and Exchange Commission of Ghana (SEC) and Ghana Stock Exchange (GSE) should also encourage organisations to organise educational symposiums, conferences, forums and so on to sensitize their shareholders on their rights. SEC and GSE can also encourage minority shareholders to form vibrant associations to safeguard their interests.

Reforming annual general meetings

An arrangement of a company's internal corporate decision-making processes helps in safeguarding minority shareholders. In their study, it was highlighted that, minority shareholders were not given ample time to express their grievances during annual general meetings. When board chairpersons chair those meetings, they may have an interest in safeguarding the board from shareholder criticisms. It is recommended that annual general meetings should be reformed so that they could be chaired by individuals who are independent of both management and boards. Those individuals should be elected by shareholders for each annual shareholder meeting. This will enable the board to be accountable to all shareholders. To give credence to this recommendation, regulatory bodies such as SEC and GSE ought to include this in the listing requirements of GSE.

Employee representation

The recommendation of the principles of corporate governance of Ghana, which states that directors are supposed to consider the interests of other stakeholders, can only be manifested if other stakeholders such as employees are represented on boards. SEC should partake in achieving the 'consideration of other stakeholders' in practice, and to try to include employee representation law. The trade unions such as the Trade Union Congress (TUC) of Ghana and the Ghana Federation of labour (GFL) should keenly deliberate on this subject and try to seek actual employee representation on boards as recommended by law.

The issue of business accountability

The issue of business accountability of organisations to the Ghanaian community has relevant connotation with the development of corporate governance in Ghana. Corporate governance should be considered as a public policy matter, and attempts should be made to draw a clear distinction between corporate decision-making processes and political decision-making processes. This subject needs to be dealt with as element of the wider initiative of improving effective corporate governance.

Reviewing guidelines of corporate governance

Although the companies code 1963 does address the inequality between large shareholders and small shareholders, companies are not implementing this recommendation. The SEC and GSE should effectively persuade organisations to execute this recommendation. Also, SEC should conduct a seasonal evaluation to get hold of the extent of compliance by corporate organisations as well as occasionally reviewing guidelines. This will induce self-monitoring and help out in achieving good corporate governance.

Divestiture policies and corporate governance

The essence of considering the consequences of privatization on corporate governance, and the eventual position of large shareholders in the decision-making processes of organisations, call for a revision of Ghana's principles of corporate governance to protect minority shareholders. It has been deduced that instead of privatization via strategic investors/capital providers to empower local shareholders, it

undermines them, and eventually makes them vulnerable to the expropriation problem. The study recommends that future divestitures should also deal with the position of local shareholders.

Recommendation regarding boards of directors

Enhancing director independence

The issue of director independence has been identified as a major challenge in Ghana. In order to curb this, the positions should be announced in public with all the requirements so that a person who considers him/herself qualified would tender in his/her application. This means that directors will be recruited from the market by applying a free and fair mechanism of inviting applications from well-qualified people.

Director evaluation

The idea of board evaluation is gaining grounds in the corporate community. This is because subjecting board of directors to any sort of evaluation is not something inappropriately silly. Due to this, it is recommended that organisations ought to put in place evaluation mechanisms. Huse (2007) opines that the actual form of evaluation may differ, but he goes on to recommend that the evaluation should be formal and regular, taking place at least once a year. Director evaluation can be executed under the leadership of an independent director, with support from external consultants. Various suggestions have been made in regards to the objectives and forms of board evaluation. Huse (2007) has grouped the objectives into two: Externally related objectives- which are associated with transparency; and Internally related objectives-which are associated with the development of internal effectiveness of the board by evaluating the manner in which the board conducts its business, by checking that all vital issues are appropriately prepared and deliberated, and by measuring the real contribution of each director to the board's work in general, through his/her skills, competence and participation in board deliberations. The board could hold a meeting at least once a year, at which time the assessment of the board chairperson, individual directors as well as the Chief executive officer's respective performances would be conducted. Steger et al (2004) suggest that if evaluations are undertaken meticulously and the procedure is well-designed and executed in a manner that all directors agree, with an assurance of confidentiality, these evaluations can bring gains to the board in general. However, the issue of individual board member evaluation is threatening in the sense that it can destroy the shared power and authority vested among board members as well as their common trust on the board. This study recommends a peer review mechanism-whereby individual directors are asked to evaluate the performance of every other director-or setting up a corporate governance committee, which should be composed of all Non-executive directors of the board to carry out such assessments. The result of these evaluations should be made available to shareholders each year in the annual reports, and the steps taken as a result. This recommendation can be executed by boards of directors.

Introduction of new members

Orientation to a new job is vital for optimal performance (Huse, 2007). However, the study of the authors shows that

corporate organisation do not normally orient newly-appointed board members, or formally introduce them to their respective jobs. Newly-appointed directors should receive a formal method of orientation into the affairs of the organisation. This can be done by the board chairperson by making sure that all newly-appointed directors are furnished with full, official and customized orientation on joining the board. Newly-appointed directors should be familiarised with the corporate organisation's dealings and top management, its environment and be inducted in relation to their fiduciary roles and responsibilities as well as in regards to the expectation of the board. If a newly-appointed director has little or no board experience, he/she must receive training.

Board education

Huse (2007, p. 194) argues that "the board itself, but, as the highest authority in the corporate structure, the board is responsible for its own job specification, including the boardroom culture". The empirical observations from the cases show that organisations often do not educate their members on some of the nitty-gritty of accounting and auditing. The Cadbury Code of the UK highlights the role of directors' education in this regard and pronounces their role as follows:

The weight of responsibility borne by all directors and the increasing commitment which their duties require emphasise the importance of the manner in which they prepare themselves for their posts. Given the varying backgrounds, qualifications and experience of directors, it is highly desirable that they should all undertake some form of internal or external training; this is particularly important for directors . . . with no earlier board experience

Since it is better to have competent and dynamic people in a bad structure than incompetent and inactive ones in a good structure, this study recommends that chairpersons of corporate organisations should make sure that board members consistently upgrade their skills and knowledge, as well as their considerable acquaintances with the organisations in order to bring into actuality successful board tasks-both on the board as well as on board committees. This is because; good corporate governance structure does not suffice everything, therefore the accentuation of the training of board members (Charkman, 2005).

Board structure

The empirical observations of the study of Agyemang and Castellini (2013) have shown varied results with respect to the leadership structure in driving corporate governance effectiveness. It is recommended that the implementation of the split leadership structure should be carefully looked at, and its importance established, on a case-by-case basis. Although the companies code 1963 has recommended that the two roles ought to be separated, this is useful in circumstances where director independence is present. This is also the case of the board composition and the setting up of board committees. Boards of corporate organisations can work hand-in-hand with their shareholders in dealing with this issue.

Recommendation for educational institutions

Recruiting from a market goes hand-in-hand with the development of a market for board members. The authors' work

has indicated that most organisations currently appoint either government functionaries or retired civil servants. This creates a lot of challenges to the organisations since most of these people do not normally possess skills in relation to private sector issues. As a result, there is the need to create a large pool of directors from which organisations could tap well-qualified and competent persons from. This is because if the competencies of board members are questionable, then the best system will prove frivolous. With true visionary, skillful, well-educated and competent board members, corporate strategies can be reviewed, approved and executed irrespective of the existing governance structure. This calls for the development of corporate governance practice via educational/training programmes. And this can be achieved by tasking universities, polytechnics and other professional institutions to introduce courses/subjects on corporate governance.

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Missing Maxillary Lateral Incisors and Persistent Primary Central Incisors- Case Reports

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Abstract- On routine medical checkups of 1st MBBS students during the admission into medical college, 2 boy students were found to have persistent primary mandibular central incisors and 1 girl student was found to have only 2 maxillary incisors instead of 4 in the upper jaw where the lateral maxillary incisors were missing. In the first two cases, on inspection of dentition of both boys, the primary milk teeth were present in the mandible only. These were small when compared to other secondary dentition. Gums were normal. There was no eruption of permanent mandibular central incisors. The primary teeth were as strong as the other permanent teeth. There was no considerable difficulty in speech or mastication. There was neither history of allergy nor any family history. In the third case, the girl student was unaware of her missing teeth and on inspection of her teeth; the lateral incisors of upper jaw were missing. There were only two central incisors on the maxillary arch with their respective sockets. There was no gap between the incisors and the canines denoting the absence of their sockets as well. Mandibular incisors were 4 with their sockets and all the other teeth were mere normal. No gum abnormality was seen. There was neither significant history of allergy nor any family history.

Index Terms- Missing maxillary lateral incisors, persistent primary mandibular central incisors, and allergy

FIGURES:



Fig 1. Persistent mandibular central incisors case-1

I. INTRODUCTION

Teeth and nails represent the exoskeleton of the human body. The number of teeth in various stages of life plays a vital role in age determination of the individual. At birth maxilla and mandible are edentulous. Primary teeth or milk teeth starts to erupt from 6-7 months of age and completed by 2-3 years of age. The number of primary teeth is 20 (8 incisors, 4 canines, & 8 primary molars). The dental formula is 2102 which represent the number of teeth in each half of the upper or lower jaw. As the age of the child advances, the milk tooth start to denude at the age of 6-7 years and permanent tooth commence eruption. By 18-25 years of age, all the milk tooth are replaced by secondary dentition which are otherwise called permanent teeth with dental formula 2123 and the total number of teeth counts to 32. As the teeth erupt twice in the lifecycle of an individual, humans are classified as diphodonts. This article presents 3 peculiar case reports which are observed in 1st MBBS students regarding their pattern of abnormal dentition.

II. MATERIALS AND METHODS

200 medical students underwent general medical check-up during their admission into government medical college and 3 students (2 boys & 1 girl) were found to have abnormal dentition pattern as reported.



Fig 2. Retained milk tooth of central incisors on mandibular arch case-2.

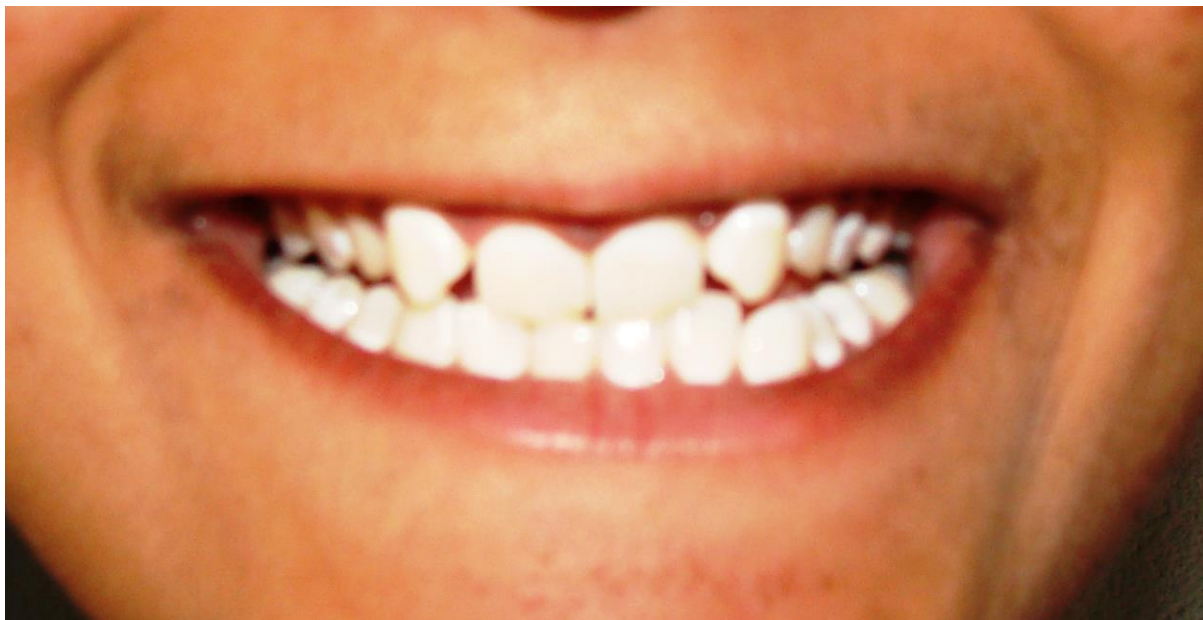


Fig 3. Missing maxillary lateral incisors case-3.

III. RESULTS AND DISCUSSION

2 medical boy students (18 years of age) were found to have persistent mandibular central incisors (fig 1 & fig 2). These were small when compared to other teeth. The primary central incisors on the mandible didn't fall and they became permanent. But the lateral incisors were denuded and were replaced by permanent teeth. On inspection, there were no supernumerary teeth. All the other teeth and gums were normal. The primary dentition of all the other teeth was replaced by permanent teeth including the molars. There was no crowding of teeth or supernumerary teeth. There was no significant cause for

persistent primary dentition like genetic or allergy or drug or family history. One student complained of slight difficulty in speech while other student didn't. All the other parameters were normal.

The 3rd case reports a medical girl student (17 years of age) with missing lateral maxillary incisors (fig. 3). On inspection, there was no gap or free socket. The teeth were placed closer and no overlapping was observed. There were no supernumerary teeth. According to Simons et al², the most frequently missing permanent teeth are the third molars (20.0%) followed by 2nd premolars (3.4%), and the maxillary lateral incisors (2.2%). But Isfahan stated that the most common congenitally missing anterior tooth is maxillary lateral incisor which coincided with

the case report. There appears to be a multifactorial aetiology to hypodontia, with both genetic and environmental factors playing important roles (Ely /etal.³) Hypodontia is thought to involve environmental factors, including infection, e.g. rubella (Gullikson⁴), drugs, such as thalidomide (Speirs⁵), and irradiation (Berland⁶), as well as the developmental relationships between the nerves, maxilla, mandible, oral mucosa, supporting tissues, and hard tissues (Kjær /et al.⁷). Developmental anomalies, endocrine disturbances, and local factors, including pathology, facial trauma, and medical treatment, have been also linked to hypodontia (Werther and Rothenberger⁸). Allergy is considered as a possible predisposing factor for hypodontia¹. But in this case, there was no significant drug history or infection or allergy or family history related to hypodontia. Hence the cases were diagnosed to have idiopathic aetiology and were reported.

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Persistent Metopic Suture in Various Forms in South Indian Adult Skulls – A Study

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Abstract- Persistence of frontal suture separating the two frontal bones in the adults is called metopism and the suture is called metopic suture. The fusion of metopic suture starts at around 18 months after birth and is completed by 8-9 years of age. The present study aims at the presence of persistent metopic suture in the adult skulls in various forms between glabella and bregma which may be misinterpreted as radiological fracture. 180 adult skulls ranging from 30-60 years of age group from the department of Anatomy RIMS, Ongole were studied for the presence of metopic suture and their shapes and measurements were tabulated. 103 skulls were found to have no metopic suture, 9 skulls showed complete metopic suture extending from glabella up to bregma, 18 skulls revealed 'V' shaped, 14 skulls manifested to have 'H' shape, 16 skulls were discovered to have linear metopic suture in the midline, 7 'Y' shape, 11 had inverted 'U' shaped metopic suture, 2 skulls showed 'U' shaped metopic suture with extension on to the right. To conclude, 42.5 % of skulls revealed the presence of metopic suture in various forms and 57.2% showed no metopism.

Index Terms- Adult skulls, bregma, frontal bone, glabella, metopic suture

replaced by bone at about 2 years. Remnants of metopic suture may persist in some skulls at the glabella. According to Warwick & Williams metopic suture is obliterated by 8th year. G.J.Romanes⁵ declared that the metopic suture closes by 5th or 6th year leaving traces above or below. Henry Gray¹ postulated that the median suture usually disappears by about 8 years but may persist as metopic suture. Metopic suture varies in different races as concluded by Breathnach⁶, the incidence is 4-5% in yellow races, 7-10% in Europeans, & 1% in Africans. Bryce demonstrated 5.1% in Mongolians, 8.7% in Europeans, 9.5% in Scottish, 1.2% in Negroes, 1% in Australian skulls. Das et al studied on Indian skulls and depicted 27.98% whereas Agarwal et al showed 40.83% skulls with metopic suture. Many factors were attributed for the persistence of the metopic suture in the adults which include abnormal growth of skull bones, hormones, cranial malformations, hydrocephalus, atavism, genetic causes etc. Knowledge regarding the persistent metopic suture is essential in studying the radiographs to avoid misinterpretation as fractures and also it is useful in evaluating various medico legal cases. The present study aims at evaluating the persistent metopic suture in adult skulls and comparison of results with different authors.

I. INTRODUCTION

The skull is the bony skeleton of the head. It shields the brain, the organs of special sense and the cranial parts of respiratory and digestive systems and provides attachments for many of the muscles of the head and neck. The majority of skull bones are held together by fibrous joints termed sutures. The frontal bone is the unpaired bone of the skull forming the forehead or the 'frons' which is the common area for scalp and face. Glabella is the median elevation between the superciliary arches (more pronounced in males). Bregma is the meeting point of sagittal and coronal sutures which can be viewed from the superior aspect of the skull. According to Gray¹, the glabella may show remains of frontal suture (metopic suture), which is present in about 9% of adult skulls.

Focussing on the development, frontal bone being a skull bone ossifies in membrane. Manzanares et al² mentioned that the metopic suture ossifies in membrane from two primary centers which appear by the end of second month of foetal life and fuse first at the inner surface of the skull by chondroid tissue. As stated by Moore, Dalley, Agur⁴ frontal suture is obliterated by 8th year and in approximately 8% of the people, metopic suture persists. A.K.Datta³ reported that at birth the two halves of the frontal bone remain separate as the metopic suture, which is

II. MATERIALS AND METHODS

180 adult skulls from the department of Anatomy, RIMS, and Ongole form the material for the present study. The age of the skulls varied from 30-60 years. Malformed or fractured or pathologic skulls were discarded and the study was conducted on mere normal crania. Each skull was thoroughly inspected for the different forms of metopic suture. The measurements of the lengths of metopic suture were illustrated in tables and graphs. The same were compared with those of different authors.

III. RESULTS

Table 1: occurrence of metopic suture in 180 skulls and their percentage

S.No.	Shape of metopic suture	Number of skulls	%
1.	Absent metopic suture	103	57.2
2.	Complete suture	9	5
3.	'V' shaped	18	10
4.	'H' shaped	14	7.7
5.	Linear midline	16	8.8

6.	'Y' shaped	7	3.8
7.	Inverted 'U' shaped	11	6.1
8.	'U' shaped with extension on right side	2	1.1

Table 2: lengths of complete metopic suture extending from glabella to bregma

S.No.	Length in cms
1.	11.2
2.	12.1
3.	11.8
4.	11.7
5.	12.0
6.	12.4
7.	11.6
8.	12.3
9.	10.8

Average length of the complete metopic suture from table 2 is 11.76 cms

Table 3: lengths of 'V' shaped metopic suture

S.No.	Length in cms
1.	0.8
2.	0.7
3.	0.9
4.	1.1
5.	0.6
6.	1.0
7.	0.9
8.	0.8
9.	1.3
10.	0.9
11.	0.7
12.	1.0
13.	1.2
14.	0.9
15.	0.8
16.	1.2
17.	0.8
18.	0.7

Average length of the 'V' shaped metopic suture from table 3 is 0.90 cms

Table 4: lengths of 'H' shaped metopic suture

S.No.	Length in cms
1.	1.0
2.	0.5
3.	0.8
4.	1.1
5.	1.0
6.	0.6

7.	0.7
8.	1.0
9.	1.1
10.	1.2
11.	0.6
12.	0.5
13.	0.9
14.	1.1

Average length of 'H' shaped metopic suture from table 4 is 0.86 cms

Table 5: lengths of linear midline metopic suture

S.No.	Lengths in cms
1.	2.0
2.	2.1
3.	1.9
4.	1.8
5.	2.0
6.	2.1
7.	2.2
8.	1.8
9.	1.9
10.	2.0
11.	2.1
12.	1.7
13.	1.8
14.	1.9
15.	2.0
16.	2.0

Average length of linear midline metopic suture from Table 5 is 1.95 cms

Table 6: lengths of 'Y' shaped metopic suture

S.No.	Length in cms
1.	0.5
2.	0.6
3.	0.8
4.	0.5
5.	0.7
6.	1.0
7.	0.6

Average length of 'Y' shaped metopic suture from table 6 is 0.67 cms

Table 7: lengths of inverted 'U' shaped metopic suture

S.No.	Length in cms
1.	1.5
2.	1.3
3.	1.2
4.	1.5
5.	1.7

6.	1.8
7.	1.5
8.	1.2
9.	1.3
10.	1.1
11.	1.0

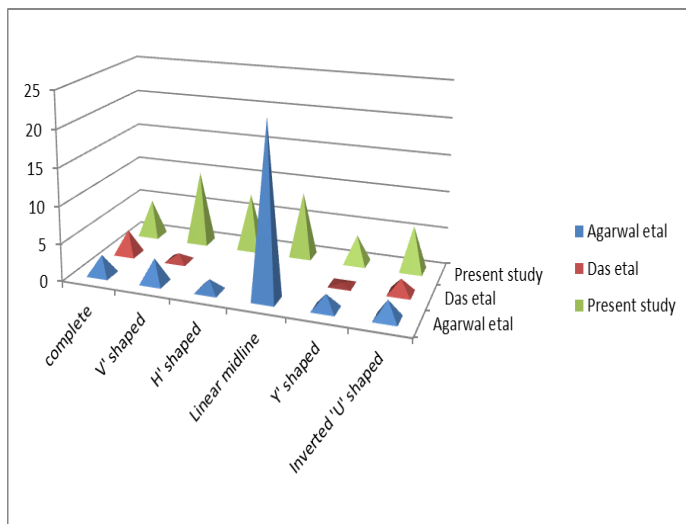
Average length of inverted 'U' shaped metopic suture from table 7 is 1.37 cms

Table 8: lengths of 'U' shaped metopic suture with extension on right side

S.No.	Length in cms
1.	0.8
2.	0.9

Average length of 'U' shaped metopic suture with extension on the right side from table 8 is 0.85 cms.

Graph 1: comparison of the present study with various authors



IV. DISCUSSION

The present study was conducted on 180 skulls for the occurrence of metopic suture in various forms. The % of complete metopic suture correlated with those of Agarwal and Das et al (graph 1). The different shapes of the metopic suture nearly correlated with the authors except the linear midline metopic suture value which showed a gross difference with those of Agarwal et al.

V. CONCLUSION

The persistence of metopic suture in adults which separates the frontal bones is of paramount importance in interpreting the radiological images and in evaluating medico legal cases. In the present study 42.5% skulls showed the presence of metopic suture which is more than the values from the previous authors.

The metopic suture occurred in various forms like complete metopic suture extending from glabella to bregma (fig. 1), 'V' shape (fig. 2), 'Y' shape (fig. 3), inverted 'U' shape, linear midline position etc. A special form of the metopic suture has been observed in 2 skulls which showed 'U' shape with extension towards right side. 57.2% of the adult skulls showed no metopism (fig. 4)

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FIGURES



Fig 1: complete metopic suture extending from glabella to bregma



Fig 2: 'V' shaped metopic suture



Fig 3: 'Y' shaped metopic suture



Fig 4 : Absent metopic suture

Stress Management among the Government Officers

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Abstract- The present study aims to examine the organizational role in causing stress to the government officers. The sample consists of 87 officers serving in the government departments. They have been assessed for their organizational role stress utilizing the Organizational Role Stress (ORS) scale. The result reveals that while inter role distance, role expectation conflict and role erosion are the main sources of stress felt by the officers, personal inadequacy, role ambiguity and resource inadequacy are the least felt stresses. On the basis of these findings, a comprehensive human resource development strategy can be evolved to deal with the impact of organizational role stress in the government departments.

Index Terms- Stress, organization, role, government officers.

I. INTRODUCTION

Role is the position one occupies in a social system, and is defined by the functions one performs in response to the expectations of the significant members of a social system, and one's own expectations from that position in office.

Role and office or position are two separate concepts, though two sides of the same coin. According to Katz and Kahn, "Office is essentially a relational concept, defining each position in terms of its relationship to others and to the system as a whole. While office is a relational and power-related concept, role is an obligatory concept."

A role is not defined without the expectations of the role senders, including the role occupant. The position of a personnel manager may be created in an organization, but his role will be defined by the expectations, stated or unstated, that different persons will have from him, and the expectations that he, in turn, has from the role. In this sense, the role gets defined in each system by the role senders and the role occupant.

The concept of role is vital for the integration of the individual with an organization. The organization has its own structure and goals. Similarly, the individual has his personality and needs (motivations). All these aspects interact with each other and to some extent get integrated into a role. Role is also a central concept in work motivation as it is only through this that the individual and organization interact with each other.

An organization can be defined as a system of roles. However, a role in itself is a system. From the individual's point of view, there are two role systems: the system of various roles that the individual carries and performs, and the system of various roles of which his role is a part. The first, we will call role space and the second, a role set.

Each individual occupies and plays several roles. A person can be a daughter, a mother, a salesperson, a member of a club, a member of a voluntary organization and so on. All these roles constitute the role space of that person. At the centre of the role

space is the self. As the concept of role is central to that of an organization, so also the concept of self is central to the several roles of a person. The term 'self' evolves from past experience with other persons and objects. Self can be defined as the experience of an identity arising from a person's interaction with the external reality, things, persons and systems.

A person performs various roles that are centered around the self and are at varying distances from the self and from each other. These relationships define the role space, which then is a dynamic inter-relationship between the self and the various roles an individual occupies.

Similarly, role set is a pattern of inter-relationships between one role, called the focal role, among many others. In a role set map, the focal role is in the centre.

The concept of role widens the meaning of work and the relationship of the worker with other significant persons in the system. The concept of job is more prescriptive in nature, while role includes more discretionary part of work. A job assumes the relationship of the worker with his supervisor whereas the role emphasizes his relationship with all those who have expectations from him, as he has from them. Recently, much emphasis has been given to the development of roles and making them more effective in an organization.

To sum up, the concept of role goes beyond the individual job holder and indicates a need to involve other significant persons in defining role requirements. The focus on roles can be useful in planning organizational effectiveness. Herzberg (1968) drew attention to the need for humanizing jobs and giving more dignity to them. The work redesigning movement highlighted the need for involving job holders in work related decisions and give them more autonomy in work related matters.

Organizational Role Stress

Modern life is full of stress. As organizations become more complex, the potential for stress increases. Urbanization, industrialization and increase in scale of operations are some of the reasons for rising stress. Stress is an inevitable consequence of socio-economic complexity and, to some extent, its stimulant as well. People experience stress as they can no longer have complete control over what happens in their lives.

There being no escape from stress in modern life, we need to find ways of using stress productively, and reducing dysfunctional stress.

Several terms that are synonymous with stress, or similar in meaning, have been used. In order to avoid confusion, we will use the following terms: stressor for stimuli that induce stress; stress for the affective (emotional) part in the experience of incongruence; symptoms for the physiological, behavioural and conceptual responses or changes; and coping for any behaviour that deals with the emotional component in the experience of

incongruence. The term stress will be used here to refer to such terms and concepts as strain, pressure, etc.

Even as stress is inevitable in today's complex life, so is it necessary for human progress. It is like a musical instrument, where as optimum stress is needed to produce good music; loose wires (less stress) would not produce the notes, and too much tautness (too much stress) might result in screeching. A distinction has been made between productive or functional stress (stress for creative work, entrepreneurial activities, Olympic competitions, etc) and dysfunctional stress (stress of boredom, unmanageable conflicts, over-work, etc). The former has been called eustress and the latter distress.

As already stated, role can be defined as a set of functions, which an individual performs in response to the expectations of the significant members of a social system, and his own expectations about the position that he occupies in it. The concept of role, and the two role systems (role space and role set) have a built-in potential for conflict and stress.

Role Space Conflicts

As mentioned earlier, role space is the dynamic relationship between the various roles an individual occupies and his self. It has three main variables: self, the role under question, and the other roles he occupies. Any conflict among these are referred to as role space conflict or stress. These conflicts may take several forms, illustrated below :-

(a) **Self – Role Distance.** This stress arises out of the conflict between the self-concept and the expectations from the role, as perceived by the role occupant. If a person occupies a role that he may subsequently find to be conflicting with the self-concept, he feels stressed. For example, an introvert, who is fond of studying and writing, may develop a self-role distance if he accepts the role of a salesman and realizes that the expectations from the role include meeting people and being social. Such conflicts are fairly common, although they may not be so severe.

(b) **Intra-Role conflict.** Since an individual learns to develop expectations as a result of his socializing and identification with significant others, it is quite likely that he sees a certain incompatibility between the different expectations (functions) of his role. For example, a professor may see incompatibility between the expectations of teaching students and of doing research. These may not be inherently conflicting, but the individual may perceive these as incompatible.

(c) **Role Stagnation.** As an individual grows older, he also grows in the role that he occupies in an organisation. With the individual's advancement, the role changes; and with his change in role, the need for taking on a new role becomes crucial. This problem of role growth becomes acute especially when an individual who has occupied a role for a long time enters another role in which he feels less secure. The new role demands that an individual outgrows the previous one and takes charge of the new role effectively. This is bound to produce some stress. In organizations that are fast expanding, and which do not have may systematic strategy for human resource development, managers are likely to experience this stress of role stagnation when they are promoted.

(d) **Inter-Role Distance.** When an individual occupies more than one role, there are bound to be conflicts between them. For example, a lady executive often faces a conflict between her

organizational role as an executive and her familial role as a wife and mother. The demands on her time by husband and children may be incompatible with organizational demands. Such inter-role conflicts are quite frequent in the modern society, where an individual is increasingly occupying multiple roles in various organizations and groups.

Role Set Conflicts

The role set consists of important persons who have varying expectations from the role that an individual occupies. The conflicts which arise as a result of incompatibility among these expectations by the significant others (and by the individual himself) are referred to as role set conflicts. These conflicts take the forms mentioned below :-

(a) **Role Ambiguity.** When an individual is not clear about the various expectations that people have from his role, he faces role ambiguity. Role ambiguity may be due to lack of information available to a role occupant, or his lack of understanding of the cues available to him. Role ambiguity may be in relation to activities, responsibilities, priorities, norms or general expectations. Generally, role ambiguity is experienced by persons occupying roles that are newly created in organizations, roles that are undergoing change, or process roles with less clear and less concrete activities.

(b) **Role Expectation Conflict.** When there are conflicting expectations or demands by different role senders (persons having expectations from the role), the role occupant experiences this type of stress. The conflicting expectations may be from the boss, subordinates, peers or clients.

(c) **Role Overload.** When a role occupant feels that there are too many expectations from the significant others in his role set, he experiences role overload. Role overload has been measured by asking questions about people's feelings on whether they can finish work given to them during a modified work day and whether the amount of work they do might interfere with how well it is done. Most executive role occupants experience role overload. Role overload is more likely to occur where role occupants lack power, where there are large variations in the expected output, and when delegation or assistance cannot procure more time.

(d) **Role Erosion.** A role occupant may feel that the functions he would like to perform are being done by some other role. Role erosion is the individual's subjective feeling that some important expectations that he has from a role are shared by other roles within the role set. Role erosion is likely to be experienced in an organisation that is redefining its role and creating new roles.

(e) **Resource Inadequacy.** Resource inadequacy stress is experienced when the resources required by a role occupant for performing his role effectively are not available. Resources may include information, people, material, finance or facilities.

(f) **Personal Inadequacy.** When a role occupant feels that he does not have enough knowledge, skills or training to undertake a role effectively, or that he has not had time to prepare for the assigned role he may experience stress. Persons who are assigned new roles without adequate preparation or orientation are likely to experience feelings of personal inadequacy.

(g) **Role Isolation.** In a role set, the role occupant may feel that certain roles are psychologically closer to him, while others are at a much greater distance. The main criterion of distance is the frequency and ease of interaction. When linkages are strong, the role isolation will be low and vice versa. Role isolation can therefore be measured in terms of existing and the desired linkages.

Stress In the Government Departments

Stress and stress related disorders are on the rise in the government departments. Though stress during war or counter insurgency operations is understandable, it is becoming apparent that service life even in the absence of such situations is stressful. The military personnel have higher job stress than their civilian counter parts. Large number of the service men experiment significant work stress. Some feel stress has led to emotional distress and some feel that work stress was severe enough to affect their emotional health. The organisation is also characterized by little autonomy and long hours of work. These factors contribute to job stress. Since most of these studies have been conducted in the west, I decided to investigate the stressors amongst government officers in our country.

II. METHODOLOGY

Hypothesis

It was hypothesised that :-

- (a) There will be a some level of stress among government officers.
- (b) There will be difference in the various types of stresses among senior, middle and junior level officers.

Participants

87 government officers from senior, middle and junior levels participated in the study. The average age of participants was 35 years, with junior most officer being 22 years and the senior most being 58 years. All the participants were graduates.

Procedure

Subjects were administered “Organizational Role Stress (ORS) Scale” developed by Dr Udai Pareek, (1988).

Measures

The self administered 50 item scale is intended to assess the following ten types of organizational role stresses :-

- (a) **Role Space Conflicts**
 - (i) Role stagnation (RS).
 - (ii) Self role distance (SRD).
 - (iii) Inter role distance (IRD).
- (b) **Role Set Conflicts**
 - (i) Personal inadequacy (Pin).
 - (ii) Role ambiguity (RA).
 - (iii) Role isolation (RI).
 - (iv) Role overload (RO).
 - (v) Resource inadequacy (RIn).
 - (vi) Role expectation conflict (REC).
 - (vii) Role erosion (RE).

ORS is a 5-point scale (0-4), containing five items for each role stress and a total of 50 items. Thus the total score on each role stress ranges from 0 to 20. The retest reliability of this scale ranged from .37 to .73. For validity, item-analysis found all correlations significant at 0.001 levels. Factor analysis revealed that all factors together explain about 95% variance.

Statistical analysis of data to study organizational role stress was by descriptive statistics; mean, minimum and maximum score for each ORS variable was calculated.

III. RESULTS

Table 1 furnishes the descriptive statistics.

Table 1 : Descriptive Statistics

ORS Variables	Mean	Minimum	Maximum
Role Space Conflicts			
RS	6.6	.00	18.00
SRD	7.16	.00	20.00
IRD	9.15	.00	20.00
Role Set Conflicts			
Pin	4.21	.00	16.00
RA	4.63	.00	20.00
RI	5.97	.00	18.00
RO	6.18	.00	20.00
Rin	6.57	.00	20.00
REC	7.97	.00	19.00
RE	7.82	.00	20.00
Total	66.31	.00	191.00

Mean score of 66.31 for total ORS is high. This can be compared with the figure 41.95 for the mean score of total ORS in a study of 221 management executives reported by Pestonjee. The comparison of mean role between government departments and management executive is given at Table 2.

Table 2 : Comparison

ORS Variables	Government officers (a)	Management (b)	Difference (c) = (a-b)
Role Space Conflicts			
RS	6.6	3.56	3.04
SRD	7.16	3.54	3.62
IRD	9.15	6.87	2.28
Role Set Conflicts			
Pin	4.21	2.66	1.55
RA	4.63	2.29	2.34
RI	5.97	4.78	1.19
RO	6.18	3.4	2.78
RIn	6.57	3.90	2.67
REC	7.97	4.01	3.96
RE	7.82	6.94	0.88
Total	66.31	41.95	24.36

IV. DISCUSSION

One of the less explored aspects of organizational stress is role stress with special reference to the government departments. Mostly combat stress and post traumatic stresses are studied exhaustively in relation to government officers. However, results of this study clearly indicate that like any other organization i.e. aviation and railways (Dhadda N.1990), public sector employees (AK Srivastava 1997), management executives (Pestonjee 1992), the organizational role stress among officers in the government departments was found to be high.

While Inter role distance, Role expectation conflict, Role erosion were main stresses felt by the government officers ; Personal inadequacy, Role ambiguity and Resource Inadequacy did not much stress them.

Role Space Conflicts

(a) Role Stagnation

(i) **Definition.** Role stagnation occurs when an individual who has occupied a role for a long time is made to take on another role wherein he feels less secure.

(ii) **Value.** 6.66, Average.

(iii) **Reasons.**

(aa) Dynamic organisation.

(ab) Frequent transfers.

(ac) Zero error syndrome.

(ad) Divergent tasking (operations, training and administration).

(iv) **Management.**

(aa) High level of adaptability through selection and training.

(b) Self Role Distance.

(i) **Definition.** This stress arises out of the conflict between the self concept and expectation from the role as perceived by the role occupant.

(ii) **Value.** 7.82, Average.

(iii) **Reasons.**

(aa) Organisational requirements.

(ab) Variation in self concept and organizational assessment.

(ac) Divergent deployment in varying Terrain.

(ad) Divergent tasking, from war to disaster management.

(iv) **Management.**

(aa) Suitably counseling the officer to enhance his self concept.

(ab) Impart adequate training specific to the role.

(c) Inter Role Distance.

(i) **Definition.** This stress arises when an individual is made to occupy more than one role.

(ii) **Value.** 9.15, Highest.

(iii) **Reasons.**

(aa) Shortage of officers in the government departments.

(ab) Heavy work load.

(ac) These personnel one required to handle multiple tasks across the country (operational, administrative and training)

(iv) **Management.**

(aa) Make genuine efforts to reduce shortage of officers.

(ab) Impart training on multiple role performance.

Role Set Conflicts

(a) Personal Inadequacy.

(i) **Definition.** When a role occupant feels that he does not have adequate knowledge, skills or training to handle a role effectively, he experiences personal inadequacy stress.

(ii) **Value.** 4.21, Lowest.

(iii) **Reasons.**

(aa) Good selection and training.

(ab) Adequate assistance from with the organisation.

(ac) Good work culture and environment.

(iv) **Management.**

(aa) Further emphasis on selection and training.

(ab) Improvement in the work culture.

(b) Role Ambiguity.

(i) **Definition.** When an individual is not clear about the various expectation that people have from his role, he faces role ambiguity stress.

(ii) **Value.** 4.63, Low.

(iii) **Reasons.**

(aa) Well defined tasking.

(ab) Adequate briefing before assigning, tasks.

(ac) Good selection and training.

(iv) **Management.**

(aa) More emphasis on briefing.

(ab) Greater emphasis on quality training.

(c) Role Isolation.

(i) **Definition** In a role set, the role occupant may feel that certain roles are psychologically closer to him, while others are at a much greater distance. The main criterion of distance is the frequency and ease of interaction. When linkages are strong, the role isolation will be low and vice versa. Role isolation can therefore be measured in terms of existing and the desired linkages.

(ii) **Value.** 6.48, Low.

(iii) **Reasons.**

(aa) Limited interaction among certain role occupants.

(ab) Spatial separation among role occupants geographical proximity.

(ac) Lack of communication.

(iv) **Management.**

(aa) Enhance frequency of interaction.

(ab) Organise frequent formal and informal meetings.

(ac) Streamline feedback system.

(d) Role Over Load.

(i) **Definition.** When a role occupant feels that there are far too many expectations from the significant others in his role set, he faces role overload stress.

(ii) **Value.** 6.18, Average.

(iii) **Reasons.**

(aa) Generic resilience and good work culture.

(ab) Good training imparted to officers.

(iv) **Management.**

(aa) Prioritise assignments.

(ab) Emphasis on time management.

(e) **Resource Inadequacy.**

(i) **Definition.** When resources required by a role occupant for performing his role effectively are not available, he experiences resource inadequacy stress.

(ii) **Value.** 5.97, Low.

(iii) **Reasons.**

(aa) All resources are made available generally.

(ab) Nevertheless, time is at premium invariably.

(iv) **Management.**

(aa) Judicious allocation of resources.

(ab) Optimum utilization of available resources.

(ac) Timely allocation and utilization.

(f) **Role Expectation Conflict.**

(i) **Definition.** This stress is generated by different expectations from the role occupant by different significant persons and the role occupant's dilemma as to how to manage them.

(ii) **Value** 7.97, High.

(iii) **Reasons.**

(aa) High expectation from the role occupant.

(ab) Multi tasking from the various persons.

(iv) **Management.**

(aa) Prioritising the work.

(ab) Good training.

(g) **Role Erosion.**

(i) **Definition.** This type of role stress is the function of role occupant's feeling that some functions which should properly belong to his / her role are transferred to / or performed by some other role.

(ii) **Value.** 7.82, high.

(iii) **Reasons.**

(aa) Multi tasking of the role occupant.

(ab) Hierarchical structure of working in the government departments.

(ac) Frequent transfer from one establishment to another.

(ad) Various types of works to be performed by each officer.

(iv) **Management.**

(aa) Postings for longer durations.

(ab) Officers specialise in particular type of work / task.

(ac) Continuity in similar type of work / task.

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V. CONCLUSION

Overall organizational role stress was reported to be high among officers in the government departments. The result reveals that while inter role distance, role expectation conflict and role erosion are the main sources of stress felt by the government officers, personal inadequacy, role ambiguity and resource inadequacy are the least felt stresses.

On the basis of above findings, a comprehensive human resource development strategy in the government departments be evolved so that impact of organizational role stress felt by role occupants is reduced.

Morphological Intra specific Variation of *Tremiorchis ranarum* from *Rana tigrina* in District Sidhi (M.P.) India

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Abstract- The aim of this paper is to increase the knowledge of the diversity of digenean parasites from *rana tigrina* collected in sidhi district madhya Pradesh, India. About 200 parasites representing *Tremiorchis ranarum* were collected from the intestine of *Rana tigrina* from different places of Sidhi (M.P.). They were critically analyzed for their intra specific variations. Measurements of various organs of 50 parasites were recorded for study. The body length was measured 2.100 mm. to 4.874 mm. The oral and ventral sucker range were 0.140 – 0.210 mm. X 0.175 – 0.246 mm. and 0.175 – 0.315 mm X 0.175 – 0.316 mm respectively.

Index Terms- Digenean, *Trimiorchis ranarum*, India.

I. INTRODUCTION

The knowledge of helminths in India is very old. Helminthology is one of the most significant branches of parasitology, which constituent a large number of worms, free living as well as parasitic occurring widely, in invertebrates and vertebrates. [1] It is an established phenomenon that a parasite is always under the influence of two types of environments - viz; the internal environment in which the host lives. It is the interaction of the influence of these environments and the strategy adopted by the parasites of counter influence that develops the host specificity and host parasite relationship. Thus the establishment and survival of helminths in their hosts is controlled by the internal environment of the host as well as its external environment. [2]

Sidhi is one of the important district, head quarters of Rewa commissionerary of Madhya Pradesh. It lies between longitude 81°-15' and 82°-49' East and latitude 24°-42' and 24°-42' North, almost in the East corner of the Rewa Division. [3]

In the present investigation, *Tremiorchis ranarum* were collected from the intestine of *Rana tigrina* from different places of Sidhi (M.P.) India for examine morphological intra specific variations.

II. MATERIALS AND METHODS

The present study was done in several areas of District Sidhi. The study was conducted between the months May 2011 to December 2011. During this time period average temperature

was 30.4 °C (maximum) and 15.61 °C (minimum) and rain fall 88.8 mm. 50 parasites were selected for study. Specimens were carefully collected without any contamination, and were carried to laboratory for examination. The worms thus obtained from the hosts were cleaned thoroughly by saline water or ordinary tap water, killed and fixed quickly by under pressure of the cover glass. Fixatives and preservatives were used: (1) Worm A.F.A. Solution (2) Mercuric chloride Acetic acid (3) 5% Formalin (Commercial) and Preservations 70% Ethyl alcohol.

Fixed worms brought to either water of 20% alcohol and stained in Gower's Carmine Stain for 12-35 hours. They were washed in one or two changes of water and dehydrated through series of alcohols, cleared in Methyl salicylate and Benzene then mounted whole in Canada balsam.

III. RESULTS AND DISCUSSION

Helminthology is only one of the significant branches of parasitology. Parasitism figures prominently in the Zoological curriculum at the present time. A large number of vertebrate hosts ranging from fishes, amphibia, reptiles, birds and mammals from different part of Sidhi region were collected then cut in saline water and a through examination of not only the alimentary canal but whole of the body was made for digenetic trematodes. [4]

In the present study we investigated morphological characters of *Tremiorchis ranarum* collected from the intestine of *Rana tigrina* like body length, oral sucker, ventral sucker and the ratio of oral and ventral sucker. The body length range was measured 2.100 mm. to 4.874 mm. The oral and ventral sucker range were 0.140 – 0.210 mm. X 0.175 – 0.246 mm. and 0.175 – 0.315 mm X 0.175 – 0.316 mm respectively. The ratio of oral and ventral sucker range was 1:1 - 1:1.56. (Table 1)

Mehra and Negi, 1926 [5] described the species *Tremiorchis ranarum* from the small intestine of *Rana tigrina*. Bhalerao, 1942 [6] described the same form, which he placed in a new genus *Centrovitus* and a new species *C. pentadelphi*.

Bharadwaj, 1963 studied intraspecific variations in *Tremiorchis ranarum*. He touched the characters of the suckers, intestinal caeca, and position shifting of gonads, size of gonads, cirrus sac and also of vitelline follicles. [7]

Table-1 : Measurements of various organs of 50 parasites of *T. ranarum*.

S.No.	Body length	Oral sucker	Ventral sucker	Sucker ratio OS : VS
1.	2.100	0.140×0.175	0.210×0.245	1 : 1.44
2.	2.170	0.175×0.175	0.175×0.175	1 : 1
3.	2.275	0.175×0.175	0.175×0.245	1 : 1.2
4.	2.410	0.140×0.175	0.210×0.210	1 : 1.33
5.	2.415	0.175×0.210	0.245×0.245	1 : 1.27
6.	2.660	0.140×0.245	0.175×0.280	1 : 1.18
7.	2.765	0.161×0.161	0.175×0.175	1 : 1.08
8.	2.925	0.175×0.210	0.175×0.210	1 : 1
9.	2.975	0.175×0.175	0.175×0.175	1 : 1
10.	3.010	0.175×0.210	0.175×0.175	1 : 0.90
11.	3.080	0.140×0.210	0.245×0.280	1 : 1.5
12.	3.080	0.175×0.210	0.280×0.280	1 : 1.45
13.	3.080	0.175×0.175	0.210×0.210	1 : 1.2
14.	3.150	0.175×0.175	0.175×0.175	1 : 1
15.	3.185	0.210×0.246	0.280×0.280	1 : 1.23
16.	3.220	0.175×0.175	0.210×0.210	1 : 1.2
17.	3.325	0.175×0.210	0.210×0.245	1 : 1.18
18.	3.360	0.175×0.210	0.210×0.210	1 : 1.09
19.	3.360	0.210×0.245	0.315×0.280	1 : 1.30
20.	3.395	0.175×0.210	0.210×0.245	1 : 1.18
21.	3.430	0.210×0.210	0.280×0.316	1 : 1.41
22.	3.465	0.196×0.196	0.245×0.245	1 : 1.25
23.	3.465	0.210×0.210	0.210×0.210	1 : 1
24.	3.500	0.175×0.210	0.210×0.245	1 : 1.12
25.	3.535	0.175×0.210	0.210×0.210	1 : 1.09
26.	3.605	0.175×0.210	0.245×0.280	1 : 1.36
27.	3.675	0.125×0.210	0.245×0.280	1 : 1.56
28.	3.710	0.140×0.175	0.210×0.245	1 : 1.44
29.	3.745	0.175×0.210	0.224×0.224	1 : 1.16
30.	3.745	0.175×0.175	0.210×0.210	1 : 1.2
31.	3.745	0.175×0.210	0.245×0.245	1 : 1.27
32.	3.780	0.210×0.245	0.315×0.350	1 : 1.45
33.	3.7850	0.175×0.175	0.210×0.210	1 : 1.2
34.	3.780	0.210×0.210	0.245×0.245	1 : 1.19
35.	3.815	0.175×0.210	0.210×0.245	1 : 1.18
36.	3.850	0.175×0.210	0.210×0.245	1 : 1.18
37.	3.850	0.210×0.210	0.210×0.245	1 : 1.08
38.	3.850	0.210×0.210	0.210×0.280	1 : 1.19
39.	4.025	0.175×0.210	0.245×0.280	1 : 1.36
40.	4.060	0.175×0.210	0.245×0.245	1 : 1.27
41.	4.060	0.210×0.210	0.245×0.245	1 : 1.19
42.	1.095	0.140×0.175	0.245×0.245	1 : 1.55
43.	4.095	0.210×0.210	0.245×0.215	1 : 1.19
44.	4.200	0.175×0.210	0.210×0.215	1 : 1.18
45.	4.865	0.175×0.175	0.245×0.245	1 : 1.4
46.	4.874	0.174×0.172	0.246×0.247	1 : 1.5
47.	4.753	0.178×0.175	0.253×0.248	1 : 1.9
48.	4.637	0.180×0.173	0.260×0.218	1 : 1.30
49.	4.613	0.189×0.175	0.271×0.215	1 : 1.35
50.	4.710	0.175×0.165	0.231×0.214	1 : 1.36

IV. CONCLUSION

In the present course of investigation, we have to explore the helminth fauna belonging to the host ranging from fishes to mammals and their ecology of Sidhi Distt. and its adjoining areas. The increasing international interest of these groups, due to their economic importance, makes it necessary in different regions, to revise the systematic status of already known taxa as well as the unknown forms.

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Platform for Pushing and Pulling Device Oriented Information via Cloud

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Abstract - Our project is to provide a platform to share device oriented information between devices via local private cloud. The information like missed call history, messages, files, notes, to do's etc. are shared between devices. For sharing such information we build the local private cloud. For first time we use windows OS and android as platform on which client application runs. This Application can set various kinds of triggers to push information into the cloud. To get easy access to the stored data anytime, anywhere and from multiple devices we use 'software as service' (SaaS) offer through cloud computing.

Index Terms- Android, Cloud, Device oriented information, Platform, Software as service (SaaS), Windows OS

I. INTRODUCTION

In this paper, we are building a platform to share the device oriented information using private cloud. Our purpose is to create an information-sharing platform that enables easy sharing of device-oriented information. The cloud is build using SaaS platform. Whenever required, the private cloud enables access to shared resources via a network connection. Through the private cloud, information is shared among various devices. The use of mobile devices is increasing rapidly day by day and people have started to use many devices simultaneously so sharing information between these devices has become an important aspect. For example, suppose a person at work needs some file or document immediately which is present on his laptop and incase if he forgets his laptop at home then it can be retrieved if the same data is stored in the cloud. Also user can get notified of the missed call history, low battery level of a device not in immediate reach to him.

Our project also provides some important and interesting modules to make the system better. This includes providing security by the use of SHA-1 hash algorithm, platform independence (presently supporting windows OS, android OS etc. but can be extended to other platforms.)

Our application provides following functionalities:

- Device independence
- Providing security
- Remote accessibility
- Easy Expansion
- Expanded to various OS
- Virtual ability
- Setup new system

- Easy access of data anytime and anywhere
- Can me modified depending on future trend

Service providers need not worry about the resource management since they are managed by cloud itself. So user can access data and service anytime and anywhere which enables data sharing in a convenient way. Location information is also a part of application. Users are left with a choice to share location information with other people. A registered user can login from any device with this application and get access to the information in the cloud. Recovery of data is easy in case of device failure and hence providing device independence.

Our platform provides users an easy way to connect devices and cloud services. Devices with Android and Windows OS are client side components which are connected to the cloud services using the communication interface. Different triggers and conditions can be set to notify about missed calls, message alerts (if device is not available with user) and low battery level.

The System architecture shown in fig.1 shows how the system actually works or interacts. The main modules are the Android and Windows OS client and Cloud Server. The application will be installed on both the OS devices and they can share information with each other.

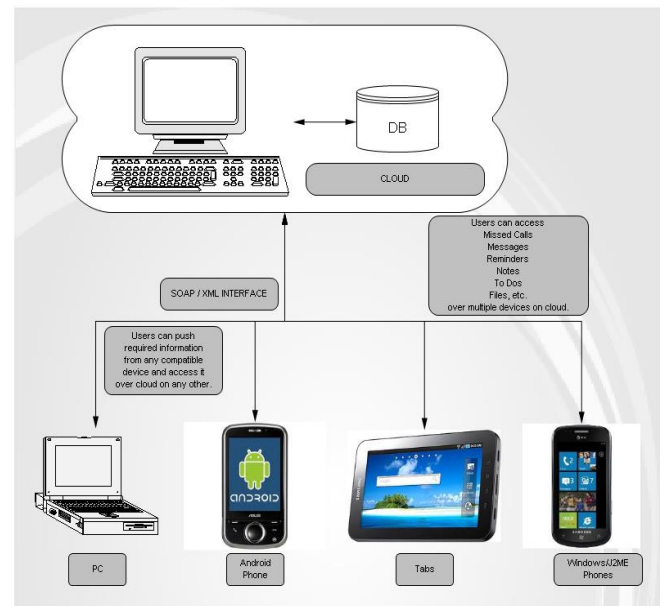


Fig 1. System Architecture

II. RELATED WORK

Some solutions of information sharing have been proposed.

a) Notitter

Notitter is a mobile bot that notifies you wherever you are. Even if you forget your phone at your home, office or car, this application will let you know different information. You can use this for emergency notification, life log, and so on. You can choose Twitter and Evernote for notifying address.

b) Context Watcher

This mobile application enables mobile phone users to easily share personal context data such as their location, heart rate, speed, or view, with their mutual consent.

It is a context-aware application which enables end-user to automatically record, store, and use context information. For example, family members can stay better informed about each other and their friends, without synchronous interaction by using automatically derived context information. In the context management framework, different entities, context providers, are exposed to and interact via the internet. Using this application a mobile phone can be used for sharing context information in everyday life. Hence, context-awareness does not force people to adapt or change significantly their daily patterns in their normal environments, but accompanies them throughout everyday life.

c) SECE

SECE is a context-aware platform that connects isolated services, making it more useful and user-personalized, composite services. SECE converges, fixed and mobile services by integrating the Internet, cellular and sensor networks. SECE takes actions automatically on behalf of the users depending on the monitored information and triggered events. SECE enables end-users to create advanced services. Although users today can use several individual Internet services, there is currently no easy way to create new services which integrate diverse information, such as location, presence, IM, SMS, calls, Facebook, Twitter, sensors and actuators.

d) Growl

Growl is local application used to share information between devices, if they are configured. When user receives shared information on device(smart phone/PC) the growl's application which is activated on that device sends a notification to Growl, which shows a pop-up to notify user that the device(smart phone/PC) receive a shared information. Depending on users preferences Growl will show the notification using one of the displays plug-in, speak to the user, email it to user, or block it from going anywhere if you have Growl set up that way. Growl notifies application information to that user's devices which are inside LAN and can access the information.

These applications are restricted to share data only on particular devices or services. Our goal is to build an application that use cloud services that avail users to share the information anytime anywhere. Cloud services provide a scalable, cost effective, and secure environment for managing your data. They also reduce expenditure for hardware and software, providing an opportunity for cost containment.

III. PROPOSED SYSTEM

A. System Outline

Our goal is to provide platform to share device-oriented information and the user is free to use any computing device they own. The following problems are to be addressed:

a) Easy adding of services

A mechanism is needed to add information sharing services along with the shared information since services in a cloud are increasing rapidly. Similarly, a convenient approach is needed to add the device oriented information. Management interface between the controller and input/output is needed to solve below problems:

- Data shared differs with each service and user
- Information may be related to data from a sensor or user context data.

b) Relation of trigger and information

Triggers and information sharing may be interrelated to each other, and so we need to collect them. For example, the platform retrieves battery level and notifies the controller.

The controller then examines the level; if it is lower than a threshold, the controller sends the level to output. Easy development of the input and triggers should be done to enable simultaneous release of services.

c) Enriching Information

We can elaborate the additional information that is strongly related to the original information (add, delete or update data). With the development of web services, there are more ways to use information. For example, location information can now be used to find addresses or landmarks nearby. We need to make it easy for users to adapt to new services.

System security depends on information sharing services that users use. Therefore, to provide security we include SHA-1 algorithm which enables storing of password in an encrypted format making it attack free from external sources. When a user wants to share information with his or her friends, they can use services with community.

B. System implementation

In this study, we implemented a platform on Android and Windows OS; we named the platform 'RIGHT ARM'. Right Arm consists of three main parts: input, output and controller. It first needs to set some parameters of the parts as shown below:

a) Sharing Information (input/output)

User is provided with the facility to choose information to push to external services. Similarly, user can choose the information to pull from the external services. Right Arm currently supports following types of information to be shared:

- Location information from GPS
- Low battery level of the device
- Missed call and unread message history
- Notes, to-do's, files

b) Controller

Setting is done by the user with respect to which information to share and the conditional triggers. There are currently three trigger settings: critical battery level, missed call and unread messages.

Right Arm works as described in the steps below:

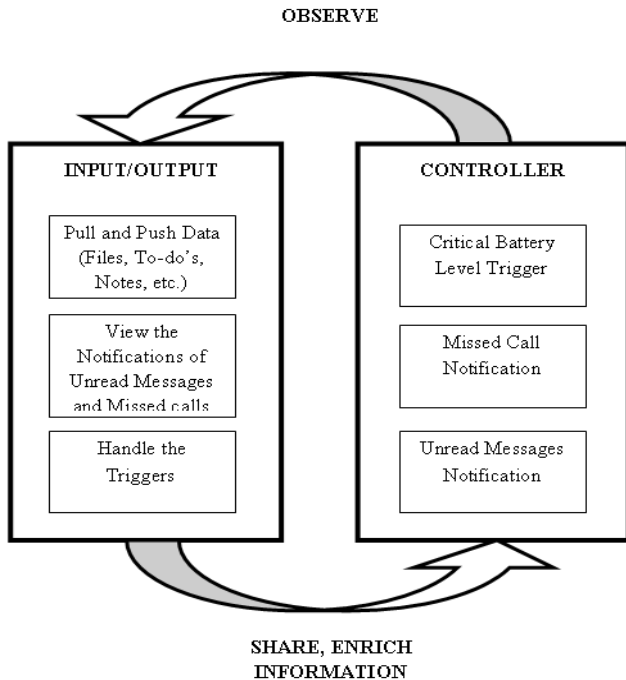


Fig 2. System overview

- 1) Settings are made as per user's preference.
- 2) The user starts Right Arm which works in the background.
- 3) The input data is constantly checked at regular intervals by Right Arm.
- 4) Right Arm share data with information sharing services if a trigger event is detected.

In case the user wants to check related information, Right Arm will add information by using web services.

Screen shots of Right Arm are shown in below. On the main page, the user has to login in his registered account. During registration the user enters all his details along with the user name and password. Here the password is saved in the database in the encrypted format using the SHA-1 algorithm. This will provide user complete security as the password cannot be tracked. The respective information that can be shared on Windows and Android OS client modules is as below:

a) Window Client API:

After the user has logged in the main menu is displayed showing the various types of options: missed calls, messages, files, to-do, notes etc. On clicking the respective buttons related information is shown. For example, files can be downloaded and viewed. Similarly, the missed calls and unread messages from the cell phone can be viewed on the click of missed call and messages button. Also a trigger message appears notifying about the critical battery level of the mobile phone.

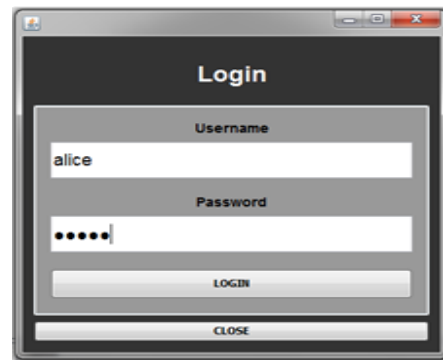


Fig 3.Login Window



Fig 4.Main Menu Window

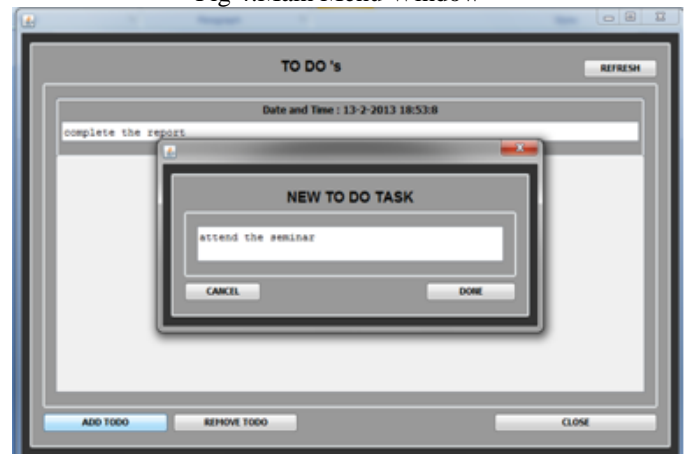


Fig 5.To Do Window

b) Android Client API:

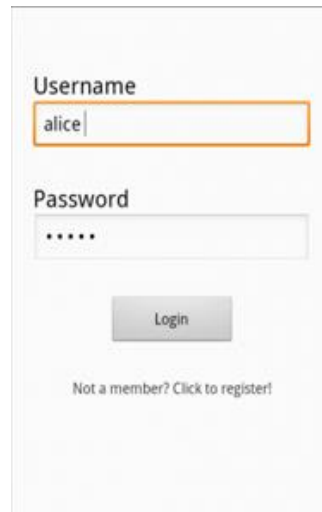
The main menu for android client is displayed with the various options: notes, to-do, files, battery level, start and stop monitor, GPS. On the click of the respective buttons the information related to it can be seen. For example, notes can be added, deleted or updated on the click of notes buttons. Similarly the start and stop monitor will notify the windows side client of the unread messages and missed calls.



The Sign Up window contains the following fields and elements:

- Full Name: alice joseph
- Address: pune
- E-Mail: alicej@gmail.com
- Contact: 9876543210
- DOB (yyyy-mm-dd): 1991-12-03
- Username: (Available) alice (with an AVAILABLE status indicator)
- Password: alice
- Sign Up button

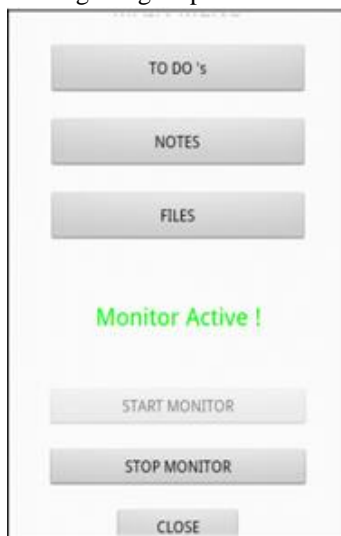
Fig 6. Sign Up Window



The Login window contains the following fields and elements:

- Username: alice
- Password: masked with dots
- Login button
- Not a member? Click to register!

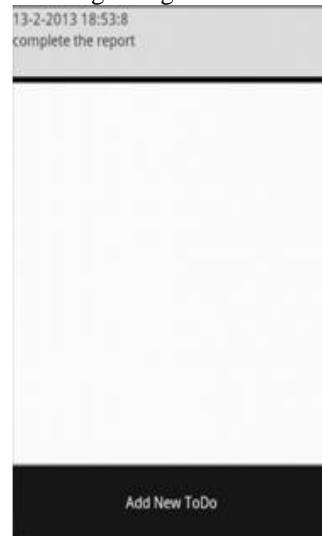
Fig 7. Login Window



The Main Menu Window contains the following elements:

- TO DO 's button
- NOTES button
- FILES button
- Monitor Active ! status indicator
- START MONITOR button
- STOP MONITOR button
- CLOSE button

Fig 8. Main Menu Window



The To Do Window contains the following elements:

- Header: 13-2-2013 18:53:8 complete the report
- Add New ToDo button

Fig 9. To Do Window

In the implemented system, user can choose the setting for information sharing, setting of cloud services, and activation of the system. The setting of each item is a layered structure. For example, the input data and trigger level of the battery is set when the battery is chosen. Corresponding APIs are used for settings of cloud services.

We present an example scenario of using Right Arm. The user first sets the settings of Right Arm on the smart phone. Here, the setting is done by choosing the 'start monitor' option. In case the mobile is unavailable with the user the unattended call and messages is pushed into the cloud. The windows side client will pull this information. This missed call history shows number of missed calls, the person who had called, their numbers, date and time, so that the user can make a contact to that person with available device. Similar is the case with messages the entire message can be read, the senders name, time and date is also viewed.

While working with the laptop the user is not paying attention to the phone. In this situation, if the phone battery goes down to the critical level the user will be notified. This notification is given in the form of trigger message popping out of the windows API. This helps the user charge the phone's battery.

IV. CONCLUSION

Thus, Platform for pulling and pushing device oriented information via cloud is an application which aims at accessing data from cloud via registered users instantly. It let the user automatically share device-oriented information so that users can observe the same information on different devices. By using cloud services, users can now access information anytime and anywhere regardless of the situation of information source device.

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Wavelet Signal Generation for Nonlinear Device Testing Applications

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Abstract- Testing using standard function generators for frequency response, pulse response is common. Oftentimes, certain nonlinear systems such as testing of saturable reactors, semiconductors of the p-n-p-n type as well as testing of avalanche conditions in power transistors need sharp rise and slow fall signals. To this end, a PC based function generator where any kind of signal pattern such as the above, including wavelets could be realized with a very simple circuit, combined with a power OPAMP. Circuits of the above type could be tested using this set-up. The software is developed in Visual Basic.

Index Terms- Wavelet Signal Generation, Morlet, DB and Haar wavelets, Nonlinear Device testing,

I. INTRODUCTION

Function generators are able to test and characterize any circuit or system which is linear. Tests of signals with high voltages are often used for evaluation in insulation testing, semi-conductor avalanche or breakdown assessment.

Wavelet operators are useful in many practical applications. Wavelet based signals could be used for nonlinear systems and circuits.. Implementation of wavelets on DSP hardware has become popular.

To generate a wavelet signal is simple enough through a DAC from a PC. Since the waveform coordinates are known by a prior calculation, the same can easily be output via a port on the PC, such as the standard printer port itself. A DAC would convert the digitally output sample numbers into an analog signal, with some filtering provided externally. Though signals of high frequency (low scales, in Wavelet parlance) cannot thus be generated due to the software instruction time and DAC's own settling time limitations, it is easily possible to generate frequencies over the audio frequency range ($< 4\text{KHz}$) A single wavelet signal, for example, as in fig. 1 below, due to Morlet wavelet, would be requiring, at iteration level.

By making use of the PC's parallel printer port, the DAC08 interfacing circuit was developed and tested with suitable programs for generating various kinds of wavelets and tested separately . .

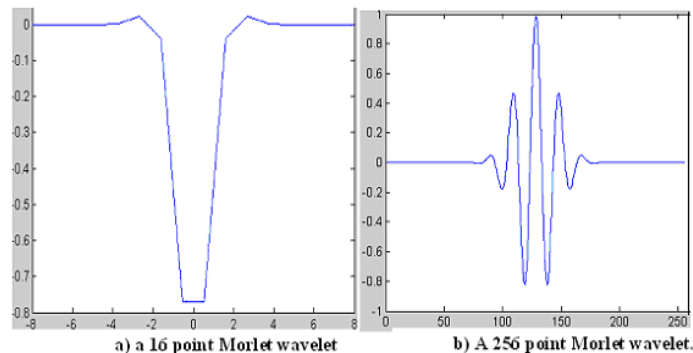


Figure.1. Typical Morlet Wavelet

II. A SHORT SURVEY OF WAVELET TECHNIQUES AND APPLICATIONS IN LITERATURE

Transient signals of known and unknown origin are fit subjects for wavelet analysis. Some signals of ergodic nature as arising from chemical analytical instruments and which presently use the Fourier spectral techniques have been considered in Chapter-2 for wavelet based interpretations.

In power systems, there occur several types of disturbance signals not periodically which are of short duration and rich in harmonic content. To cite an example, work by Fransisco Juardo and Jose R.Saenz (2002) relating to electronic six phase pulse converter drive has been performed in this direction using wavelets.

Signal processing in bio-medical Engineering has long since been under the purview of wavelets. Bentley P.M. and McDonnell J.T.E. describe the simple analysis of ECG (electrocardiograph) using wavelets to bring out the time course of the QRS complex better. But, since the ECG is a synchronised activity, this is not a signal arising out of multiple entities. Hence there is not much that could be gleaned further to the plain ECG signal itself for diagnosis. Unser and Aldroubi (1996) have attempted a review of wavelets in some biomedical applications. . Neuro images could be denoised using wavelets in lieu of Gaussian filtering As another different application, is using the wavelet for AGC (auto gain compensator) for hearing aids, which is more than an analysis of a signal using wavelets and is of practical applicability. Likewise, signal generation based on wavelets is itself offering scope for some new methods of testing of systems. Swarup Bhunia and Kaushik Roy [2000] using Mexican hat wavelet using wavelet transform have reported dynamic supply current testing for analog circuits.

In the field of EEG for neuropathology and disorders, there are quite many references. Some aim at EEG noise reduction for a better visual observational diagnostics. A fast wavelet transform for EEG, with a view to real time instrument observation, has been reported by Strichartz, R.D., (1993). Multi-resolution decomposition of EEG with a view to analyze local pathological patterns is very useful. Apart from denoising, another area has been in (automatic) identification of onset of spikes to aid in continuous patient monitoring. For a certain patient, from his past e.e.g. records, if a set pattern of spike and wave has been noted, a wavelet could be constituted and used for automatic matching with data from continuous monitoring. This is combined with an ANN in some work described by Tugla Kalayci et al (1995). Spike and seizure localization could also be possible using wavelets according to Steven J.Schiff et al (1994).

III. PC BASED WAVELET SIGNAL GENERATION:

An 8-BIT HIGH-SPEED MULTIPLYING D/A CONVERTER DAC08 SERIES

The DAC-08 series of 8-bit monolithic multiplying Digital-to-Analog Converters provide very high-speed performance coupled with low cost and outstanding applications flexibility. The compact size and low power consumption make the DAC08 attractive for portable and military aerospace applications

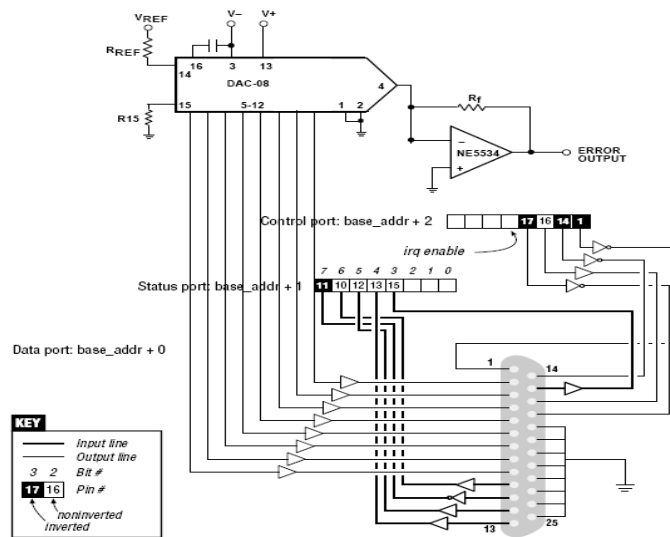


Figure. 2-Bit High-Speed Multiplying D/A Converter DAC Interface with Printer port

A typical program for generating a signal (basic) for testing the DAC Port with a 50 Hz sinusoidal waveform. Was written in basic.

IV PROGRAM TO GENERATE DB WAVELET

By making the use of the coefficients stored with the above Matlab program in .XLS format, the program to develop the continuous DB wave was generated and checked on the output of the DAC port. By making use of the same program, the other DB 7,db8,DB15 were generated and tested

By using printer port, the DAC08 interfacing circuit was developed and tested with suitable programs for generating various kinds of wavelets and tested separately. A DSP based wavelet signal generation is also suggested for generating the analog wavelet signal for use with non linear device testing purpose .

V TESTING FOR NON LINEARITY IN CIRCUITS USING MORLET WAVELET

With a suitable Power OPAMP, the wavelet signal generated can be amplified to any voltage or power level. The principles of testing simple semiconductor devices are outlined below.

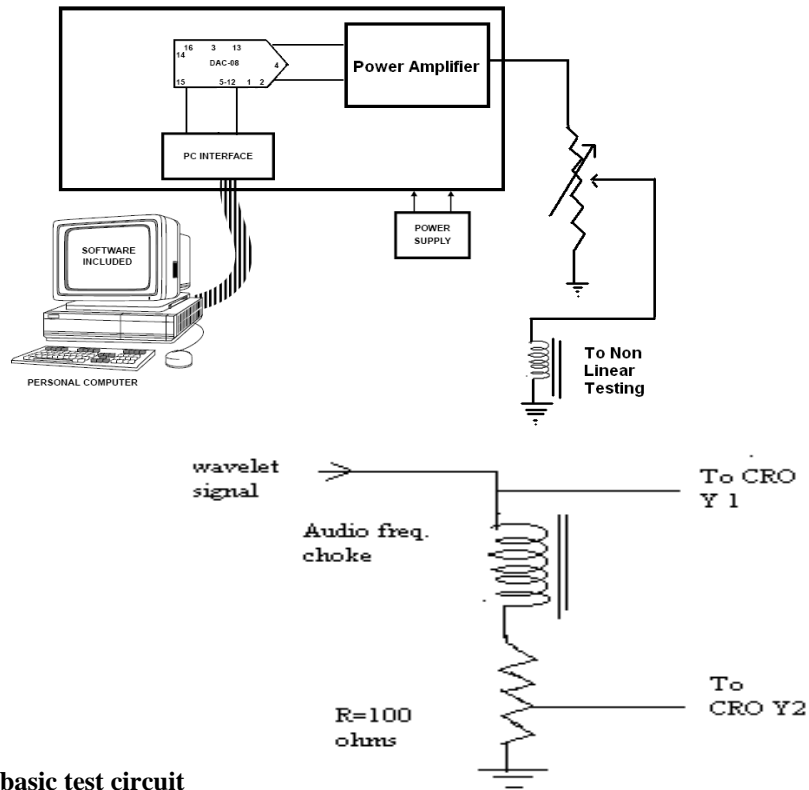


Figure 3a A basic test circuit

Figure.3b shows the Non-linear device testing unit and resistor

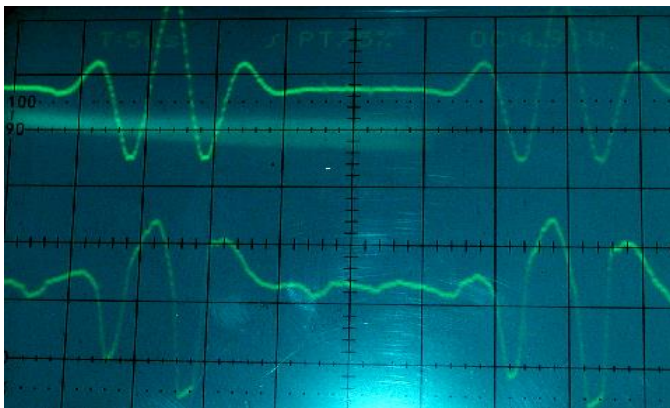


Fig.4a

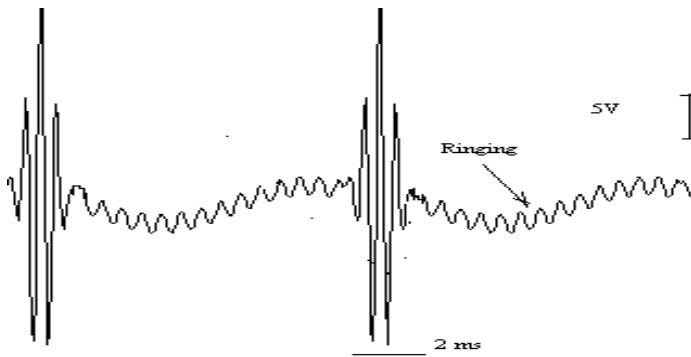


Figure.4b

Figure 4.a shows the oscillogram of the Morlet wavelet signal repeatedly applied to a circuit of nonlinear nature. Here, an inductor of iron core using an audio frequency transformer's winding is in series with a wire-wound resistor. The current in the circuit is measured by the oscillogram (Fig.4.b).

It shows that at the peak central wave, there is an effect of saturation. Additionally some low level oscillations are also present in the inter-wavelet gap period.

During the first oscillation (sinusoidal) of the Morlet wavelet, the waveform for current is not distorted. Thus, the level at which the saturation effect occurs is detected while slowly increasing the amplitude of signal. In one cycle of the wave, this detection is possible. Any possible damage to the device is thus reduced. If a continuous sine wave signal were applied, the saturation on the several cycles – since we cannot apply a single sine wave will cause worse effects if the device is not able to withstand that voltage level.

The low level oscillation midway between the two wavelets in the above figure indicates how the wavelet signal resonates with the inductor for this frequency input. This is not any resonance, but still the effect is noted. In another test, when the frequency of the wavelet was increased (through the program) slowly, these oscillations rose up at a certain point. Then, it is easy noted that the choke has ringing as shown in Fig 4.4 at this frequency due to its winding stray capacitances. If this frequency is further increased, it was found that the OPAMP output is not able to sustain the signal because of the coupling capacitor from the same to the circuit.

VI. DEVICE TESTING MAKE EASY BY WAVELETS AND RESULTS

It is easy to identify defects in semi-conductor devices in this method, rather than by sinusoidal or pulse excitation, even if there is mild leakage. Non linearity is immediately noticeable from the current waveform. The following pictures illustrate the principle typically for forward biasing zener with different resistor values, testing both silicon and germanium junctions of transistors with a good and a defective components. in the results.

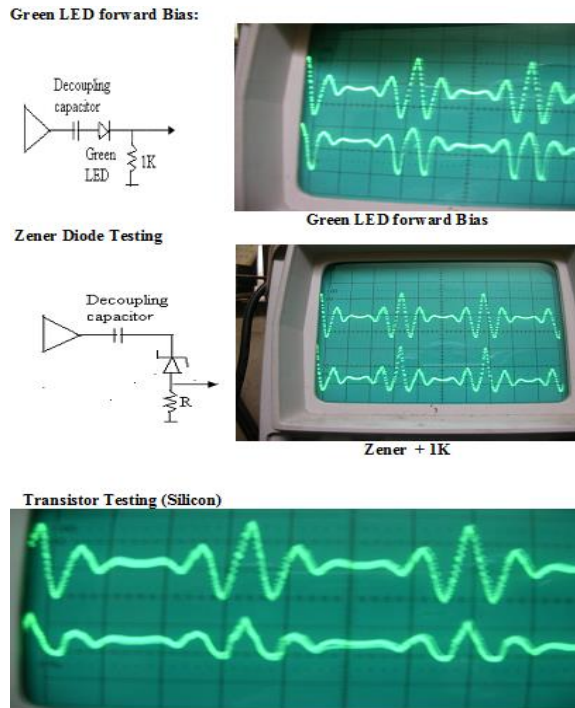


Fig. Base-Collector junction of silicon (2N5172) transistor + 150 ohms

Figure 5. shows the Oscillogram of the typical Non-linear components under test

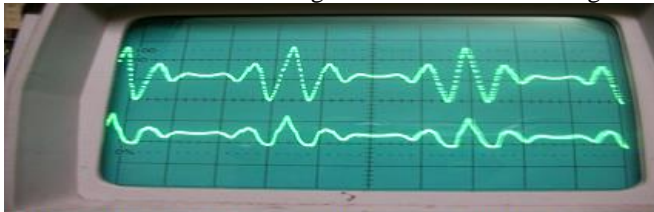


Fig. Shows the Base collector junction of silicon (2N5172) transistor + 150 ohms
Emitter – Base junction silicon Transistor

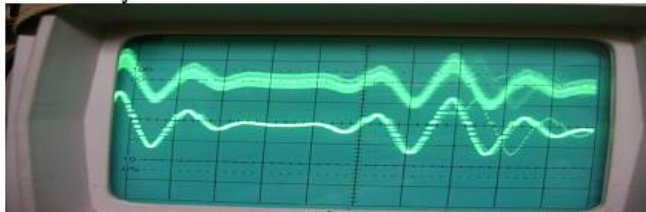
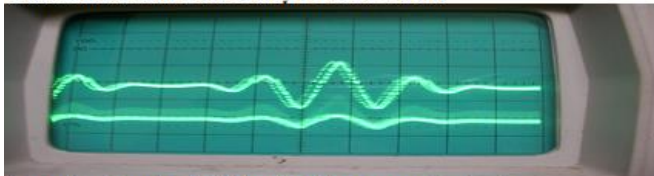


Fig. Shows the E-B junction silicon Transistor under test

Defective B-C Junction Silicon alloy diffused Transistor



Germanium Transistor B-C Junction (Shows reverse Leakage)



Fig. Germanium Transistor B-C Junction (Shows reverse Leakage)

Figure.6 Shows the defective transistors tested with the given wavelet signal along with the oscillograms

Thus, the wavelets generated by any one of the methods suggested in chapter 3, and chapter 4 of this dissertation work, is an useful method for testing the non linear device so that any defective components and devices can easily be identified in pre determined way

by looking at the waveforms. The photographs gives the clear idea of the components used in a circuit under test with various conditions are given here.

V. CONCLUSION

Testing using standard function generators for frequency response, pulse response is common. Oftentimes, certain nonlinear systems such as testing of saturable reactors, semiconductors of the p-n-p-n type as well as testing of avalanche conditions in power transistors need sharp rise and slow fall signals To this end, a PC based function generator where any kind of signal pattern such as the above, including wavelets could be realized with a very simple circuit, combined with a power OPAMP. Circuits of the above type using dedicated AVR microcontroller (atmega 8535) based unit was designed, fabricated and tested with suitable program for the above units is one of the contribution made in this work.. Secondly, a PC based DAC 08 port has been employed for the generation of the wavelet signals for testing the non-linear devices and components has also been done in this work. The software is developed in Visual Basic.

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Study of Medical Students and Internet Usage

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Abstract- The Internet provides an opportunity for anyone to interact with whole of the world without any boundaries and barriers. Just think of friends and family members, to search any topic one can imagine, and to explore the world while sitting in the comfort of their own home or moving around by either desktops, laptops, or by smart phones. The popular media suggests that Internet usage decreases the amount of social interaction individuals have with the world outside of their computer and may be accompanied by social anxiety, loneliness, lowered self-esteem, or chronic depression, and the psychological dependence, literature's mixed findings on this issue and topic have not given any clear inference rather a confusion like state is being created about its usage or effects on individual and society. This study looked at the impact that Internet usage has on an individual's psychological well-being in an effort to clarify and expand on the previous researches and their outcome. Participants in this study were undergraduates' medical student of different medical college using internet as a routine for their studies, social media and interacting with society.

This study investigated three primary areas in addressing the disparate portrayals of the effect of Internet based social interactions among youth : 1) Can the amount of time spent and the level of social interaction for which a person uses the Internet predicts loneliness, level of social interaction, and social anxiety in offline settings/face-to-face relationships, and loneliness and social anxiety in online relationships; 2) Can the amount of time spent the Internet, or the amount of social interaction engaged in online predict participants reported levels of depression; and 3) Does the gender of the participant makes any difference on the amount of time spent on the Internet, their social interaction online, or their reported levels of depression?

I. INTRODUCTION

Information and communication technologies used to acquire knowledge and exchange of thoughts in any form had a significant effect on the development and behavior of human beings during the second half of the twentieth century. For this reason, the 21st century is often referred to as the "knowledge society", "knowledge period" or "knowledge revolution". To effectively fit in the global arena, almost all as individuals or organizations/ institutions have the internet as a vital tool. As we were approaching a new millennium, the internet has been and is being creating a revolution in our society on almost all fronts, either in our economy or technological advancements in education, industry, market, transport and so on. . No one knows for certain how far, or in what direction, the internet will evolve, but no one should underestimate its importance (Kahn and Cerf, 1999:15).

Adegoke (2009:122) affirms that, "Indeed, the internet is also a virtual library which is seen as virtual space containing a vast amount of information and documents including books, pictures, video, graphs and musical sounds that can be consulted." Clearly, there is a lot of information out there – too much to catalog. In fact, nobody knows exactly what is available online and where it is. The growth represents both an opportunity and a hazard...exactly a double edged sword .The opportunity is that, sitting at your desk, you can access information that you may not have been known existed. The hazard is that you waste a lot of time looking at information that is not relevant to the projects on which you are working.

The present study investigated and analyzed the extent to which medical students use the internet and effect of its use on social interaction with particular attention to the levels of social anxiety, and depression experienced by college students who engage in frequent, non-academic Internet use or exposure. In particular, these students frequently reported that they were more comfortable talking to their friends using technology such as the Internet or text messaging on their cell phones, than traditional forms of communication such as face-to-face conversations or speaking on the telephone. Anecdotally, a particular student reported that she frequently "froze up" and was unable to have an in-person conversation with her male friends but had no difficulty "talking" with text via a computer instant messaging program or online chatting.

II. METHODOLOGY

A survey was conducted on 500 students of the 2011/12 and 2012/13 academic sessions of Hamdard Institute of Medical Sciences and Research , Jamia Hamdard, New Delhi , AIIMS Jodhpur and SN Medical college Jodhpur by circulating a questionnaire , students were given time to answer the questionnaire and these were analyzed in detail.

Structured questionnaire was administered on the sample in two days to collect data. The questionnaire was segmented into four sections dealing with demographic variables, access and adoption, frequency and purpose of usage, and its effects on behavior or personality. Every question was compulsory and consisted of three options depicting maximum to minimum internet association. The individual responses thus obtained were then compiled, processed and analyzed to arrive at the certain conclusions on various issues. Involvement of students in sports and social activities was not included in the study.

The data was collected to explore the information on demographic and psychographic aspects of the respondents. The demographic questionnaire (Appendix A) consisted of 10 questions that included participants' current academic standing, gender, family income and parental levels of education. This

questionnaire also assessed participants' current ability to access the Internet and the typical locations of their access. Additionally, the demographic questionnaire asked participants to list the three most important activities in which they engage on the Internet. The psychographic variables included attitude towards usage of internet, its dependence and associated anxiety.

III. MAIN RESEARCH QUESTIONS

1. How often do students use the Internet?
2. Does access to the internet influence students' use of the Internet?
3. For what purpose do students use the Internet most?
4. Is there any relationship between students' use of the internet and their academic performance?

IV. OBSERVATIONS

All the 500 questionnaires distributed were retrieved, representing a hundred per cent response rate. Data showed that demographic variables were divided into three namely gender, level and age. Out of the 500 respondents 194 (38.8%) were male while 306 (61.2%) were female. As many as 418 (83.6%) of total respondents were within the age bracket 18-25, 82 (16.4%) were within age bracket 26-30.

Research Question One: How often do students use the internet?

From data collected, 256 (51.2%) respondents used it daily, 178(35.6%) used the internet on weekly basis, while 66 (13.2 %) used the facility ones in a while. This is presented in Table 1 below.

Table I: Frequency of Usage of the Internet

Responses	Frequency	Percentage
Daily	256	51.2
Weekly	178	35.6
Seldom	66	13.2

Research Question Two: Does accessibility affect students' use of the internet?

Table II: Accessibility of Respondents to the Internet

Questions	Responses		
	Yes	No	No Response
Is your department connected to net?	331 (66.2%)	133 (26.6 %)	36 (7.2 %)
Have you acquired a Laptop/desktop?	285 (57 %)	215 (43 %)	
Is there any cluster of computer systems you could use at any time to have access to the internet?	332 (66.4%)	168 (33.6 %)	

As shown in Table 2 above, 331 (66.2%) respondents agreed that their departments are connected to the internet as against the 133 (26.6%) who disagreed, while 36 (7.2%) did not respond. To the question of whether they acquired laptop or not, 285 (57%) agreed whereas 215 (43%) said they have not got a laptop. Similarly, 332 (66.4%) admitted that there is a cluster of computers at their disposal to access the internet as against the 168 (33.6%) whose responses were on the contrary.

Research Question Three: For what purpose do students use the internet most?

Table III: Main Purpose of usage of the Internet

Purposes	Frequency	Percentage (%)
Mails	183	36.6
Academic	176	35.2
Fun	86	19.2
Social networking	50	10
No Response	5	1

As depicted in table 3 above, as many as 183 (36.6%) respondents admitted that they mostly use the internet for mailing, while 176 (35.2%) used it mostly for academic purpose, 86 (19.2%) used it most for fun, while 50 (10 %) used it for social networking sites. One respondent 5 (1%) did not respond to this question.

About 67% students admitted that they spend 45hr/ wk along with internet while 23% spend time in between 35- 45hr/ wk and rest of them spend less than 35hr. Most of student spend their time for emailing and chat purpose rather than academics. According to data collected 45% of students spend 36hr/wk for emailing and 27.2% spend around 30hr/wk for chatting and blogging on social networking sites.

V. DISCUSSION

Like any other academic endeavor, this work is pegged on a theory which is that of uses and gratification. The bottom line of uses and gratification theory is that media do not do things to people; rather, people do things with media. In their contribution, Baran and Davis (2001) conclude that audience members actively seek out the mass media to satisfy individual needs. These include learning, passing time, companionship, escape from tension, excitement and relaxation.

McQuail (2005: 424) adds that the media serve the various needs of the society, which include cohesion, cultural continuity, social control and large circulation of public information of all kinds. This pre-supposes that individuals also use media for related purposes such as personal guidance, relaxation, adjustment, information, and identity formation.

Data collected provided deep insight to the subject matter. Accordingly, in order to establish how often students use the internet, Table 1 above shows that only few (35.6%) respondents used the internet weekly, while those who seldom used it stand at (13.2%), and (51.2%) used it daily. The implication of this is that much of the use of the internet considered a routine exercise.

Table 3 is explicit on the purpose for which students use the internet most. According to respondents, 36.6% students mostly use it for mails despite the fact that most mails are mere correspondences without any academic usefulness. A few others (29.2%) use it for fun and social networking leaving a large majority (35.2%) who use the internet for academic purpose. This could be connected with the fact that users have found an enormous reservoir of information in different disciplines amid dearth of books in our libraries. So, against the backdrop that a majority of the students use the internet for mailing and fun purpose, it could be admitted that the internet enables students to solve their academic problems. This position conveys the fact that there exists a significant relationship between students' usage of the internet and their academic performance.

However, results indicated that there was a significant difference in the way that participants responded to measures of social anxiety when referencing face-to-face relationships as opposed to online relationships. Limitations included not tracking ethnicity of participants, an unequal distribution of gender across the population, and that the population was restricted to undergraduate students in a rural setting. Based on these results, future research would benefit from exploring differences in individual's perceptions of online relationships compared with face-to-face relationships, and from exploring similar questions in non-college aged, ethnically diverse populations with gender equally distributed across the sample.

There is a paucity of psychological literature concerning college student use of Internet social networking is available and those studies that are available are contradictory in nature (Brignall & Van Valey, 2005; Kraut et al., 1998, 2002; Ybarra, 2004). The popular media, who are more consistent about the issue, repeatedly infers that Internet use impairs social interaction and that increased use may even lead to chronic depression and clinical levels of social anxiety in traditional social situations (CBS News, 2007; Fox News, 2007; Geldof, 2007; USA Today, 2007).

During teaching-learning activities, females use the internet in a more functional sense than males. These results are concurrent with those from previous studies. This finding overlaps with the research conclusions in literature. According to the research conclusions of Tutkun, Erdoğan and Arslan (2010), female students hold higher standards concerning educational activities when compared with males. This may be because female students also tend to have higher standards of responsibility for teaching-learning processes and helping attitudes in a classroom environment

VI. CONCLUSIONS

In youths particularly the medical students of today's era it is clear that internet usage or knowledge of internet is almost 100%. Also it is evident that they are more into the era of e-usage and i-usage or net or tech friendly but true also is that they are using it mainly for non-academic purposes 55% like mailing ,gaming and social networking , this leads to loss in their study schedules or time as well as wastage of time is also there because of non-focused approach as well as diversity of knowledge at net on a particular topic. On the other hand students with a focused approach go deep in subject who primarily use internet for

academics are 35% and do not waste time because of proper management of time , focus of search areas and avoiding the social networking sites to minimum and if connecting that too in idle time. Psychological issues ranging from mood swings to altered behavior, withdrawn attitude and loneliness has been reported by those who have been using internet mainly for social networking and mailing, because they remain in some sort of virtual world of net. By this study this is established that 51% of students use net daily and 35% use it weekly. They are using net 16 to 22 hours on an average basis, with a range of 6to 38hrs weekly usage, for academic purposes 6 to 16 hrs were used on net on average in a week, while for other activities 14 to 34 hrs per week were used at net. 57% of study group had their own laptops or personal computers. Family income on an average ranged 5 to 8 lacs in 62% , 8 to 12 lacs in 21% , 12 to 20 lacs in 8% , above 20 lacs in 3% and 1 lac to5lacs in 11%. Net has become an integral part of today's life but should be used as a tool for coomunication and acquirement of knowledge but not as habbit forming addiction.

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APPENDIX A

Part One: Demographic Questionnaire

Where do you currently reside?

- On campus in student housing
- Off campus in student housing
- Off campus with family
- Off campus with friends
- Off campus alone
- Other:

Do you own a personal computer?

- yes
- no

Where do you have Internet access (check all that apply)?

- On campus
- At home
- At parent's house
- At work
- Other:

What are the 3 most important activities you use the Internet for?

- (1)
- (2)
- (3)

What is your gender?

- Male
- Female

What is your mother's highest level of education?

- Did not complete high school
- High school
- Vocational or trade school
- Some college
- Bachelor's degree
- Masters degree
- Doctorate degree

What is your father's highest level of education?

- Did not complete high school
- High school
- Vocational or trade school
- Some college
- Bachelor's degree
- Masters degree
- Doctorate degree

What is your family's estimated total income?

- less than 1,00,000
- between 1 and 5 lakhs
- between 5 and 8 lakhs
- between 8 and 12 lakhs
- between 12 and 20 lakhs
- over 20 lakhs

Part Two: Internet Usage Follow-up Questions

How many hours per week do you spend studying?

How many total hours per week do you spend using the Internet?

How many hours per week do you use the Internet for school related work?

How many hours per week do you use the Internet for emailing?

How many hours per week do you use the Internet for instant messaging?

How many hours per week do you spend in Internet chat rooms?

How many hours per week do you spend browsing Internet sites?

How many hours per week do you use the Internet for gaming?

How many hours per week do you use the Internet for blogging or on social networking sites (Facebook, MySpace, etc.)?

Please rank-order these Internet activities from most likely to be what you do online to least likely:

_____ Email

-----WebCT / Online Course

_____ Research for personal knowledge

_____ Sex sites

_____ Chat

_____ Shopping

_____ Researching items for purchasing

_____ News

_____ Games

_____ Music

_____ Blogs / Social networking sites

_____ Gambling

Analysis of Cell Tower Radiations & Practical Realization of Compliance Distance

Richa Chitranshi*, Prakash Pancholi**

Abstract- The effect of electromagnetic radiation on human health is the subject of recent interest and study. ICNIRP (International Commission on Non-Ionizing Radiation Protection) study has concluded that the exposure levels due to cell phone base stations are generally around one-ten-thousandth of the guideline levels. Moreover, the WHO has classified mobile phone radiation on the IARC (International Agency for Research on Cancer) scale into Group 2B – possibly carcinogenic to humans. That means that there could be some risk. On the other hand, telecom service providers are worried about QoS (quality of service) of mobile services after implementation of stricter norms regarding cell tower radiations. Therefore an exercise was done to measure cell tower radiations at various places of dense urban regions, in the context of QoS measurement at these places. Exercise was also done to understand near field behavior of mobile towers and practically realization of compliance distance. This paper deals with practically observed radiation level (power density) and QoS benchmarks at various sample points along with practically realization of safer zone from cell tower radiation point for various sets of EIRP/ERP, antenna gain, bands etc. Comparison among theoretical and practically observed values of signal strength/power density/EIRP is also done with MATLAB program.

Index Terms- Cell tower radiation, Compliance Distance, ICNIRP, QoS.

I. INTRODUCTION

Cell phone technology has grown exponentially in the last decade. Large number of BTSs/towers is to be deployed to meet the communication demand. Presence of large number of cell phone towers in populated area starts the debate on biological impact of cell tower radiation. Most of the countries has adopted the radiation norms as suggested by the ICNIRP. As per the ICNIRP, the value of power density at general public exposure zone should be less than $f/200$ watt/m² for 400-2000 MHz band. Here f is the frequency used by the mobile operator in Mhz. Still some researchers are demanding to strengthen the radiation norms i.e. recommended value of power density at safer distance (that is expose to general public) should be as low as possible. At the same time telecom service providers are opposing such demands and arguing that reduction in transmitted power/EIRP (effective isotropic radiated power) for reducing the risk of radiation may hamper the QoS of mobile operation.

Some researches theoretically proves that presence of large number of antennas on single tower with multiple carriers from each antenna may cause sifting of compliance zone very much away from the tower and general public exposure area comes in

accidence zone where power density is very much high then the recommended value.

Hence a research was done to measure cumulative cell tower radiation values at various dense populated urban areas and QoS parameters were also measured to analyze both power density (radiation level) and QoS in collective manner.

A research was also done to measure radiation level at various distances for various sets of BTS /mobile towers to understand near field behavior of mobile antennas and to find out the compliance distance and its dependency on various factors like antenna gain, transmitted power, bands etc.

II. EMF EXPOSURE ZONE

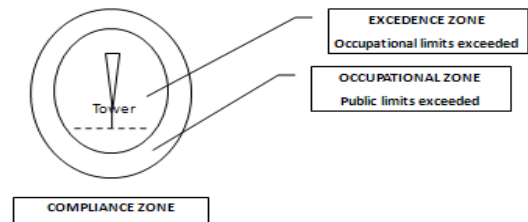


Figure 1- EMF exposure zone

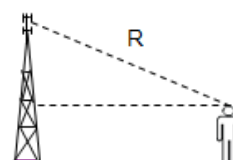
A. Excedence zone – This zone has restricted access to workers and the general public.

B. Occupational zone- This zone is restricted access to general public. Physical barriers lock out procedures or adequate signs can accomplish the access restriction. Workers may be permitted to enter the occupational zone.

C. Compliance zone- This has EMF value below the applicable limits and it is treated as safer zone for general public.

III. POWER DENSITY AND RADIATION LEVEL

The power density at any distance from an isotropic antenna is simply the transmitter power divided by the surface area of a sphere at that distance. The surface area of the sphere increases by the square of the radius, therefore the power density, PD, (watts/square meter) decreases by the square of the radius.



$$S = \frac{PG}{4\pi R^2}$$

Where: S = Power density (W/m^2),
 P = Power input to the antenna (W)
 G = Power gain of the antenna
 R = Distance to the center of radiation of the antenna (m)

Table1-Compliance distance recommended by ICNIRP (based on ITU K.70 fact sheet formula)

Radio Frequency Range	General Exposure	Public Exposure
1 to 10 MHz	$r = 0.10 \sqrt{eirp \times f}$	$r = 0.129 \sqrt{erp \times f}$
10 to 400 MHz	$r = 0.319 \sqrt{eirp}$	$r = 0.409 \sqrt{erp}$
400 to 2000MHz	$r = 6.38 \sqrt{eirp / f}$	$r = 8.16 \sqrt{erp / f}$
2000 to 300000MHz	$r = 0.143 \sqrt{eirp / f}$	$r = 0.184 \sqrt{erp}$

Where r is compliance distance in meters, f is the frequency in MHz and EIRP is equivalent isotropically radiated power in the direction of maximum antenna gain in watts while ERP is effective power in the direction of maximum antenna gain in watts.

IV. ANALYSIS OF CELL TOWER RADIATIONS

Cell tower radiation measurement methods can be classified in three categories:-

1. Calculation method
 - a. Prediction of RF fields
 - b. Calculation to determine $EIRP_{th}$
2. Software simulation
3. Field measurement

Field measurement approach was chosen to analyze cell tower radiations in various regions.

Approach:-

Ten test points were chosen. Following were considered in area selection

1. Area should be such that it should be covered by all major GSM operators radiating with GSM 900 & 1800 MHz bands. It should also serve by major CDMA operators.
2. Large number of closely situated shared towers with many antennas should be present in that dense urban area.
3. Preferably it should be border area of two or more PLMNs, so that interference/ radiations from nearby PLMNs can also be taken in to account.
4. Site data & other technical data regarding that area should be available.

Following points were chosen in Ghaziabad (India) as per the availability of maximum number of towers/ antennas in that area.

Table. 2- Area chosen for measurement.

Point 1	Raj Nagar, Sector 10 Ghaziabad, Latitude 77.23263 Longitude 28.60146
Point 2	New Railway Station, Latitude 77.44944, Longitude 28.682192
Point 3	Meerut Road, Latitude 77.44812, Longitude 28.702333
Point 4	Kavi Nagar Ramleela Ground, Latitude 77.449869 , Longitude 28.66651
Point 5	Shastri Nagar Water Tank, Latitude 77.464519 , Longitude 28.672718
Point 6	Govind Puram, Latitude 77.564163 , Longitude 28.683962
Point7	Nand Gram Ghaziabad, Latitude 77.427692, Longitude 28.689759
Point 8	Bamheta, Latitude 77.506142 , Longitude 28.646155
Point 9	Bamheta, Latitude 77.506142 , Longitude 28.646155
Point 10	Vijay nagar, Latitude 77.431169 , Longitude 28.647775

Network quality reports related to that area were studied to see the QoS of mobile services. TEAMS drive testing handset was also used to observe the network performance. Also, personal interview was conducted to find out the QoS in term of customer satisfaction. this formula is explained as under:-

Maximum value of QoS=1

Sr.No.	Parameter	Weightage in QoS formula
1	SDCCH BLOCK	1/20 if SDCCH block is < 1%, otherwise zero.
2	SDCCH DROP	1/10 if SDCCH drop is < 1%, otherwise zero.
3	TCH BLOCK	1/20 if TCH block is < 2%, otherwise zero.
4	TCH DROP	1/5 if TCH drop is < 2%, otherwise zero.
5	Call completion success ratio	1/5 if CCSR > 95%, otherwise zero
6	Rx signal Strength	1/5 If Rx signal > -95 dBm , 1/10 >-103dBm otherwise zero.
7	Rx quality.	1/5 for Rx Quality 0 to 3 ,1/10 for Rx Quality 4 to 5 , otherwise zero

Graph regarding observed power density at various places at compliance distance is shown below.

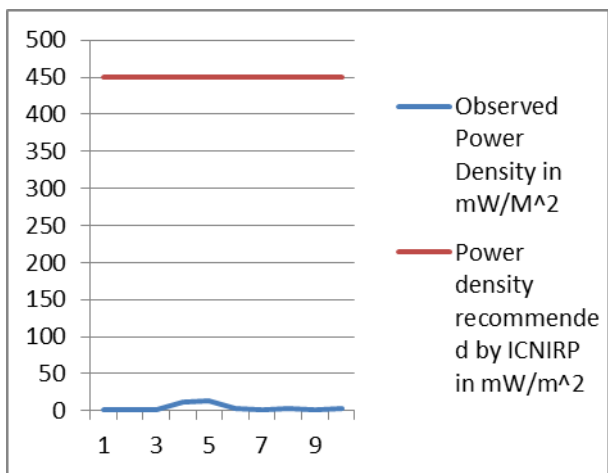


Figure 2- observed power density at various places at compliance distance

Graph among ratio of measured and recommended power density and QoS is shown below.

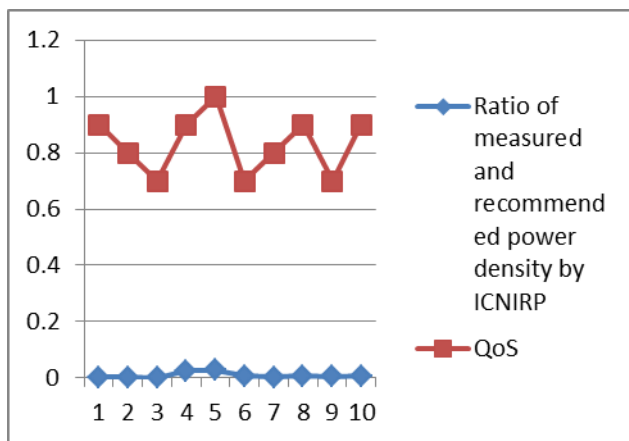


Figure 3- Ratio of measured and recommended power density and QoS

It can be realized that power density measured varies from 0.66 to 11.2 mW/m² and the QoS is also between 0.7 to 1. Ratio of practically observed and recommended power density varies from 0.028 to 0.0013 at compliance distances at these critical sites.

Hence it can be stated that telecom operators are radiating below the 1/100 to 1/1000 value of maximum allowable power density and even they were able to manage good QoS, so radiation norms can be further strengthen i.e. recommended power density at compliance distance may be $f/2000$ or less than it.

V. REALIZATION OF COMPLIANCE DISTANCE

This exercise was done to realize compliance zone for a particular BTS/ antenna. Then various parameters like transmitted power, antenna gain, frequency, antenna height, tilt etc were vary to observe dependency of these factors on compliance distance.

Approach

A BTS site was chosen (test bed of GSM). It was not utilize by the general public so various parameters like frequency, transmitted power, hopping etc were changed & with the help of ANRITSU_MS2661A-11 spectrum analyzer and Narda SRM 3006 Frequency-selective meter power density/ electric field strength were measured at various points to find out the point where power density would be less than $f/2000$ watt/m² & $f/400$ (Watt/m²) to find out compliance & occupational zone. Then graphs between observed power density/ electric field strength & distance was drawn for various sets of configuration (like transmitted power, antenna gain, antenna height, frequency etc) to observe the dependency of various factors on compliance distance.

Near field behavior was observed for the following specifications:-

Transmitting power:- 43dBm Antenna Gain= 17 dBi
 3dB beam width vertical θ_{bw} (deg)= 7.5
 BCCH frequency= 949.2 Mhz Antenna height= 4m
 Antenna Tilt(Electrical + Mechanical)=4 degree
 RX cable length=32m Side lobe attenuation=15 Db
 Cable unit loss (dB/100m)= 3

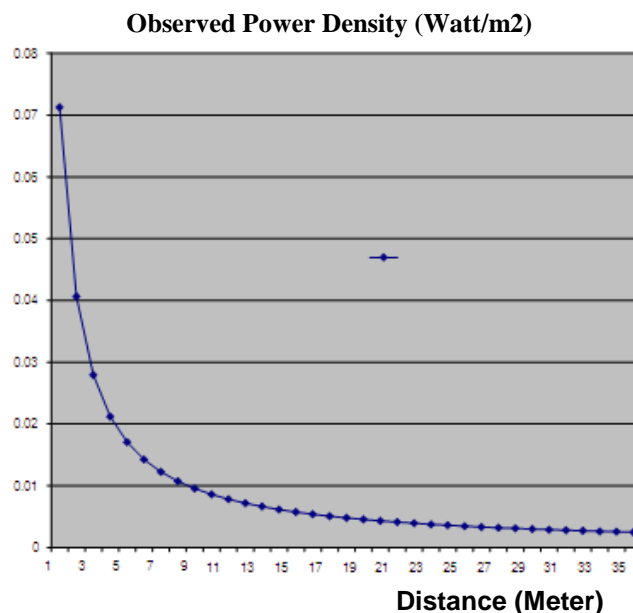


Figure 4 -Observed Power Density (Watt/m2)

Graph shown above represent near field behavior of directional antenna. It is almost similar to exponential decay.

Here if power density $f/20000$ will be considered for the compliance distance then it can be seen that observed compliance distance is between 3 to 4 m (for one carrier per sector).

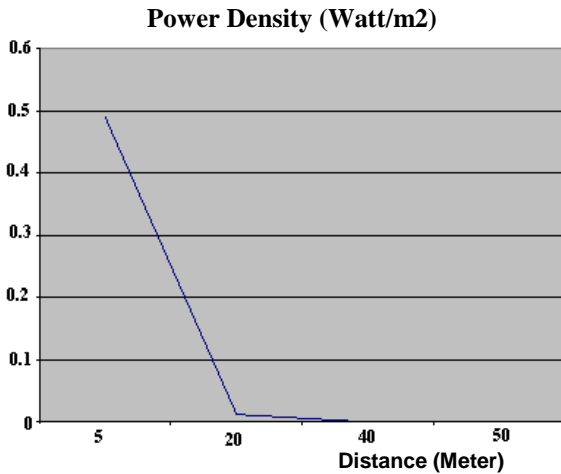


Figure 5- Near field behavior of GSM antenna with 4 carriers in one sector

Graph shown above show the near field behavior of GSM antenna with 4 carriers in one sector. It can be observed that if power density $f/20000$ will be considered for the compliance distance then it can be seen that observed compliance distance is between 14 to 18 m. For 36 carriers the 57.5m was observed as compliance distance.

Graph shown below represent electric field strength at various distance for various antenna gain. It can be observed that antenna with high gain offer higher value of power density/ electric field strength in near field region as compare to low gain antenna.

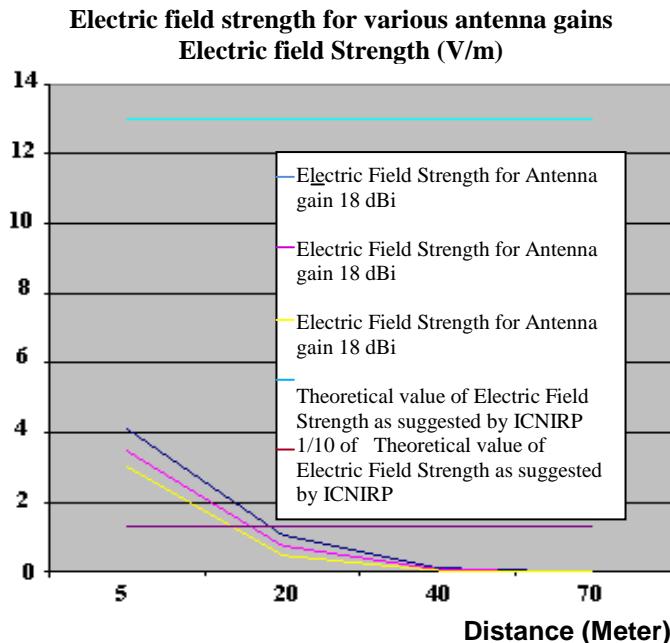


Figure 6- electric field strength at various distances for GSM 900 & 1800

Graph shown below represent electric field strength at various distance for GSM 900 & 1800 for the same transmitting power. It can be observed GSM 900 offers antenna with higher

value of power density/ electric field strength in near field region as compare to GSM 1800.

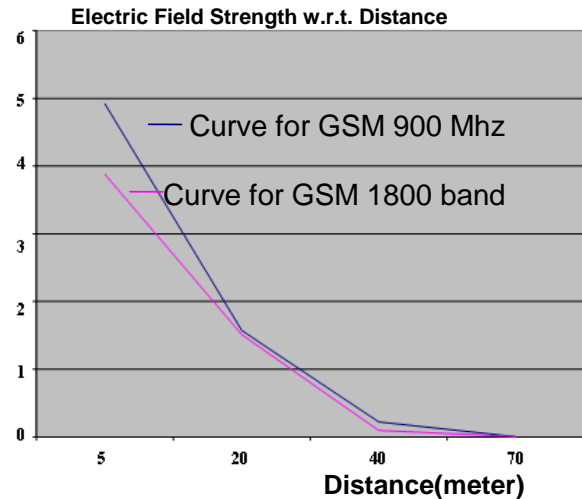


Figure 7- Electric Field Strength w.r.t. Distance

then observed compliance distance was between 2 to 3 m.(for maximum power transmitted i.e. 43 dBm & antenna gain 18 dBi) But this was the case of 1 carrier per sector.

When 6 carriers were used per sector, then compliance distance increases by 4 times.for 36 carriers the observed compliance distance was 57.5m.

As shown in graphs, compliance distance varies with antenna gain, transmitting power, frequency etc. It was also observed that frequency hopping did not put any influence on compliance distance.

VI. CONCLUSION

This paper was concern with practical measurement of cell tower radiation and QoS along with realization of compliance distance for various antenna gain and bands. It was observed that operators were able to manage radiation level 1/100 to 1/1000 below the recommended value while maintaining QoS. So, so radiation norms can be further strengthened i.e. recommended power density at compliance distance may be $f/20000$ or less then it. It was observed that compliance distance for 6 carriers with 18dBi antenna gain and 43dBm EIRP was near about 12 meters from the tower and for 36 carriers this value reaches to 57.5 meter. It was also observed that compliance distance varies with antenna gain, transmitting power, frequency etc. Frequency hopping did not put any influence on compliance distance.

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Impact of Globalization on Human Rights and Environmental Protection

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Abstract- Economic globalization impacts the environment and sustainable development in a wide variety of ways and through a multitude of channels. The aim of the paper is to interrogate a variety of arguments about human rights and environmental sustainability in order to assess their coherence and consistency, and to evaluate competing perspectives. The purpose of this paper is (a) to identify the key links between globalization and environment; environment and human rights. An integrative section on the effects of globalization and environmental policy and performance leads to domestic and international priority policy issues and recommendations. Globalization is the process by which all peoples and communities come to experience an increasingly common economic, social and cultural environment. By definition, the process affects everybody throughout the world. In short, the more integrated environmental and trade policies are, the more sustainable economic growth will be and the more globalization can be harnessed for the benefit of the environment. The paper tries to analyze the effects of globalization and its impact on various sectors.

Index Terms - Environment, Globalization, Human Rights, Sustainable Development

I. INTRODUCTION

All over the world, people are experiencing the effects of ecosystem decline, from water shortages to fish kills to landslides on deforested slopes. The victims of environmental degradation tend to belong to more vulnerable sectors of society, i.e., racial and ethnic minorities and the poor, who regularly carry a disproportionate burden of such abuse. Increasingly, many basic human rights are being placed at risk, as the right to health affected by contamination of resources, or the right to property and culture compromised by commercial intrusion into indigenous lands¹. While the causes of the environmental degradation are contested, the ramification on the human life and realization of basic human rights are indisputable. But the international and national acknowledgement of relationship between environmental protection and human rights is relatively recent. The United Nations Conference on Environment in Stockholm in 1972 designated as the 'Magna Carta of Environment' laid down the foundation for the statutory base of the environmental law framework in India.

Environmental issues have become more important in modern economic policy. At the same time, struggle for human rights have become more complex and challenging in the era of globalization. While human rights have been increasingly protected by governments and international bodies like the United Nations, grave threats to and gross violations of human rights are also on the rise. An important issue confronting policy makers today is the complex challenge of preserving the natural environment while simultaneously promoting development to meet the basic needs of humanity. Many problems resulted in this area of discussion, with regard to the intricate linkages between globalization, human rights, and environmental decay.

So the author discusses the inter relationship between environment and human rights and also points out the challenges to protect equitable human rights in the era of globalization in such a way that it promotes sustainable environmental development through eco friendly trade policies. In short, by adopting the more integrated environmental policies, more sustainable economic growth will be done and globalization can be harnessed for the benefit of the environment.

II. ECONOMIC DEVELOPMENT TO ENVIRONMENTAL PROTECTION

Environmental right means access to the unspoiled natural resources that enable survival, including land, shelter, food, water and air. They also include more purely ecological rights, including the right for a certain beetle to survive or the right for an individual to enjoy an unspoiled landscape.¹¹

The first environmental movements were a direct consequence of the industrial revolution in the late eighteenth and early nineteenth centuries; the increased use of fossil fuels and chemicals, urban expansion and deforestation and increased human

consumption led to drastic changes in the environment, drastically raised the level of pollution, damaging bio-diversity and depleting natural resources.ⁱⁱⁱ The first environmental movements were, however, primarily concerned with wild- life protection and nature conservation and paid little attention to the negative effects of human settlement and commerce.^{iv}

It is only after the Second World War that environmental movements have become extremely active. The rise in environmental movement is closely linked to the new phenomenon of globalization, which has transformed the structure of the international system. A globalised world is one, in which the boundaries between states are less and less visible and political, economic, cultural and social events are more and more interconnected with greater and far- reaching impact. The phenomenon of globalization has led governments and individuals to realize the international and trans-boundary dimensions of environmental issues. Finally, beginning with the UN Conference on the Environment held in Stockholm, Sweden in 1972 there has been an increasing movement towards the adoption of international instruments as tools for environmental protection.

III. INTER-RELATIONSHIP BETWEEN ENVIRONMENT AND HUMAN RIGHTS

The right to development is an inalienable human right by virtue of which every human person and all peoples are entitled to participate in, contribute to, and enjoy economic, social, cultural and political development, in which all human rights and fundamental freedoms can be fully realized^v. Integrating the socio-cultural, economic and environmental components is not easy. Sustainability is really a simple concept, i.e., actions taken in the present to improve the human condition and the Earth system in which we live need to be lasting and benefit future generations.

Relationship between development and human rights has a long history, both in concept and in practice. At the end of the Second World War, the most atrocious and destructive conflict humanity had ever experienced. No wonder that the founding fathers of the United Nations had pledged a strong commitment to the promotion and protection of human rights. In fact, the architecture of the United Nations, by its very Charter, is built on three main pillars: peace and security, development, and human rights.

Conceptually, these three pillars were linked, interrelated and interdependent, so much so, that there could be no peace and security without development, no development without human rights and no human rights without peace and security. This trilogy was and remains the conceptual underpinning and basic mandate of the United Nations. In practice, the interrelationship between peace and security, development, and human rights has not always been evident over the years.

But now days the legal protection of human rights has increasingly been invoked to achieve the ends of environment justice. Environmental justice deals with equitable utilization of resources, procedural fairness and a safe and healthy environment. In the era of globalization and a shift towards non-state actors international human rights has acquired crucial role. It can be arguably said human right deals with the conflict between trade and the environment and provide the means to reconcile it.^{vi}

The relationship between a safe and healthy environment and human rights has been on the global agenda since the preparations for the 1972 Stockholm Conference on the Human Environment. This idea was reflected in principle 1 of the 1972 Stockholm Declaration, which states that man's natural and self-made environment is *'essential to his well-being and to the enjoyment of basic human rights and the right to life itself'*. Despite this strong statement, such a human rights based argument has not been followed in subsequent environmental declarations, such as the 1992 Rio Declaration. Instead, these declarations have linked human wellbeing to the state of the environment without any explicit reference to human rights.

In general, there are three broad approaches to link human rights and the environment.

1. To view a quality environment as an underlying precondition for the enjoyment of existing human rights, rather than a specific right in itself.
2. Focusing on the procedural rights of people in relation to control over their environment, such as rights to participation in environmental decision-making and access to justice.
3. A substantive justifiable right to a certain quality of environment. Provisions to this effect are found in some national constitutions, such as those of South Africa, the Russian Federation and Spain, and in the African Charter on Human and Peoples' Rights.

The link between human rights and the environment has developed in a fragmented manner across national, regional and international levels in case law, regulations and international agreements. As a result, much of the linkage between human rights and environmental law has been highlighted through decisions of national courts and regional human rights bodies. This has resulted in rapid development of jurisprudence, but the piecemeal development has lacked a comprehensive framework linking human rights and the environment.

Several efforts have sought to clarify the linkage between these important concepts at the international level. Like, a draft declaration on Principles on Human Rights and the Environment was prepared in 1994 by a group of experts, and it was presented before the UN Commission on Human Rights in 1995. This declaration proposed a substantive right to ‘*a secure, healthy, and ecologically sound environment*’ and included the concept of intergenerational equity.

There are three main dimensions of the interrelationship between human rights and environmental protection:

- The environment as a pre-requisite for the enjoyment of human rights (implying that human rights obligations of States should include the duty to ensure the level of environmental protection necessary to allow the full exercise of protected rights);
- Certain human rights, especially access to information, participation in decision-making, and access to justice in environmental matters, as essential to good environmental decision-making (implying that human rights must be implemented in order to ensure environmental protection); and
- The right to a safe, healthy and ecologically-balanced environment as a human right in itself (this is a debated approach).^{vii}

In examining the relationship between environmental protection and human rights, the controversial question is whether environmental protection aims at enhancing the quality of human life and is thus a subset of human rights or whether environmental protection and human rights are based on different social values. Another, third approach sees human rights and environmental protection as representing two different strands with different but overlapping social values. The two strands overlap and can be mutually supportive where environmental values seek to protect human needs or well-being. However, this approach differentiates between environmental protection and human rights when the conceptual underpinnings of human rights are not suitable to address environmental issues. Further, these issues gained importance after adopting globalization as a basic mantra of the economic policies.

IV. EFFECTS OF GLOBALIZATION

Since coming to the fore as one of the most talked-about issues of the late twentieth century and the new millennium, the phenomenon of globalization has captured world attention in various ways. Now, because of globalization's multifaceted nature, it is essential to grasp the different motivating forces that are impelling these developments aside from the purely economic, and also to recognize the different directions from which they are coming. Intrinsic to this form of globalization is a growing legal and institutional framework within which the regimes of contemporary international trade, finance and investment are being conducted.

Another form of globalization has its effects on environmental and human rights struggles. Human rights movement has long laid claim to a universalizing mission. This is evident in the assertion that the regime of rights and freedoms established through the Universal Declaration of Human Rights and the numerous other instruments that have since been promulgated in the same spirit extend beyond the arena of purely national concern.^{viii} The concept of sustainable development becomes a buzz word and to implement the concept, some of the important international Conventions were entered into.

The term sustainable human development may be defined as the capacity of all human communities, including the most deprived, to meet their fundamental needs for accommodation, drinking water, food, satisfactory conditions of health and hygiene, participation in decision-making, social cohesion, a social fabric, cultural and spiritual expression, etc. This entails the adaptation of technologies and lifestyles to the social, economic and environmental potential of each region, internalizing costs and establishing systems that are compatible with the biosphere.

Such an approach makes sustainable human development a multifaceted process. It seeks a balance between the ecological, economic and social spheres, while also taking account of political (participation and democratization), ethical (responsibility, solidarity, social justice and sufficiency) and cultural (local diversity and artistic expression) considerations.

Sustainable human development also calls for a fundamental re-evaluation of our basic principles and lifestyles, and of the way our societies function, particularly regarding production and consumption. This implies significant changes in attitudes and behavior, in which an awareness of living in a common space, individual responsibility for actions, and learning to identify long-term perspectives and partnership between players in different regions of the world, including governments, international institutions, business and civil society, take precedence over material factors.

V. CONCLUSION

With the above discussions, the author concludes that an important issue confronting policy makers today is the complex challenge of preserving the natural environment while simultaneously promoting development to meet the basic needs of humanity. With the adoption of globalization trade policies were liberalized, which caused further environmental destruction. Many problems resulted in this area of discussion, with regard to the intricate linkages between human rights and environmental decay.

In spite of the tussle between human rights and environment protection one thing is ample clear that mankind is part of nature and separation of interests of human beings and the environment is quite difficult because human requires air, water and food in order to survive but on the hand contamination, pollution or destruction of these elements poses a direct threat to health, shelter, food and well being of human life.

In fact human right and environment go hand by hand because the degradation of the environment violates numerous well-recognized human rights. This is the fundamental principle that no life is possible without some level of healthful environment. Just because of this it can be averred that the right to environment is a condition precedent to all other human rights but at the same time the basis for a right to a healthful environment.

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¹ www.iisd.ca > MEA Bulletin .

¹ <http://www.foei.org/en/what-we-do/solidarity-work/environmental-rights-are-human-rights>

¹ Environmental Movement, Encyclopaedia of Sustainable Development, at <http://www.ac.uk/esd/Earth/Environmental-Movement.html>.

¹ <http://www.ace.mmu.ac.uk/esd/Environmental-Movement.html>.

¹ The Declaration on the Right to Development, UN GA Res. 41/128, article 1/1, 4 December 1986

¹ <http://www.nliu.com/new/Art8.pdf>

¹ <http://www.unep.org/environmentalgovernance/Events/HumanRightsandEnvironment/tabid/2046/language/en-US/Default.aspx>

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Geomorphological and Geo-Electrical Investigations for Ground Water Resources in Pulang River Basin, Andhra Pradesh

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Abstract- An endeavour is made in the present study to identify the groundwater potential zones in the Pulang River basin, Cuddapah district based on the Geological and Geo-electrical investigations. The Geomorphological features and lineament patterns are also studied in locating favourable sites for groundwater. The Geoelectrical soundings conducted at hundred locations in the basin area are interpreted by Schlumberger method. These studies helped to understand the subsurface Geology and in identifying the high groundwater potential zones and to locate in turn the favourable sites for good yielding bore wells.

Index Terms- Geomorphological features , Geoelectrical soundings, groundwater potential zones, Schlumberger method.

I. INTRODUCTION

The pulang river rises from the Seshachalam hill ranges in Rajampet taluk of Cuddapah district, flows in general northerly direction and joins Cheyyeru river at Atterala. The basin includes six sub-basins with a drainage area of about 757 sq. Km (Fig. 1). The climate of the river basin is hot and semi-arid. The basin receives an annual average rainfall of 795 mm, out of which 45 to 65 percent of the total annual rainfall is received during the north – east monsoon period.

II. GEOLOGICAL SETTING

The rock formations of the basin area represent a suite of sedimentary and metamorphic rocks formed during pre-cambrian times. Lithologically the Cuddapah formations are predominantly argillaceous sequence with subordinate calcareous sediments. Characteristically each group starts with quartzite and ends with dolomite or Shale/Phylite. The Nagari quartzite is exposed mainly in the southern part of the basin. This is dominantly an arenaceous consisting of conglomerate quartzite, quartzite with shale formations (Fig. 2).

The Pullampet formation rests over the Nagari quartzite conformably in the southern part of the basin with purple shale, carbonaceous shale and calcareous shale with prominent intercalations of dolomitic limestones. The basal part of the Pullampet is marked by the ferruginous chert and Jasper with lensoid dolomite patches. Large outcrops of quartzite are seen in the southern and western portion of the area as hills and ridges.

Dolomitic limestones occur at places as discontinuous interbands and lenses. The shale occurs mostly in low-lying

lands and strike in a NNW direction with variable dips. The shale is interspersed by bands with quartzite, which sometimes occurs as low lying elongated hillocks. Alluvium of recent age is composed mostly of sand and subordinately of silty or clayey sand and is confined all along and on either side of the Pulang River.

The structural map of the basin area has been prepared using Landsat-5 (TM) and satellite imagery (LISS-II) with some field checks and presented in Fig.3. The map shows lineament patterns mostly in NE-SW direction, parallel to the quartzite hill ranges. A large number of minor lineaments recognized are trending differently in different rock formations. The faults are running NS, NE-SW, NNE-SSW which are mostly parallel to the river course. The change of river course towards west at northern side is an important feature of the basin. This might be due to intersection of two major faults. Another major fault trending NS direction can be seen towards the northern most side of the area. Probably due to its influence, the river reaches Cheyyeru river where a natural spring also emerges.

III. GEOMORPHOLOGY

The Geomorphological features which influence the groundwater potential zones are identified. These are classified on the basis of their geomorphic expression, relief, slope factor and surface cover with soil or vegetation. The landforms identified in the basin area are broadly classified as denudational landforms covered by outcrops and depositional landforms covered by colluviums, alluvium and transported soils.

The denudational hills are the resultant landforms formed due to the natural dynamic process of denudation and weathering and mostly these are with negligible soil cover and vegetation. The residual hills present in the area are aligned E-W direction and a few are N-S direction. The denudational hills and the residual hills are mostly composed of quartzites and appear to be poor groundwater potential zones.

The gently sloping surfaces showing a greater degree of weathering adjacent to these hills are known as pediplain zones. The thin soil cover present over the pediment surface supports scanty vegetation of low shrubs and grass. As the erosion is active in the pediplain area, groundwater expected in this zone is low to moderate.

The Geomorphic features related to fluvial landforms present in the area of study are rock cut terraces and flood plain deposits. Flood plains are covered with alluvium transported and deposited by streams. Palaeochannel of substantial thickness of

alluvium deposited by the action of abandoned rivers is noticed at Atterala where the river joins the Cheyyeru river. Certain alluvial fans loaded with resulting deposition of alluvium are formed at the foot of the hills.

The flood plains, Palaeochannels and alluvial fans which are present in the basin area comprise unconsolidated materials, coarse boulders and pebbles carried by the streams. Hence, a substantial groundwater potential zones are identified in these areas.

IV. GEOELECTRICAL STUDIES

In order to study the subsurface structure of the Pulang river basin, Electrical Resistivity method has been used. Soundings were carried out at about 100 locations in the area (fig. 4.). This technique had shown greater potential for ground water development, especially in hard rock terrain, where the weathered or fractured rock formations show as a conducting layer in an otherwise resistive bed rock. The results of these investigations, together with geomorphology should provide a good indication for identification of ground water potential zones in the river basin.

Schlumberger configuration has been used with a maximum electrode separation of $AB/2=100$ m. The sounding curves obtained in the area are mostly H, and A type with apparent resistivity values generally varying from about 10 Ohm-m to few hundred Ohm-m. A few examples of them are shown in Fig. 5.

The interpretation of the sounding curves has been carried out at National Geophysical Research Institute, Hyderabad using linearised inversion (Jupp and Vozoff, 1975) scheme. The inversion scheme required an initial model. The initial model for each curve has been obtained from curve matching technique. The inversion scheme progressively reduces the error between

the observed and computed data by changing the parameters in the given initial model and finally gives a model that satisfies the observed data in a least mean square sense. The results of the investigation give a parametric layered model, assigning definite resistivity and thickness for each layer. The results thus obtained are presented in the form of contour maps also as 3-D perspective plots.

In fig.6 A and B contour map of apparent resistivity with 1.5m and 10m, are shown respectively. From these figures it can be clearly seen that high resistivity values of the order of 100 ohm-m and above are oriented in NW-SE direction, showing a cluster of high resistive contours. These high resistive zones correspond to the relatively high resistive formation of Quartzite. Towards NE direction there is a general decrease in apparent resistivity value indicating conductive formations, which corresponds to shale/dolomites.

In figs 7 and 8, interpreted results of sounding curves are presented. Figs, 7 A and B shown the surface layer resistivity plot and its 3D representation respectively and Fig. 8 A and B show the bottom layer depth contour map and its 3D perspective plot respectively. It can be seen from these figures that the surface layer is resistive towards NE-SW direction and conductive towards NE direction. The depth to the bottom layer in the study area varies from 4m (VES-33) to as great at 47.2 m (VES-82). In a hard rock terrain such as in Pulang river basin large basement depth areas are suitable for greater ground water potential. Based on the integrated surveys involving geological, geomorphological and geophysical investigations, the basin area is divided into three classes with varying probabilities of groundwater occurrence i.e. high, moderate and low potential areas (Fig.9).

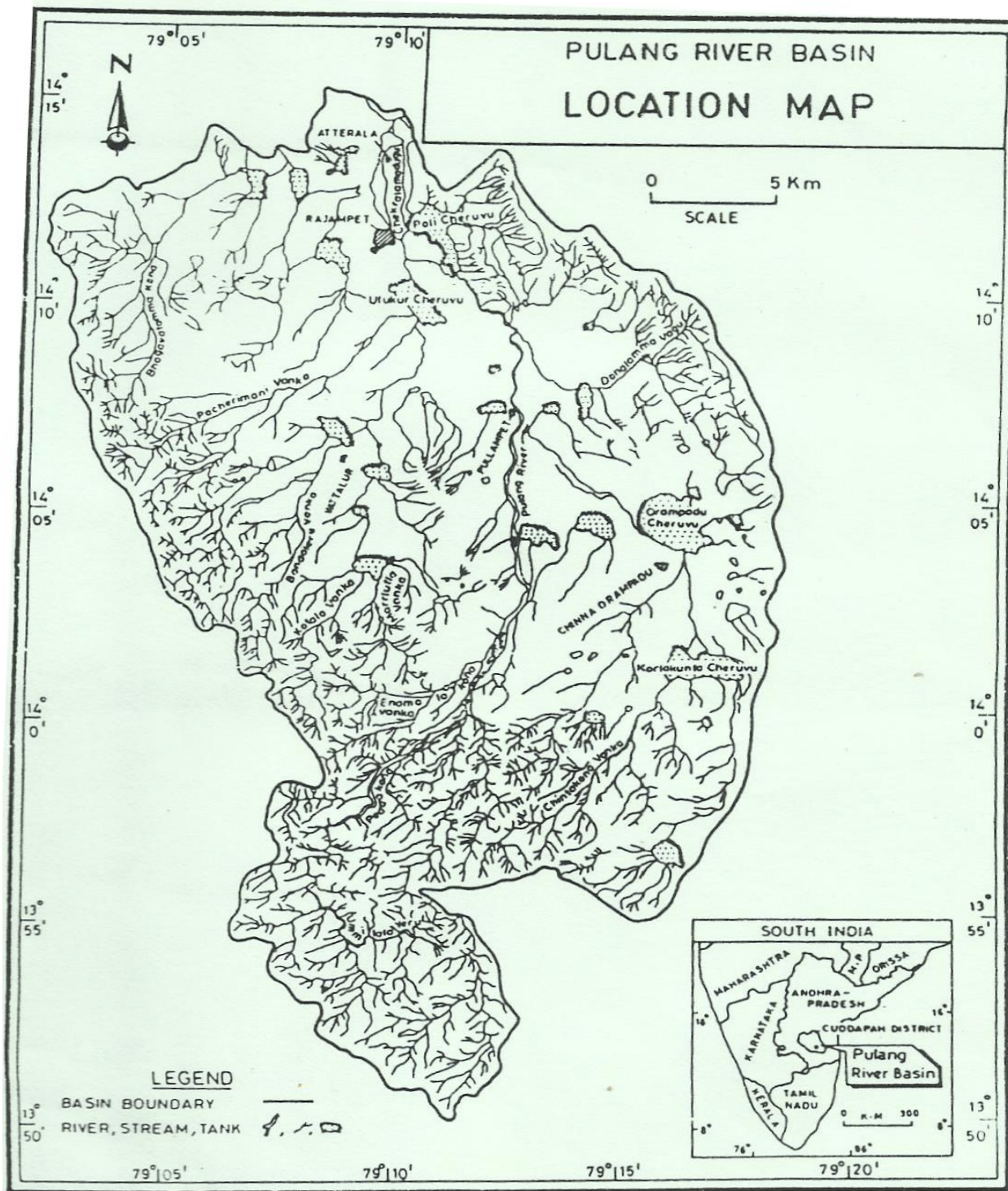


Fig.1 Location map of pulang river basin

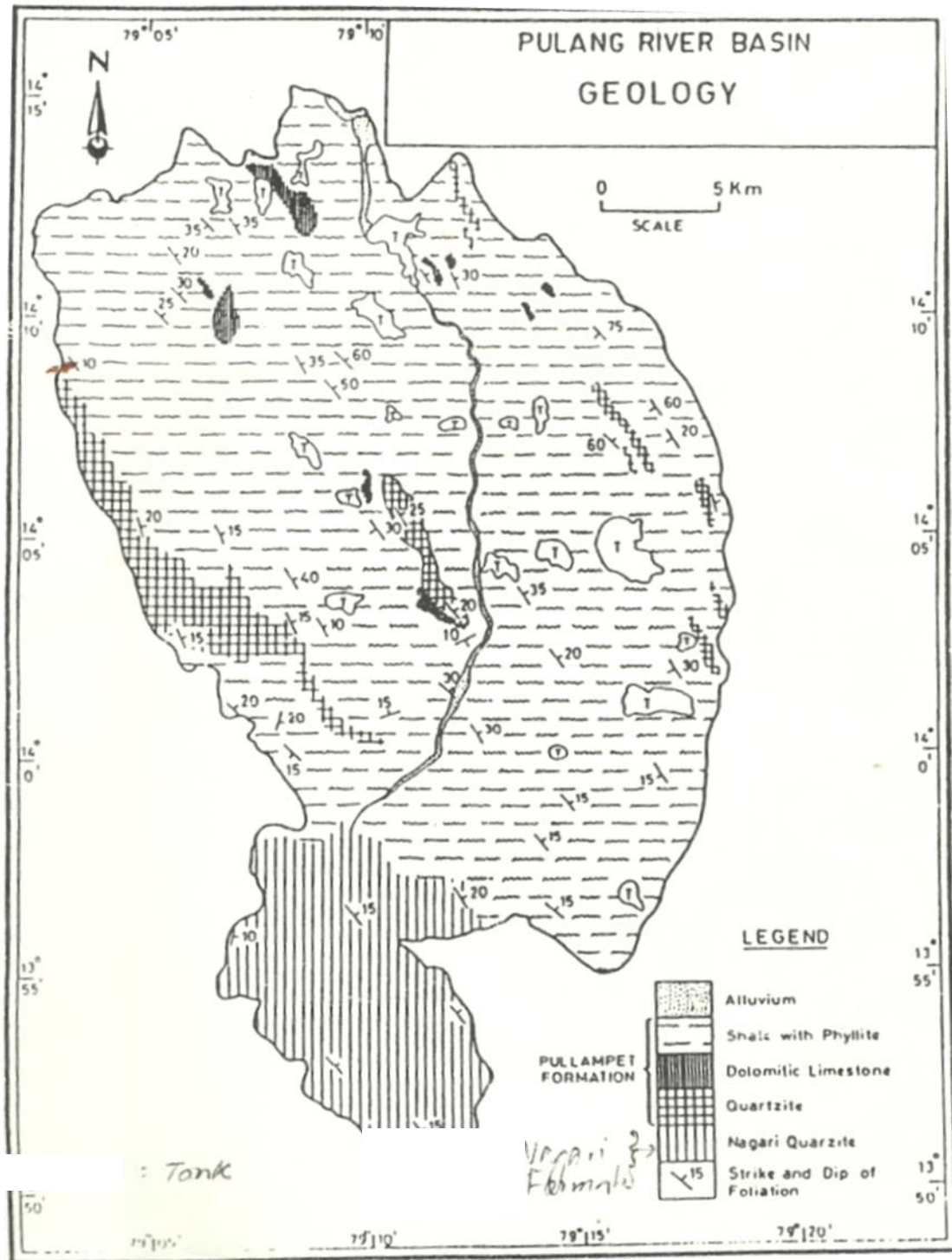
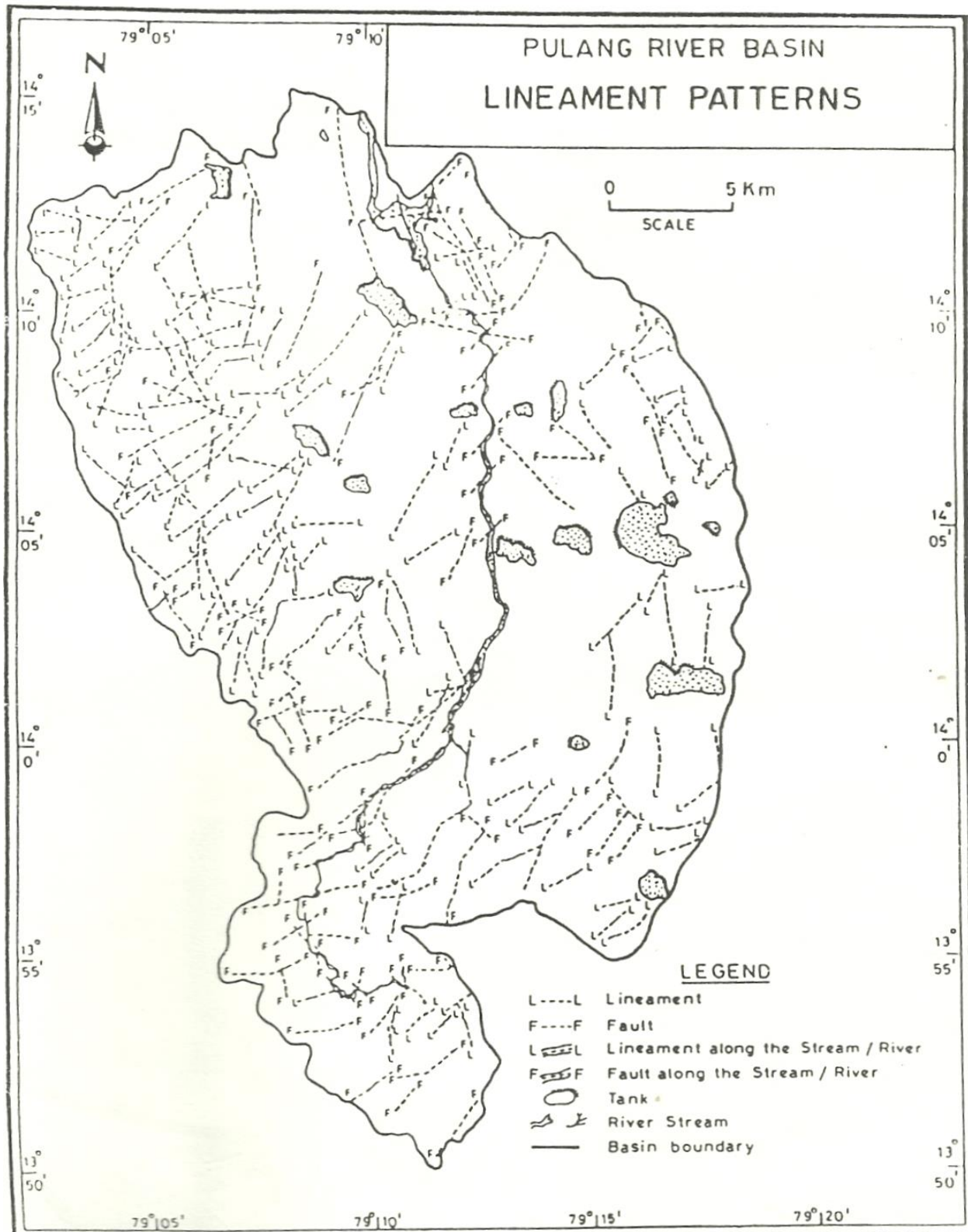


Fig.2 The map showing geo morphological features



SOURCE : 1:50,000 Scale Topographical map of Survey of India, Satellite imagery LISS II 4 Feb. 1989 & Landsat - 5 (TM) 13 Oct. 1989.

Fig.3 The lineament patterns identified from satellite imagery

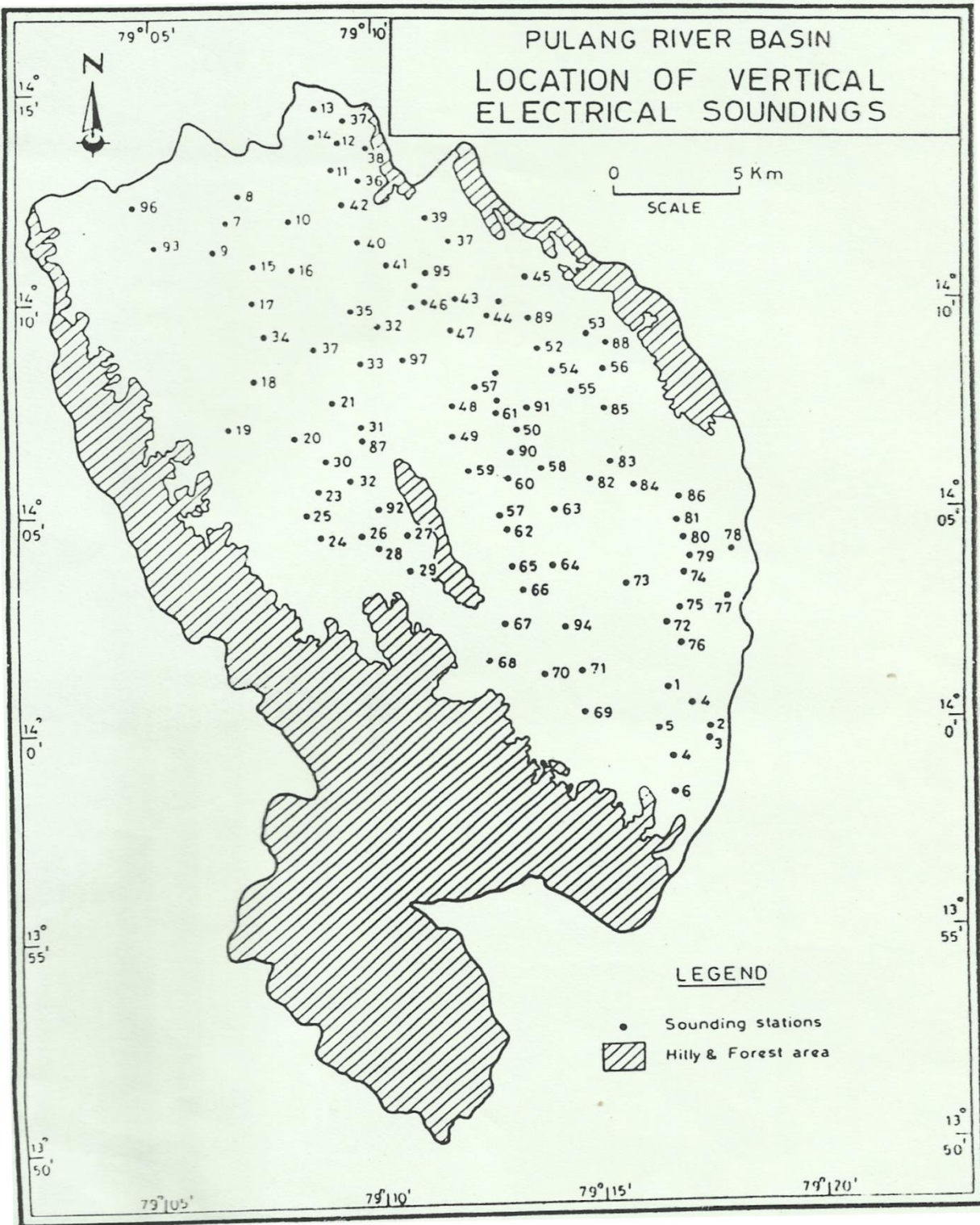


Fig.4 Location of vertical electrical resistivity soundings.

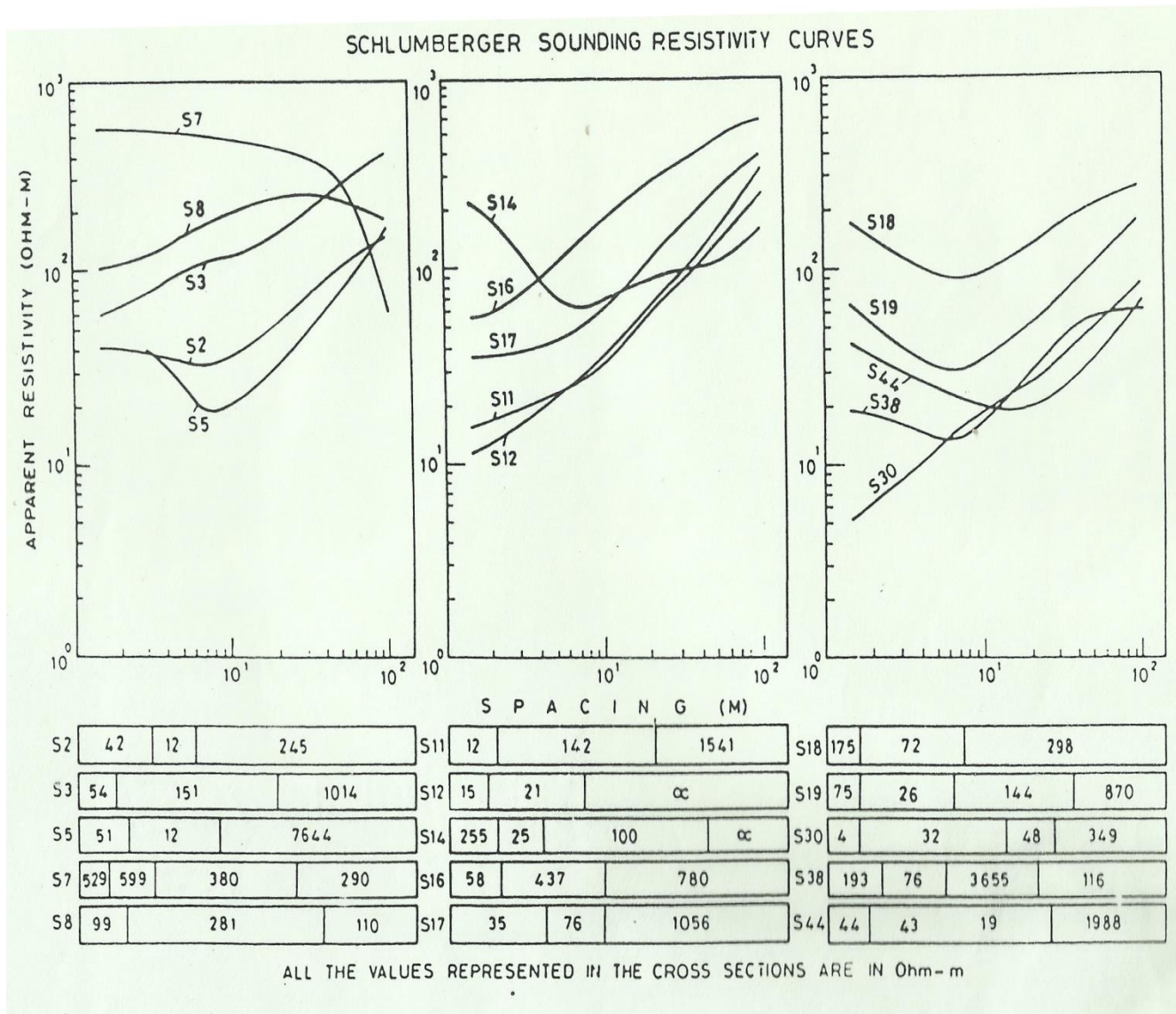


Fig.5 Schlumberger curves of electrical resistivity

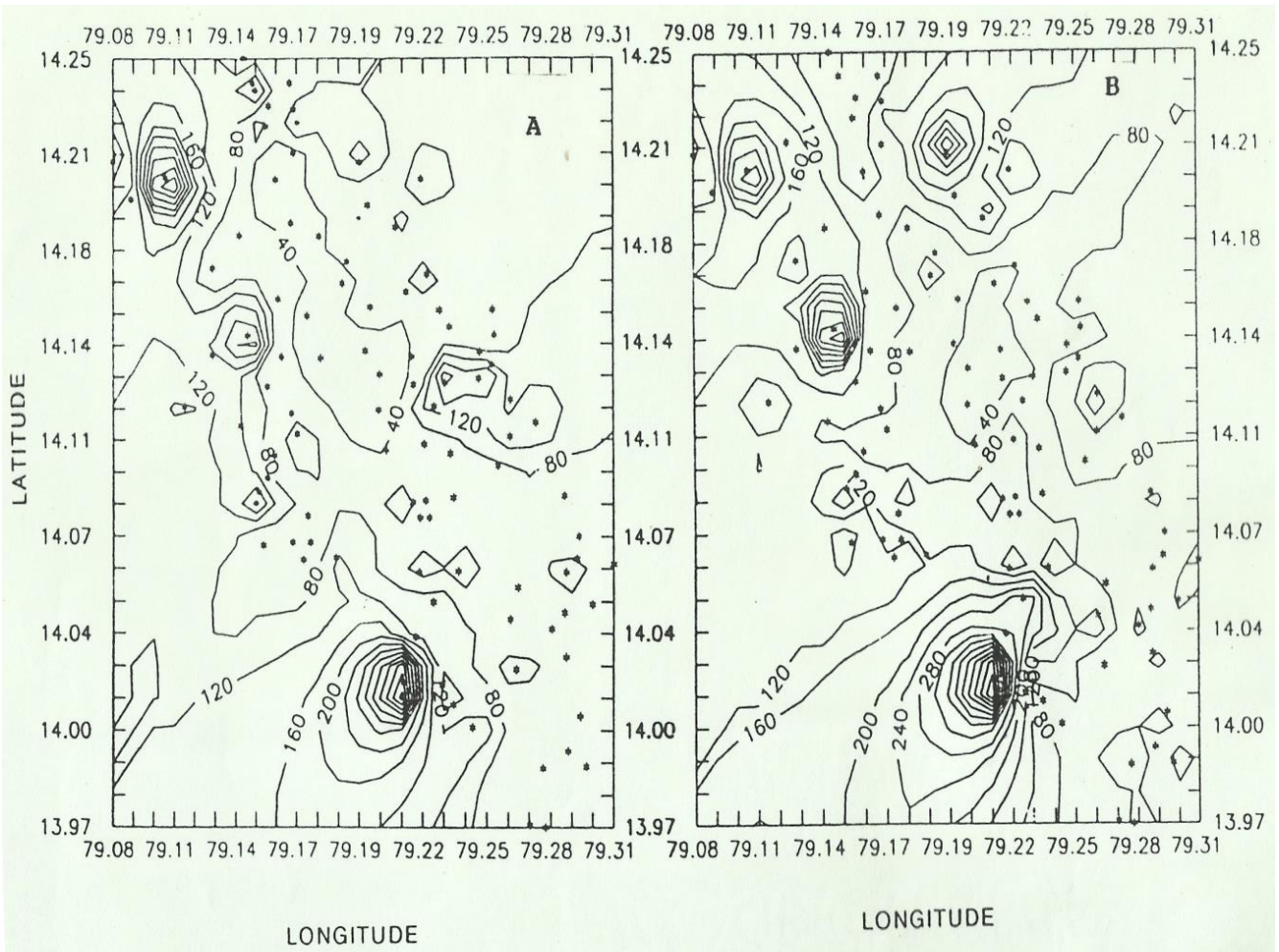


Fig.6 A & B contour maps of apparent resistivities with 1.5 & 10.0 mts electrode spacing's respectively.

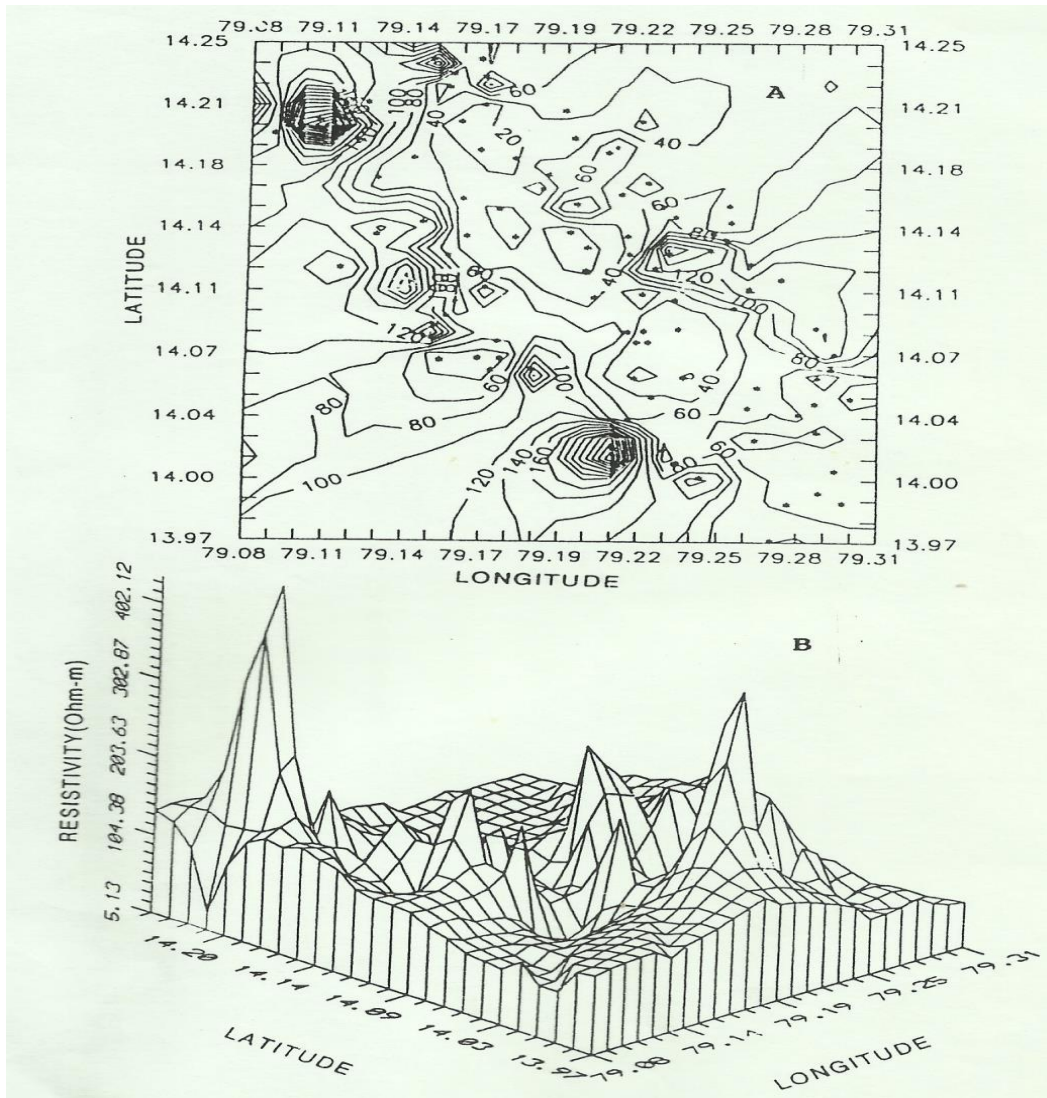


Fig.7 A & B The surface layer resistivity contours in Ohm-mts and 3D representation viewing from south-west corner respectively.

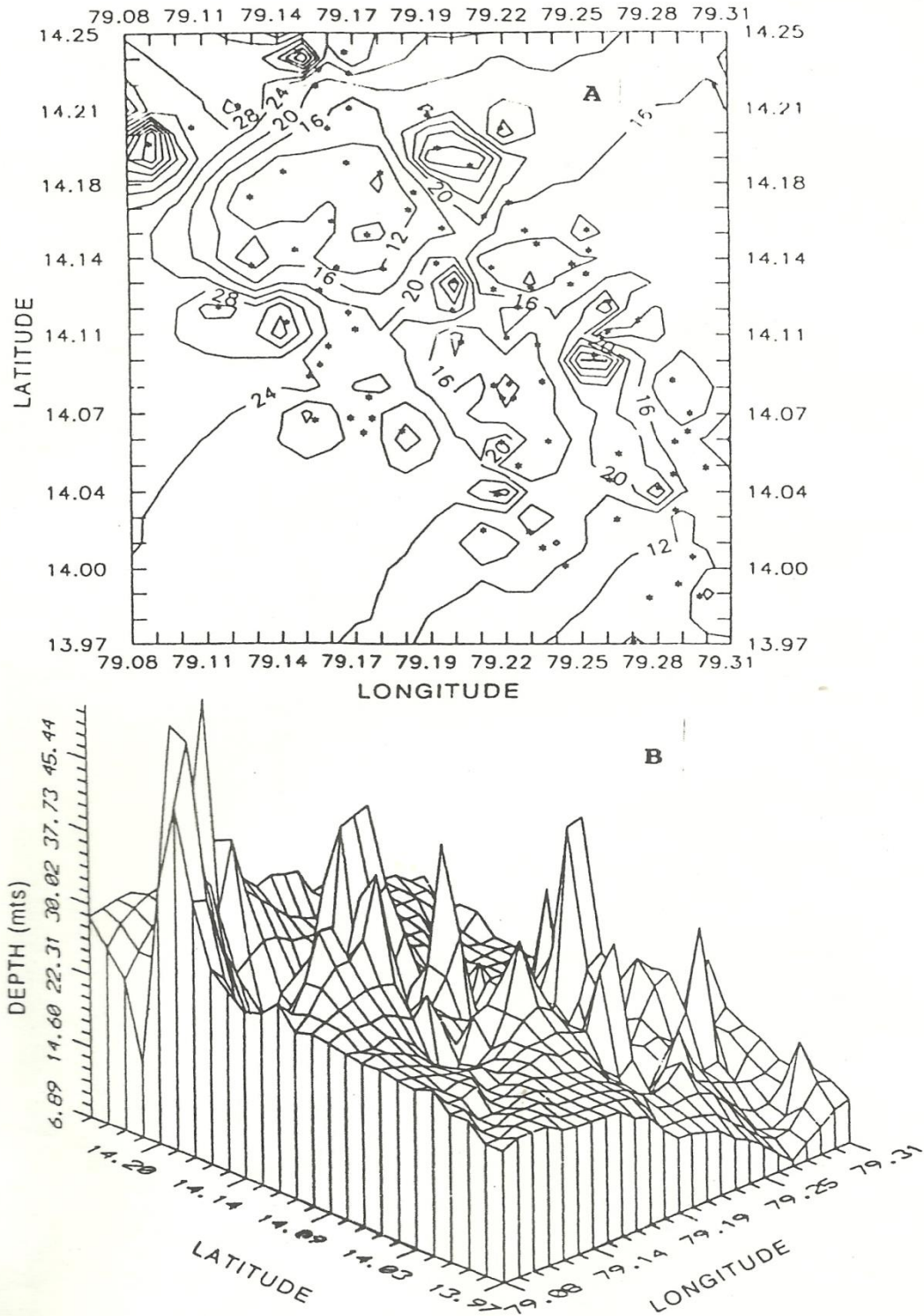


Fig. 8 A & B the bottom layer depth of contours in mts. And 3D representation viewing from south-west corner respectively.

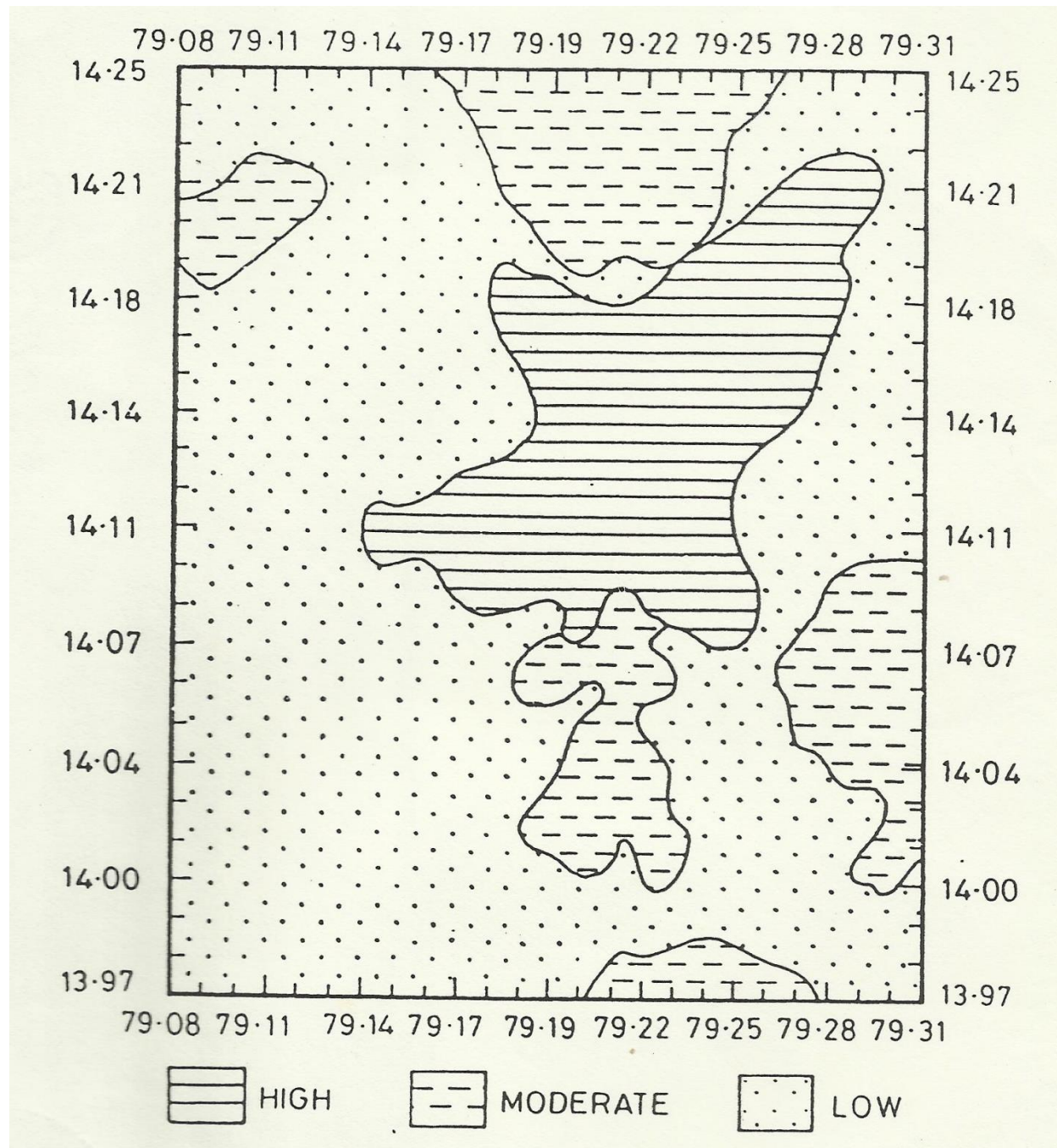


Fig.9 Delineation of ground water potential zones.

V. CONCLUSIONS

The study reveals that fractured shale with dolomitic intercalations situated in the central and NE parts of the study area are indicative of ground water potential zones. These potential zones are interestingly found to align the megalineaments which are inferred fault zones. Equally or more water potential zones are also identified in pockets of deep sandy alluvial regions all along the river course. Weathered peniplains rank next as moderate water potential zones while the hard rock

areas such as quartzites that exists in the NW and southern parts of the study area is very poor in ground water potential.

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Synthesis of Nanocarbon Powder from Sesame Oil and Its SEM Characterization

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Abstract- In this work a simple pyrolysis route to synthesis nano-carbon powder from Sesame oil is followed. The precursor sesame oil used as the source of hydrocarbon by decomposition at high temperature, is a group I vegetable oil with long chain fatty acid containing 16 or 18 carbon atoms. Experiment was performed in an open air laboratory atmosphere and sophisticated laboratory conditions such as inert gas atmosphere, isolated chamber etc are avoided. The synthesized agglomerates are subjected to Atomic Absorption Spectroscopy to investigate its chemical contents. X-ray diffraction (XRD) study is carried out to analyze the grain structure of the fabricated powder. The functional groups present in the sample is investigated by employing the Fourier Transform infrared absorption spectra (FT-IR). Extensive Scanning electron microscopic (SEM) investigations showed that the size of the nano particles were within the range of 50 nm to 70 nm. The electrical conductivity of the sample is studied by four probe method within a temperature variation ranging from 30°C to 175°C.

Index Terms- Carbon nano-material, sesame oil, Carbonisation, Pyrolysis.

I. BACKGROUND

The production and use of carbon nano-material in different scientific areas have increased unbelievably during the past few years. 'Nano-material' will be the building block of forthcoming technology with carbon being the leading member. Nano structures, with at least one dimension between 1 nm to 100 nm have attracted steadily growing interest due to their fascinating properties as well as unique applications. Within the nano regime the fundamental characteristics of the material strongly differ from that of the bulk [1]. Nowadays the researchers concentrates their investigations on the special properties of metals, semiconductors, amorphous materials, layered structures, superconductors etc., when their grain size approaches to nano-scale. The exotic properties of nano material are largely due to the quantum confinement of electrons within a nano metre sized potential well [2,13]. Also, these materials are made in a very unique way, stacked atom by atom or atomic layer by layer [3]. Nano-material can be fabricated on different ways such as sputtering, gas condensation, spray conversion processing, electron deposition, physical vapour deposition, chemical method and mechanical milling [4,5]. All these methods being promising and effective but simpler and

economical preparation methods are still the research emphasis and this work points in this direction.

The precursor sesame oil is used as a healing oil for thousands of years. In Vedas it is mentioned as excellent for humans and later the antibacterial property against common skin pathogens such as staphylococcus aureus, streptococcus aureus and many fungi are proved in different scientific studies [6,20]. Ayurvedic physicians all over the world uses this oil for the treatment of several chronic diseases including hepatitis, diabetes, migraine etc. Sesame seed oil is a potent antioxidant and will neutralize oxygen radicals [7,12].

Carbon, due to its versatility and diversity in different fields, is named as the 'king of elements'. The biochemical mechanism responsible for life are very much dependent on the role of Carbon either directly or indirectly [8,9]. Natural Carbon exists in two isotopic forms such as C₁₂ and C₁₃. The different allotropic forms of carbon are diamond, graphite, fullerenes, Carbon nanotubes and amorphous Carbon. There are some modified forms of Carbon such as diamond like Carbon, glassy Carbon and Carbon fibers [10,17].

Carbon nano-materials with its remarkable electronic and mechanical properties attracted the attention of the scientific world. Carbon served the world as electrodes, electronic components, absorbents for environmental protection or high strength carbon fibers, composites for structural applications, and now opening a new world of nanoscience and technology [11,14]. Now carbon nano-materials as layered materials, fullerenes, nanoclusters, nanofibres and nanotubes, are important tools for most of researchers all over the world. Carbon nanotubes with its immense industrial applications serve us as energy storage devices, hydrogen storage devices, sensors, electrodes for Lithium ion batteries and in electronic and communication industry[12,15]. Another industrial importance of carbon nanotube is due to its unbelievably high young's modulus[10]. Pyrolytic carbon with excellent mechanical properties such as wear resistance, fatigue resistance and bactericidal property and also being highly bio-compatible are now used for making artificial heart valves [13,19]. This paper is the result of a humble attempt by the authors to fabricate the carbon nanopowder by a simple thermal pyrolytic deposition method in normal atmospheric conditions.

II. EXPERIMENTAL PROCEDURES

The basic knowledge that the pyrolysis of sesame oil produces Carbon vapour is adopted in the experiment. Sesame oil

being a vegetable oil is a complex mixture whose primary components are triglycerols (TAGS) of saturated and unsaturated fatty acids [12]. The precursor sesame oil has a percentage composition of oleic acid 45, linoleic acid 41 and polyunsaturated fatty acids in trace[13,21]. Pyrolysis is carried out with different source substrate separation. In each case rate of evaporation, amount of carbon produced, approximate grain size, etc. are analyzed. Finally substrate is localised in position giving minimum rate of evaporation and producing carbon with lowest grain size. Since the experiment is performed in open air atmosphere, highly hygienic laboratory condition is ensured. The oil is burnt in a small pot with the help of highly cleaned cotton thread medium. To restrict the carbon vapour in upward direction a cylindrical chimney made of aluminium sheet is used. A glass substrate is used to deposit the Carbon vapor. The distance from the flame to the substrate is adjusted as 1.5 m to deposit particle of lowest size. The presence of oxygen as a component in the reaction system, making possible the formation of carbon monoxide reduces the tendency to deposit non fibrous carbonaceous material [11,15]. During pyrolysis the sesame oil decomposes and reacts forming clusters on which carbon nano material including carbon nano tubes may nucleate and grow [12]. To get appreciable deposition substrate is exposed 7 to 8 hours to the flame.

The prepared sample is soaked in 100 ml of 1M HCl and heated at 80°C for 20 minutes. After cooling at room temperature for 24 hours it is filtered and then washed with distilled water five times. Finally it is rinsed with acetone to remove the traces of water and then dried in oven at 120 °C for 24 hrs. This purified sample is subjected for characterization studies.

III. RESULTS AND DISCUSSION

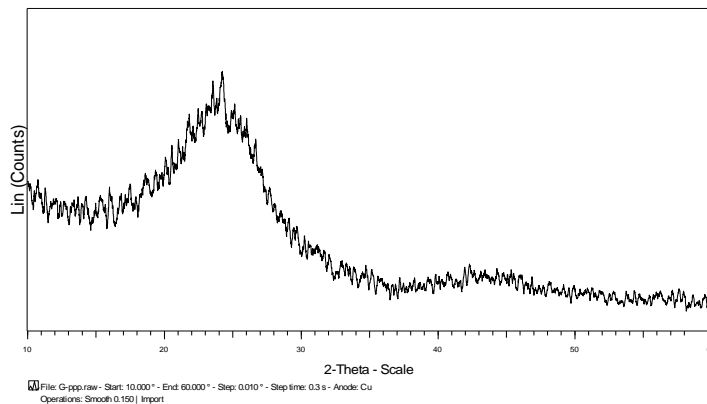
3.1. Atomic Absorption study

Atomic absorption analysis of the purified sample is carried out by an Australian Make AA-20 Atomic Absorption Spectrometer. The analysis of data gives knowledge about its various contents as Calcium 76 mg/kg, Magnesium 50 mg/kg, Iron 51 mg/kg, Manganese 2.3 mg/kg and Potassium 162 mg/kg. This quantifies that the sample is 99.9% pure in Carbon.

3.2. XRD analysis

The X-ray diffraction (XRD) study was conducted by a Bruker AXS D 5005 X-ray diffractometer, using Cu- α radiation filtered by a graphic monochromator at a setting of 40 KV and 130 mA. The X-ray diffraction pattern obtained is shown in Fig. 1.

The absence of peaks in the spectrum clearly indicates the absence of long range order. The broad hump observed around 20-22° is a characteristic of disordered Carbon [16].



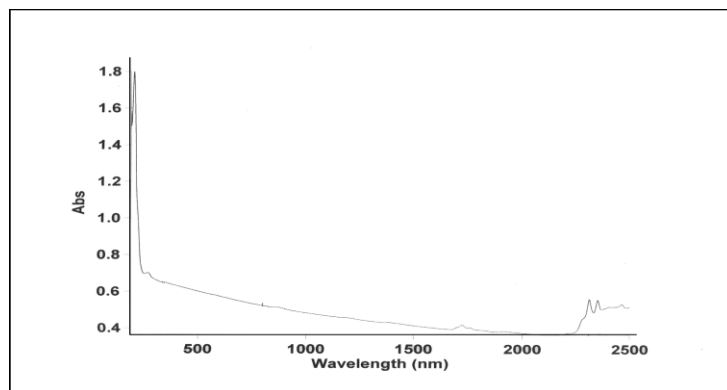
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Figure 1: XRD Pattern of the Sample

3.3. UV-vis-NIR Spectral analysis

UV-visible-NIR Spectroscopy of the sample is done in solid phase using Nujol Mull in the region 190 nm to 2550 nm. The analysis is carried out by a Varian-Carry 5000 spectrophotometer. The figure below depicts the UV-vis-NIR spectrum of sample. No major absorption peaks are observed in this range and the only peak available at 203.2 nm is due to the solvent (nujol). This also indicates the purity of the sample.

Figure 2: UV-visible-NIR Absorption Spectra of Sample



The minor peaks of absorption around 1725 nm indicates the presence of C=O (ketone) and at 2300 nm and 2350 nm is due to the presence of C≡N.

3.4. FT-IR Analysis

The FT-IR spectrum of sample in the form of KBr pellets is analyzed by a FT-IR spectrophotometer, Thermo Nicolet-AVATAR370-GTGS. The graph is plotted with wave numbers on X axis and percentage of transmittance on Y axis.

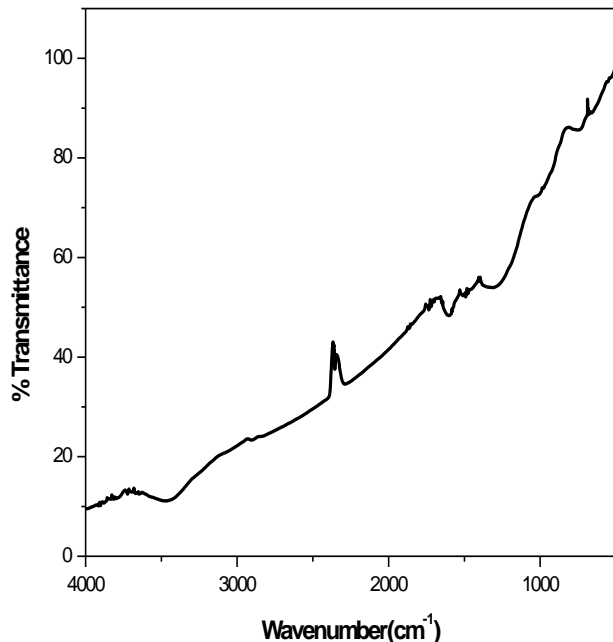


Figure 3: FT-IR Spectra of Sample

Analysis of the spectrum shown in Fig. 3 indicates no major absorption bands. However minor bands at 3473.43 cm^{-1} are connected with ν (O–H) vibrations in hydroxyl groups present in the sample [16]. This is due to the moisture content in the sample. The weak band defined at 1598.41 cm^{-1} is due to ν (C=C) vibrations. Also the absorption indicated at 2282 cm^{-1} leads to the presence of C≡N stretching .

3.5. Scanning electron microscopic study

The surface morphology of the synthesized sample was characterized by scanning electron microscopy. Low and high magnification images are presented in figure 4. Synthesized particles are found as almost identical spherical particles with uniform morphology.

Fig. 4 shows typical SEM image of Carbon film grown in this study recorded by the JEOL-JSM 5600 LV instrument with an accelerating voltage of 15 KV.

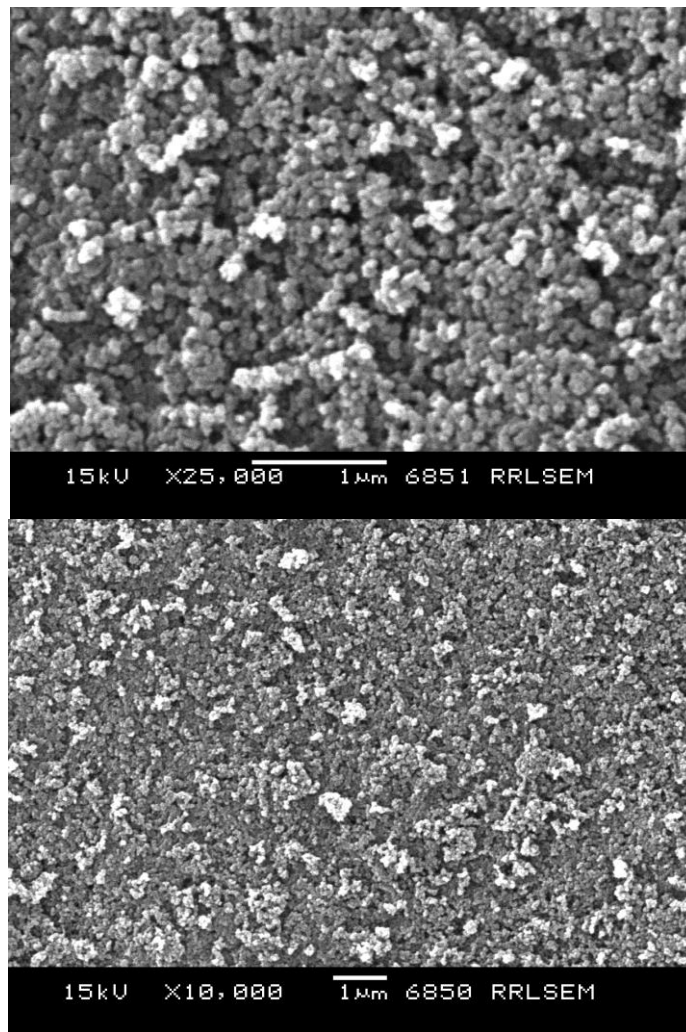


Figure 4: SEM micrograph of the sample

The particle size calculated from the SEM micrograph ranges from 60 nm to 70 nm and is well within the nano regime .

3.6. Electrical conductivity studies

The conductivity study is carried out by measuring the resistivity by conventional four probe method. The resistivity is measured within a temperature variation ranging from 30°C to 175°C. . A graph is plotted between the logarithm of resistivity with inverse of temperature . The plot is shown in Fig. 5.

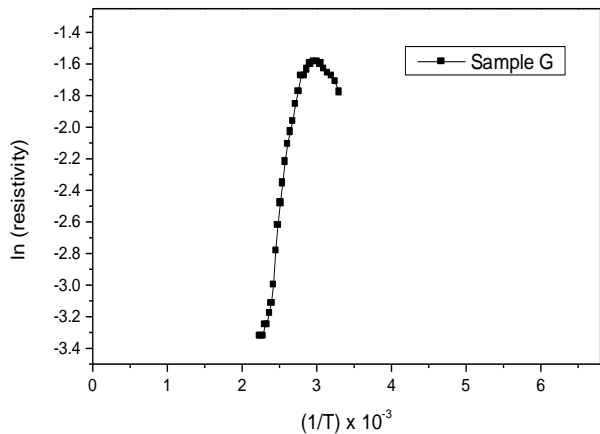


Figure 5: Resistivity of Sample as a Function of Inverse of Temperature

The resistivity of the sample is found to vary from 0.03604 Ω -m to 0.2048 Ω -m within the temperature variation from 30°C to 175°C. The initial decrease in conductivity with increase in temperature as observed in the Figure is due to the moisture content in the sample [18]. After this region the sample behaves as a perfect semiconductor with an increase in conductivity with temperature.

IV. CONCLUDING REMARKS

To conclude, our humble attempt is to demonstrate, nanoparticle is not only the result of complicated reactions and sophisticated laboratories but it can also be prepared by simple means in normal atmospheric conditions. The atomic absorption analysis study proves the purity of the prepared sample. Also the XRD line profile analysis clearly indicates the absence of long range order in the deposited carbon powder. The FT-IR spectra points towards the presence of hydroxyl groups, C=C stretching and C≡N bending. SEM micrograph analysis proves Carbon powder consists of quasi spherical particles and the particle size is well within the nano regime and it ranges from 50 nm to 70 nm. Finally in the electrical property studies, the sample confirms its semiconducting behaviour. Further studies on the antibacterial and wound healing properties of carbon material prepared from sesame oil is to be continued.

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Nutrient Benefits of Quail (*Coturnix Coturnix Japonica*) Eggs

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Abstract- Cross-sectional study of quail eggs was conducted to evaluate the nutritional compositions of carbohydrate, fat, protein, calories, vitamin, minerals and sex hormones. The results showed that average of each whole quail egg weight was 10.67 g. Their contents of ash, carbohydrate, fat, protein and moisture were 1.06, 4.01, 9.89, 12.7 and 72.25 g 100g⁻¹, respectively. Total energy in calories obtained was 156.50 kcal 100g⁻¹ whole egg. The most essential amino acid found in egg whites, was leucine and the most non-essential amino acid was aspartic acid. Egg yolks contained the highest essential fatty acid content of linoleic acid and the highest non-essential fatty acid content of oleic acid. In addition, there was high content of vitamin E in egg yolks and sex hormone progesterone in both of egg yolks and whites. The most essential and trace minerals of whole eggs were nitrogen and iron. Iron was high content in egg whites meanwhile nitrogen and zinc were found high in egg yolks. This study indicated that quail eggs contained high nutritional contents of amino acids, fatty acids, vitamin E, sex hormone P and minerals of nitrogen, iron and zinc. Quail eggs are the good source of nutrients for human health.

Index Terms- Quail egg, nutritional compositions, benefit

size, their nutritional value is three to four times greater than chicken eggs. Regular consumption of quail eggs helps fight against many diseases which is a natural combatant against digestive tract disorders such as stomach ulcers. Quail eggs strengthen the immune system, promote memory health, increase brain activity and stabilize the nervous system. They help with anemia by increasing the level of hemoglobin in the body while removing toxins and heavy metals (Troutman, 1999-2012). Chinese use quail eggs to help treat tuberculosis, asthma, and even diabetes. Quail eggs can help prevent sufferer of kidney, liver, or gallbladder stones and remove these types of stones. The nutritional value of quail eggs is much higher than those offered by other eggs with they are rich sources of antioxidants, minerals, and vitamins, and give us a lot of nutrition than do other foods (Lalwani, 2011). It may consume about 2 quail eggs in a day. But there were argued in nutrient information of quail eggs cause of lack of scientific data. Thus, this study aimed to evaluate nutritional compositions of carbohydrate, fat, protein, calories, vitamin, mineral and sex hormone contents of Thai quail eggs. The idea that may resolve the world food problem for developing countries. The limited knowledge of Western science about food is over shadowed by the centuries.

I. INTRODUCTION

Good nutrition affects growth and development of human body. Nutritional composition research has shown that eating a well-balanced food can improve human health. A variety of foods, including vegetables, fruits, grain, and protein, is essential to get the full range of nutrients for good health. The right balance of calories, protein, fat, carbohydrates, vitamins, and minerals provides energy, and the variety of nutrients growing children and working adult need. Foods that are high in fat, sugar, or salt, should be limited, they do not provide important nutrients. Both Child and Adult Care Program (CACFP) meal pattern and the Pyramid Web site by US Department of Agriculture, Food and Nutrition Service, encourages eating a variety of foods (US Department of Agriculture, Food and Nutrition Service, 2005). Egg consumption is a popular choice for good nutrients which they are variety of chicken, duck, roe, and caviar, but by a wide margin the egg most often humanly consumed is the chicken egg, typically unfertilized (Applegate, 2000). Besides, a lot of people especially in Asian countries consume quail eggs (or *Kai Nok Kra Tha*, Thai name) which previous study reported that quail eggs are packed with vitamins and minerals even with their small

II. MATERIALS AND METHODS

2.1. Samples collection

Quail egg (*Coturnix coturnix japonica*) samples were collected from local markets in Ayutthaya province. Triplicate samplings of eggs were conducted, and Eggs samples were carefully handled in an ice-box, and transported to the laboratory. They were kept in the refrigerator (@ 7°C) before analyses.

2.2. Samples preparation and analyses for chemical compositions, amino acids, fatty acids and vitamins

Egg sample was weighed for whole, and separated for egg whites, and egg yolks, respectively. Egg samples were separately homogenized by a laboratory blender (Moulinex A327, France), and subjected to proximate analyses (Shapiro, 1995a, 1995b; AOAC, 2007), profiles of amino acids were determined by acid hydrolysis and derivatization prior analysis by GC-FID detection (Robert and Sarwar, 2005), fatty acids profiles by methylation prior analysis by Capillary GC detection (Ratnayake *et al.*, 2006). Vitamin analysis was conducted by saponification and liquid extraction of organic solvents with HPLC-Fluorescence detection (DeVries, 2005). All analyses were

performed by a certified laboratory (ALS Laboratory Group Co.,Ltd., Bangkok).

2.3 Minerals analyses

All samples were oven dried before ashing at 550 °C. for 5 hours. Addition of 20 mL of 1 N hydrochloric acid (HCl) followed by qualitative and quantitative analysis by Inductively Couple Plasma (ICP) (Allen, 1971) for phosphorous (P), potassium (K), calcium (Ca), magnesium (Mg), iron (Fe), manganese (Mn), copper (Cu), zinc (Zn) and nitrogen (N) analysis (Allen, 1945).

2.4 Sex hormones analyses

Whole egg samples were separated for egg whites and egg yolks, and they were homogenized. Each sample was weighed for 5.0 g of each and 50.0 ml of hexane was added for a 3-minute extraction in a mixer (Vortex Genie 2 TM, Scientific Industries, INC, BOHEMIA, N.Y.11716, USA). Solvent of the extract was evaporated in nitrogen gas. Sample extracts were soluble in phosphate buffer (pH 7.0): dimethylsulfoxide (DMSO) (1:1, vol/vol) before determinations of sex hormones of LH (Luteinizing Hormone), FSH (Follicle Stimulating Hormone), P (Progesterone), E2 (Estradiol), T (Testosterone) by ECLIA (Electrochemiluminescence immunoassay, method (Xin et al., 2012) using Roche Diagnostics kits and PRL (Prolactin) by IFMA (Time-resolved fluoroimmunoassay) method (Diamandis, 1988) using PerkinElmer Life and Analytical Sciences kit. The

hormonal analyses were performed by reference laboratory of King Chulalongkorn Memorial Hospital, Bangkok.

2.5. Data analyses

Statistical analyses of the results were carried out using descriptive statistical analysis and compared with One-Way ANOVA: Post Hoc Multiple Comparison (LSD) between egg groups (whole eggs, egg whites and egg yolks). Mean differences were considered statistical significant. All statistical analyses performed by SPSS for window version 17.0.

III. RESULTS AND DISCUSSION

3.1 Nutritional compositions of whole quail eggs, egg whites, and egg yolks

Whole quail eggs were 10.67 g egg⁻¹ in weight. Their contents of ash, carbohydrate, fat, protein and moisture were 1.06, 4.01, 9.89, 12.7, and 72.25 g 100g⁻¹, respectively. Energy obtained from whole eggs was 156.50 kcal 100g⁻¹ (Fig. 1). Most of nutrients determined in egg yolks were significantly higher in contents than those of egg whites ($p < 0.001$). There was highest protein (N * 6.25) content in egg whites. The nutrient compositions of quail eggs showed higher ash, carbohydrate (include dietary fiber), fat, protein and calories in egg yolks. This study resulted that good nutrients should be more in egg yolks.

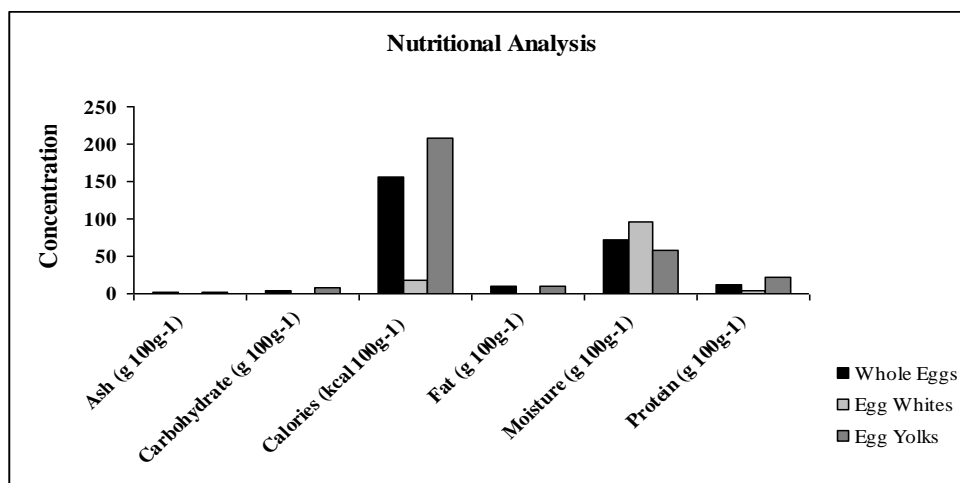


Fig. 1. Nutritional compositions of whole quail eggs, egg whites, and egg yolks.

3.2 Profile amino acids of quail egg whites

The most essential amino acid (EAA) of egg whites were leucine (1139.0 mg 100g⁻¹), valine (869.5 mg 100g⁻¹) and lysine (790.0 mg 100g⁻¹) (Fig. 2). Leucine is a branched chain amino acid along with valine and isoleucine. It is beneficial and functional to protein structure for 60-70% in human body, and blood sugar level regulation which maintains a balance of insulin and glucose (Khan, 1999-2012). It proposed as a promising pharmaconutrient in the prevention and treatment of sarcopenia and/or type 2 diabetes (van Loon, 2012). Valine is required for muscle metabolism, repair and growth of tissue and maintaining the nitrogen balance in the body. Valine also assists to regulate

blood sugar and energy levels (Vitalhealthzone, 2007a). While lysine is required for growth and bone development in children, assists in calcium absorption and assists in maintaining the correct nitrogen balance in the body, as well as maintaining lean body mass. Lysine is also needed to produce antibodies, hormones, enzymes, collagen formation as well as repair of tissue (Vitalhealthzone, 2007b). The body consists of the branched chain amino acids, their effects are synergistic when they were taken together. The total EFA (5486.5 mg 100g⁻¹) and total NEFA (5297.0 mg 100g⁻¹) were not significant different concentration.

While most of non-essential amino acid were aspartic (1488.0 mg 100g⁻¹), alanine (739.0 mg 100g⁻¹) and serine (665.5

mg 100g⁻¹). Aspartic acid is plays a vital role in energy production while alanine plays a key role in maintaining glucose levels in the body by helping the body to convert glucose into energy. Alanine also eliminates excess toxins from the liver (Vitalhealthzone, 2007c, 2007d). They are good health which

both NEAA and EAA should be considered in the classic “ideal protein” concept or formulation of balanced diets to maximize protein accretion and optimize health in animals and humans (Wu, 2010). The total of EAA and NEAA in this study were not significantly different.

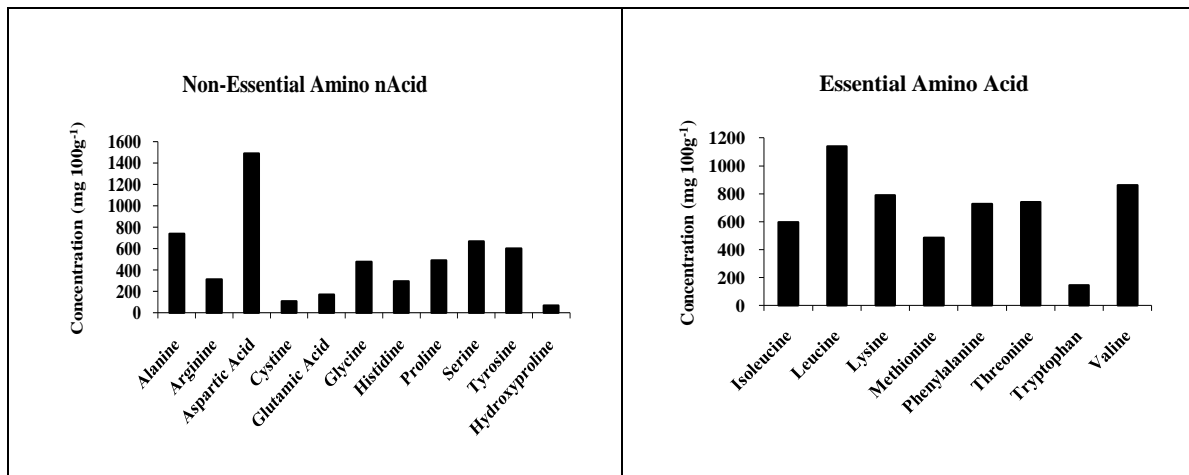


Fig. 2. Profiles of NEAA (left) and EAA (right) amino acids of quail egg whites

3.3 Profile fatty acids of quail egg yolks

The most essential fatty acid (EFA) in egg yolks were linoleic acid (2.58 g 100g⁻¹), docosahexaenoic acid (0.50 g 100g⁻¹) and arachidonic acid (0.44 g 100g⁻¹) (Fig. 3) which they were UFA. While most non-essential fatty acid (NEFA) in egg yolks were oleic acid (8.84 g 100g⁻¹), palmitic acid (5.13 g 100g⁻¹) and stearic acid (2.03 g 100g⁻¹). Total NEFA (17.09 g 100g⁻¹) was higher than EFA (3.70 g 100g⁻¹). Linoleic acid must be consumed for proper health which effects on body composition. A diet only deficient in linoleate causes mild skin scaling, hair loss (Cunnane and Anderson, 1997) and poor wound healing in rats (Ruthig and Meckling-Gill, 1999). Docosahexaenoic acid (DHA) is essential for the growth, visual and functional development of the brain in infants and has a positive effect on diseases such as hypertension, arthritis, atherosclerosis, depression, adult-onset diabetes mellitus, myocardial infarction, thrombosis, and some cancers (Hrrocks and Yeo, 1999; Craig, 2005). Arachidonic acid is a polyunsaturated omega-6 fatty acid 20:4(ω-6). Along with omega-3 fatty acids, omega-6 fatty acids play a crucial role in brain function (Wang *et al.*, 2006; Fukaya *et*

al., 2007; Rapoport, 2008) as well as normal growth and development (Auestad *et al.*, 2001; Clandinin *et al.*, 2005; Leu and Schmidt, 2008). Also known as polyunsaturated fatty acids (PUFAs), they help stimulate skin and hair growth, maintain bone health, regulate metabolism, and maintain the reproductive system (Watkins *et al.*, 2001; Remans *et al.*, 2004; Kirby, 2004). Total NEFA of quail egg yolks was higher than total EFA for 4.6 folds. In addition, quail egg yolks were higher UFA level than SFA for 1.79 folds. This result showed even quail eggs have high fat but most of them were UFA which was better for health. The quail eggs had low trans fatty acid which was bad for human health. Consuming trans fat increases low-density lipoprotein (LDL, or "bad") cholesterol. Food manufacturers in the United States and many other countries list the trans fat content on nutrition labels. They recommended a limit of less than 0.5 grams of trans fat per serving (CDC, 2012). The Dietary Guidelines for Americans (DGA) recommend that individuals keep trans fatty acid consumption as low as possible (US. Department of Agriculture and US. Department of Health and Human Services, 2010).

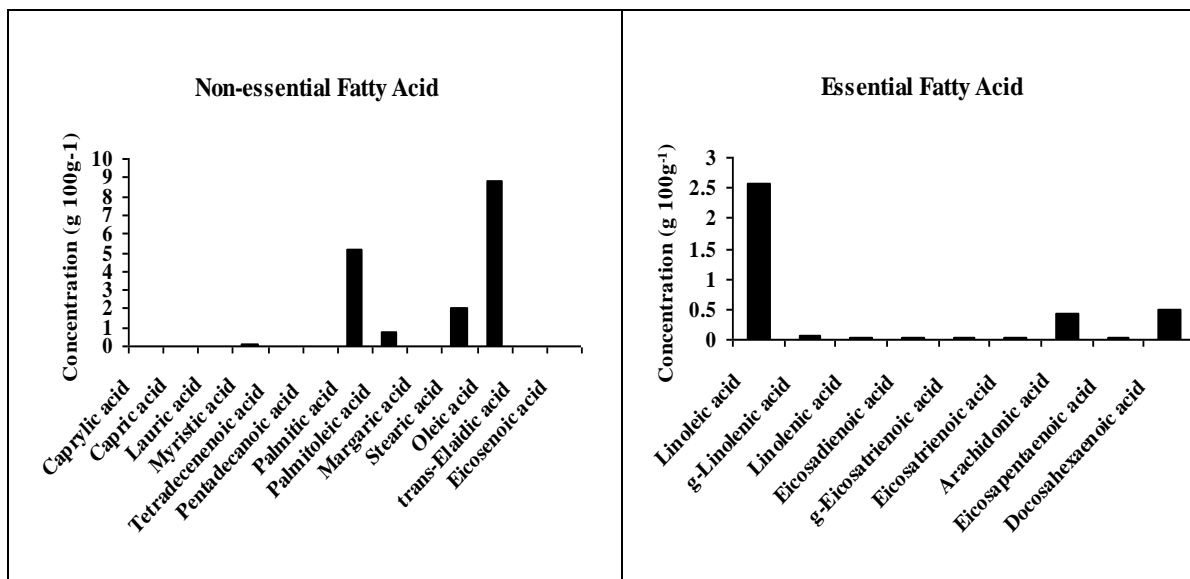


Fig. 3. Profiles of NEFA (left) and EFA (right) amino acids of quail egg yolks

Total unsaturated fatty acid (UFA, 13.3 g 100g⁻¹) was composed of monounsaturated fatty acid (MUFA, 9.64 g 100g⁻¹) and polyunsaturated fatty acid (PUFA, 3.68 g 100g⁻¹) which was

higher than total saturated fatty acid (SFA, 7.41 g 100g⁻¹) (Fig. 4). The UFA to SFA ratio was 1.79.

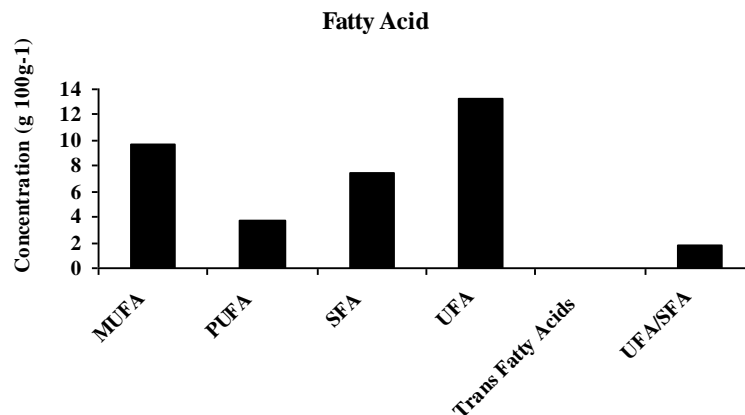


Fig. 4. Fatty acids of quail egg yolks

3.4 Vitamins of quail egg yolks

The most fat soluble vitamins of egg yolks were vitamin E (tocopherol, 5920.0 µg 100g⁻¹) which was significantly higher than vitamin A (717.0 µg 100g⁻¹, $p < 0.001$) and vitamin D (1.14 µg 100g⁻¹, $p < 0.001$) (Fig. 5). The most vitamin of egg yolks was vitamin E but was low vitamin A and D which was different from previous study which reported that egg yolk is one of the few foods naturally containing vitamin D (NRC, 1976). Vitamin E is a fat-soluble vitamin with antioxidant properties. Vitamin E exists in eight different forms (isomers): alpha-, beta-, gamma-, and delta-tocopherol; and alpha-, beta-, gamma-, and delta-tocotrienol but alpha- is the most active form in humans. It has been proposed for the prevention or treatment of numerous health conditions, often based on its antioxidant properties. Its supplementation was linked to a 24% lower risk of cardiovascular death (Lee *et al.*, 2010) and 26% reduced the risk

of major cardiac events among women ages 65 and older (Harvard School of Public Health, 2012). Vitamin E might be involved: heart disease (Knekt *et al.*, 1994; Glynn *et al.* 2007; Traber, 2007), cancer (Weitberg and Corvese, 1997; Lee *et al.*, 2005), eye disorders (Leske *et al.*, 1998; Jacques *et al.*, 2005) and cognitive decline (Sano *et al.*, 1997; Morris *et al.*, 2002; Kang *et al.*, 2006). Evidence suggests that regular use of high-dose vitamin E supplements may increase the risk of death from all causes by a small amount, although human research is conflicting. Caution is warranted (Miller *et al.*, 2005; Bjelakovic *et al.*, 2007; Mayo Clinic, 2011).

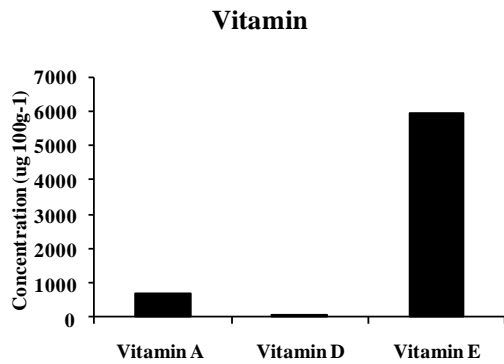


Fig. 5. Vitamin A, D and E of quail egg yolks

3.5 Minerals of contents of quail eggs

The most essential mineral of whole eggs was nitrogen (6.36 %) which it was mostly in egg whites (12.2 %) (Fig. 6). While most of trace mineral of whole egg were iron (80.8 mg L⁻¹) and zinc (46.9 mg L⁻¹). Both of iron (116.0 mg L⁻¹) and zinc (70.6 mg L⁻¹) were higher in egg yolks. Nitrogen functions as the component of nucleic acids, proteins, hormones, coenzymes (Soetan *et al.*, 2010). It is especially important is during pregnancy. The global nitrogen cycle changes affect human health well beyond the associated benefits of increased food production (Townsend *et al.*, 2003). In addition, most trace minerals in whole eggs were iron and zinc which were higher in egg yolks. Iron has many functions in the body and is also important for maintaining a healthy immune system which is essential for blood to work efficiently. Iron functions as

haemoglobin in the transport of oxygen. Iron deficiency is not uncommon among athletes, especially long distance runners which can cause of fatigue among these athletes. If the lack of iron in our bodies is severe, we can get iron deficiency anemia. Iron deficiency anemia is probably the most common nutritional disease in the world, affecting at least five hundred million people (Mineral Information Institute (Soetan *et al.*, 2010, Mineral Information Institute, 2012). Zinc is involved in well over one hundred different reactions in the body. Some of these reactions help the bodies construct and maintain DNA, the molecule that controls how every single part of our bodies is made and works. It is also needed for the growth and repair of tissues throughout our bodies (Debjit Bhowmik and Sampath Kumar, 2010; Mineral Information Institute, 2012). This extremely important element is used to form connective tissue like ligaments and tendons. Teeth, bones, nails, skin and hair could not grow without zinc. The enrichment of zinc would be benefit for reduction of diarrhea and pneumonia mortality in children (Haider and Bhutta, 2009; Yakoob *et al.*, 2011). The previous study presented its biological role in homeostasis, proliferation and apoptosis and its role in immunity and in chronic diseases (Chasapis *et al.*, 2012). Toxicity disease or symptoms of zinc in humans include gastrointestinal irritation, vomiting, decreased immune function and a reduction in high density lipoprotein (HDL) cholesterol. Higher dietary levels of Zn are required in the presence of phytic acid to prevent parakeratosis and allow for normal growth (Sidhu *et al.*, 2004). The optimum dietary level for the individual elements required for humans is very difficult to clarify cause of each variation of physiological response.

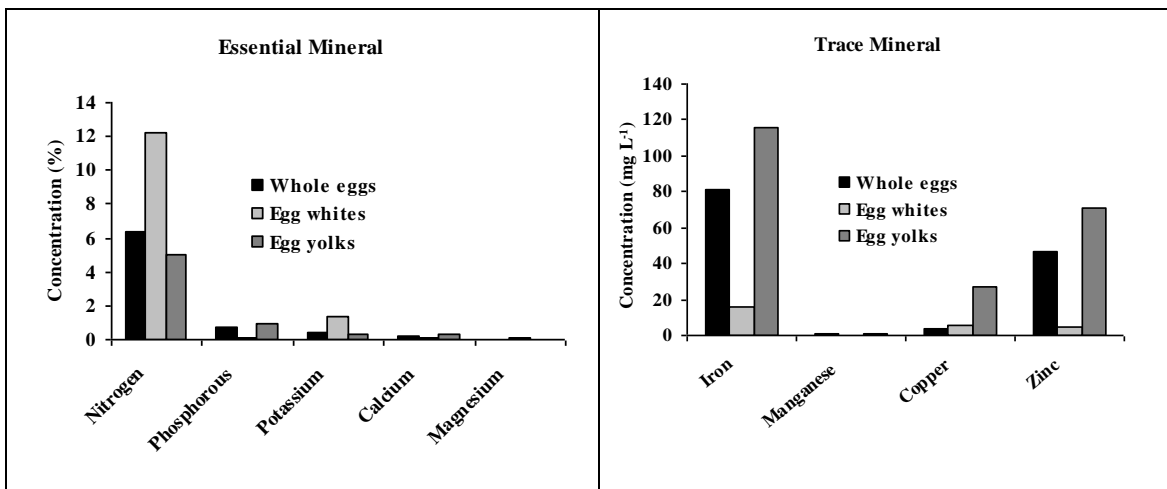


Fig. 6. Essential minerals (left) and trace minerals (right) contents of quail eggs

3.6 Sex hormones of quail eggs

The most sex hormone of whole eggs was P (318.8 ng g⁻¹) which was both high in egg whites (321.9 ng g⁻¹) and egg yolks (307.8 ng g⁻¹) (Fig. 7). And a little T of whole eggs was 3.1 ng g⁻¹ which was higher in egg yolks (4.3 ng g⁻¹) than in egg whites (1.9 ng g⁻¹). Sex steroids are pleiotropic hormones that act on multiple targets including the central nervous system, bone, reproductive organs, and the immune system among others. Sex

hormones influence the development, maturation, activation and death of immune cells (Verthelyi, 2001). The result showed that the most sex hormone of whole eggs was P which was both higher in egg whites and yolks. Hormone P are benefit for antidepressant, balancing blood sugar level, decreasing PMS and menopause symptoms and weight loss (Daniel, 2010). But quail eggs had low T which low testosterone levels lead to many problems for both genders such as reduced sexual drive, sexual

dysfunction, infertility, irritability, mood swings, depression, reduced concentration, and sense of well being and prostrate and testicular diseases in men (NSI, 2011). Men and women both possess testosterone hormones; however, the levels are different in both. Some studies also show that low levels of testosterone

lead to the onset of Type 2 diabetes. The result of sex hormone from this study should be better for women and this result approved that quail eggs were not high male sex hormone of T.

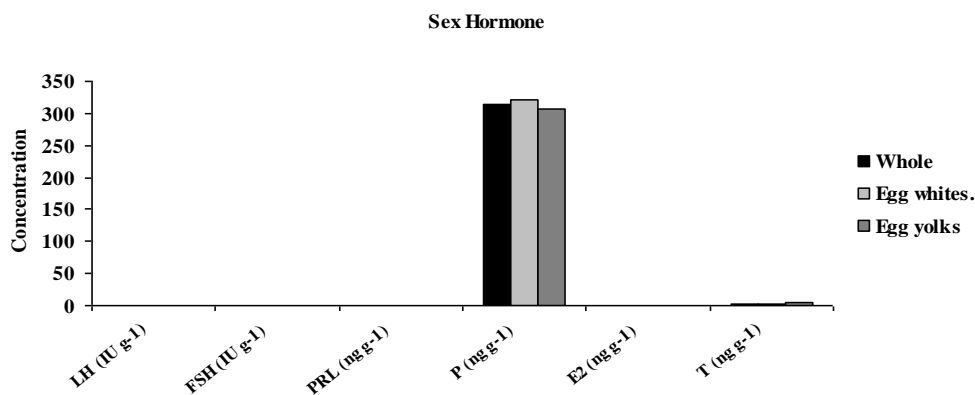


Fig. 7. Sex hormones contents of whole quail eggs, egg whites, and egg yolks.

Overall, quail eggs have both essential and non-essential nutrients which most of them were benefit for human health. The total calories were 156.50 kcal 100g⁻¹ for human body using for function and maintenance of organ. Health benefits may be good for anti cancer effects and inhibits cancerous growth, straightens immune system by stunning aging in organs, helps to prevent anemia by promoting hemoglobin, is a remedy to gastritis and stomach ulcers as many reports (Ye *et al.*, 1999; Lalwani, 2011; Squidoo, 2012).

IV. CONCLUSION

There were many nutrient benefits of quail eggs which most of them as good sources of protein, fat, vitamin E, minerals (nitrogen, iron and zinc) and sex hormone P. Thus, we should educate or transfer knowledge to people for good nutrient benefits of quail eggs as good nutritional foods and may be the alternative resolving problem of people in some or all nutritional nutrients necessary for human health in developing countries and may be a good potential to resolve “World Food Problem”.

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Hypothesis: Morphology & Development of Patella

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Abstract- A Sesamoid bones are embedded in tendons, and are essentially hardened calcifications of the tendon itself. The largest sesamoid bone in the human body is the patella, which lies suspended in between the quadriceps tendon above and the patellar tendon below. They are found in locations where a tendon passes over a joint, such as the hand, knee, and foot. Functionally, they act to protect the tendon and to increase its mechanical effect, The presence of a bone serves to hold the tendon slightly further away from the centre of the joint this increases its movement, and stops the tendon from flattening into the joint. This differs from menisci, which are made of cartilage and rather act to disperse the weight of the body on joints and reduce friction during movement. There are two sesamoid bones in the thumb, within the adductor pollicis and abductor pollicis brevis tendons, and one in each forefinger and one in each wrist. Each foot also has two sesamoid bones in the ball of the foot, at the base of the big toe, both located within the flexor hallucis brevis tendon. About 2% of the population have a congenital condition in which each sesamoid bone is separated into two parts this condition, known as bi-partite sesamoid bones, can also be caused by trauma, such cases are rare.² The tendency to form sesamoids may be linked to intrinsic genetic factors. Evolutionary character analyses suggest that the formation of these sesamoids in humans may be a consequence of phylogeny, observations indicate that variations of intrinsic factors may interact with extrinsic mechanobiological factors to influence sesamoid development and evolution.³ The sesamoid bones are primarily made of trabecular bone, also called cancellous bone or spongy bone.

Index Terms- Sesam, Patella, Fabella, Sesamoid bones, Morphology

I. INTRODUCTION

The sesamoid bones(ossa Sesamoidea)⁴They are more frequent in hands and feet fingers near the phalanxes⁵ and the most common is the patella. In humans we can find about 46 sesamoid bones.³ In knee joint we can find the fabella, placed inside the tendon of the lateral head gastrocnemius muscle, in posterior part of the lateral condyle femur.⁶In fabella one of the structural changes is the presence of the fabellofibular ligament is the form of short collateral ligament.⁷The arcuate and fabellofibular ligaments are structures that contribute with the stabilization of knee joint together with the tendon of the popliteus muscle⁸the posterior-lateral compartment of the knee stabilized by popliteo fibular ligament^{8,9}Those ligaments an important function in the stabilization during the rotatory movements of the knee¹⁰ histologically fabellar structure are

fibrocartilaginous according to Minowa & Gardner (1970)¹¹ Llorca (1963)¹² states that it is formed by bone tissue and that its prevalence is larger in men. Sesamoid bones and their functions probably are to modify pressure, to diminish friction, and occasionally to alter the direction of a muscle pull. That they are developed to meet certain physical requirements, evidenced by the fact that they are present as cartilaginous nodules in the fetus, and in greater numbers than in the adult. According to Thilenius, as integral parts of the skeleton phylogenetically inherited. Physical necessities probably come into play in selecting and in regulating the degree of development of the original cartilaginous nodules. Nevertheless, irregular nodules of bone may appear as the result of intermittent pressure in certain regions, e.g., the "rider's bone," which is occasionally developed in the Adductor muscles of the thigh. They are, however, present in several of the tendons of the lower limb, e.g., one in the tendon of the Peroneus longus, where it glides on the cuboid; one, appearing late in life, in the tendon of the tibialis anterior, opposite the smooth facet of the first cuneiform bone; one in the tendon of the tibialis posterior, opposite the medial side of the head of the talus; one in the lateral head of the gastrocnemius, behind the lateral condyle of the femur; and one in the tendon of the psoas major, where it glides over the pubis. Sesamoid bones are found occasionally in the tendon of the gluteus maximus and in the tendons which wind around the medial and lateral malleoli.¹³

In other animals

The patella is also found in the horse. The radial sesamoid is larger than the same bone in counterparts such as bears. It is primarily a bony support for the pad above it, allowing the panda's other digits to grasp bamboo while eating it. The panda's thumb a classical example of exaptation, where a trait evolved for one purpose is commandeered for another.¹⁴

II. RESEARCH ELABORATIONS

The Sesamoid bones are so named because they resemble a sesame's seed, is considered to be the oldest oilseed crop known to man, domesticated well over 5000 years ago. Sesame is very drought-tolerant. It has been called a survivor crop, with an ability to grow where most crops fail.¹⁵



Sesame's seed

There are two theoretical propositions for the development of sesamoid bones, a functional and phylogenetical.⁵The functional theory has a support in the biomechanical aspect, where sesamoid bones are described as pulleys, reducing the friction of the tendons and potentiating the muscular handspike.¹⁶ The phylogenetic suggests genetic intrinsic factors developed during the evolutionary process that can be the key for the development of sesamoid bones.³ They appear in the womb period. Initially cartilaginous they can calcify or not after the birth depending on the kind of activity done by the individual, that is, a "biomechanics-embryological" origin. Testut¹⁷ stated that the fabella was fibrocartilaginous. However, Minowa¹¹ divided the fabella according to the texture and the histology. According to the texture, the exam was done by touching. This way, Minowa characterized the sesamoid as "hard" and "elastic". According to the histological point of view, the fabella was classified about the predominant tissue. Of the 39 fabellas studied, 29 were made of bone tissue; 9 of fibrous tissue and 1 fibrocartilaginous. Following the criterion proposed by Minowa all the fabellas found were "hard", constituted of bone tissue without osteoclasts.. The absence of osteoclasts told this fact allows to state that the fabella is not susceptible to bone remodeling after its ossification.

Patella

The patella (knee cap or kneecap) is the largest sesamoid bone in the human body it is a thick, circular-triangular bone which articulates with the femur and covers and protects the anterior articular surface of the knee joint. It being developed in a tendon, its center of ossification presenting a knotty or tuberculated outline; being composed mainly of dense cancellous tissue. It serves to protect the front of the joint, and increases the leverage of the quadriceps femoris by making the greater angulation of the line of pulling. It has an anterior and a posterior surface three borders, and an apex.

Ossification.—The patella is ossified from a single center, which usually makes its appearance in the second or third year, but may be delayed until the sixth year. More rarely, the bone is developed by two centers, placed side by side. Ossification is completed about the age of puberty.

Function

Being a part of knee joint the primary functional role of the patella is knee extension. It is in the way of quadriceps femoris muscle, which contracts to extend/straighten the knee. The vastus

intermedialis muscle is attached to the base of patella. The vastus lateralis and vastus medialis are attached to lateral and medial borders of patella respectively, insertion of vastus medialis stabilizes patella & prevent lateral dislocation during flexion. The retinacular fibres of the patella also stabilize knee during exercise.

Ligamentum patellæ also called patellar tendon, it is a strong, flat, ligament, about 5 cm. in length originates from the apex, rough depression on its posterior surface and the adjoining margins of the patella. Inserts on the tuberosity of the tibia. superficial fibers of the quadriceps femoris continuous over the front of the patella. The medial and lateral portions of the tendon of the quadriceps passes down on either side of the patella, to be inserted into the upper end of the tibia on either side of the tuberosity; these portions merge into the capsule forming the medial and lateral patellar retinacula. The patellar ligament is the central portion of the ligamentum patellæ which is continued from the patella to the tuberosity of the tibia, it is single in carnivores, pigs and sheep and triple in horses and cattle. The posterior surface of the ligamentum patellæ is separated from the synovial membrane of the joint by a large infrapatellar pad of fat, and from the tibia by a bursa.

The pisohamate ligament is in the hand. It is the volar ligament that connects the pisiform to the hamate. It is a prolongation of the tendon of the flexor carpi ulnaris. It serves as part of the origin for the abductor digiti minimi, pisometacarpal ligament is a palmar ligament and is a strong, fibrous band. joins the pisiform to the base of the fifth metacarpal bone, which joins the little finger.

Evolutionary variation

The patella has convergently evolved in placental mammals and birds, most marsupials have only rudimentary, non-ossified patellae although a few species possess a bony patella. A patella is also present in the living monotremes, the platypus and the echidna. In more primitive tetrapods, including living amphibians and most reptiles (except some Lepidosaurians), the muscle tendons from the upper leg are attached directly to the tibia, and a patella is not present.¹⁸

Fabella

The fabella (Latin-little bean) is a small sesamoid bone found in some mammals embedded in the tendon of the lateral head of the gastrocnemius muscle behind the lateral condyle of the femur in about 25% of people. It is a variant of normal anatomy and present in humans in 10% to 30% of individuals, fabella is a standard finding on radiographs of the dog and cat, and both. It can thus serve as a surrogate radio-opaque marker of the posterior border of the knee's synovium. On a lateral radiograph of the knee, an increase in the distance from the fabella to the femur or to the tibia can be suggestive of fluid or of a mass within the synovial fossa. This is of particular use in radiographic detection of knee effusions.¹⁹

Development of patella

During the third week of embryonic life the limb buds become filled with a vascular mesenchyme. In may come from the primitive body-segments. Toward the end of the fourth week a slight condensation of the mesenchyme can be seen at the

centre of the arm bud, and early in the fifth week a similar condensation may be noted in the leg bud. This condensation represents the first rudiment of the skeleton of the limb. The tissue composing it may therefore be called scleroblastema. which develops a membranous skeleton. In this a cartilaginous skeleton is differentiated, and this in turn is replaced by the permanent osseous skeleton, 3 overlapping periods, a blastemal, a chondrogenous, and an osseogenous.

Blastemal Period

At the time when the condensation takes place in the leg bud. The bud projects considerably from the body, but do not shows definite resemblance to the limb. The condensed tissue, scleroblastema, is not sharply outlined. It represents the region of the acetabulum and the proximal end of the femur. In an embryo 11 mm. long, the condensation of tissue has extended both distally and proximally, but much more freely in the distal direction. The leg of this embryo, therefore, represents a stage of transition from the blastemal to the chondrogenous stage of development.

Chondrogenous Period

The further development of the skeleton of the limb during the second and third months of intra-uterine life development of the several parts of the skeleton will be taken up as follows: The blastemal anlagen of the tibia and fibula are here very incompletely separated. Within the blastema of the femur, tibia, and fibula chondrification begins as soon as the outlines of the blastemal skeleton are fairly complete (Fig. 1) The cartilages of the lower leg lie nearly in a common plane appears slightly kneewards from the centre of the shaft of each bone and then toward the ends.. That of the tibia is larger than that of the fibula and toward the knee it broadens out considerably. At this stage the joints consist of a solid mass of mesenchyme (Figs.5 &9). The tissue uniting the femur and tibia has temporarily somewhat the appearance of precartilage. From this period onwards the development of the individual bones and joints is rapid.²⁰

Fig. 1-4 Lateral view of models to illustrate the development of the distal part of the spinal column and of the inferior extremity of embryos 9-50 mm. long, In Figs.. 1, and 2 shows the scleroblastema & the centres of chondrification. In Figs. shows 3 and 4 the cartilaginous skeleton. **Fig. 5-7** shows joints consists of a solid mass of mesenchyme

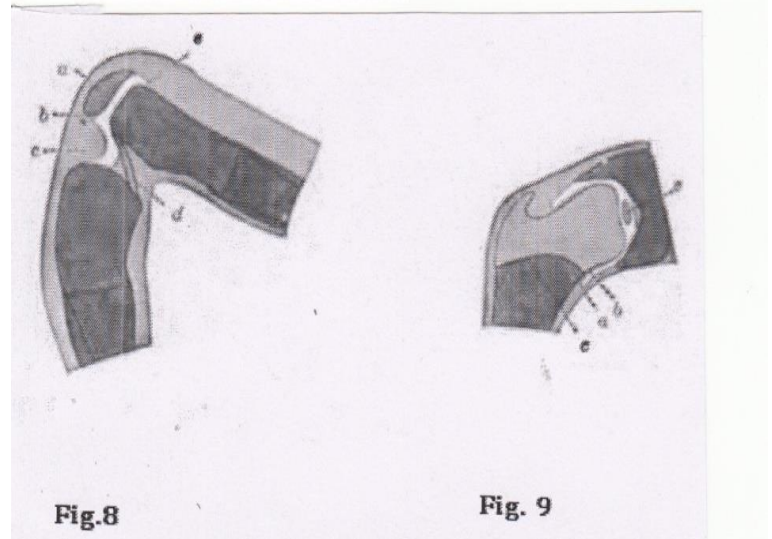
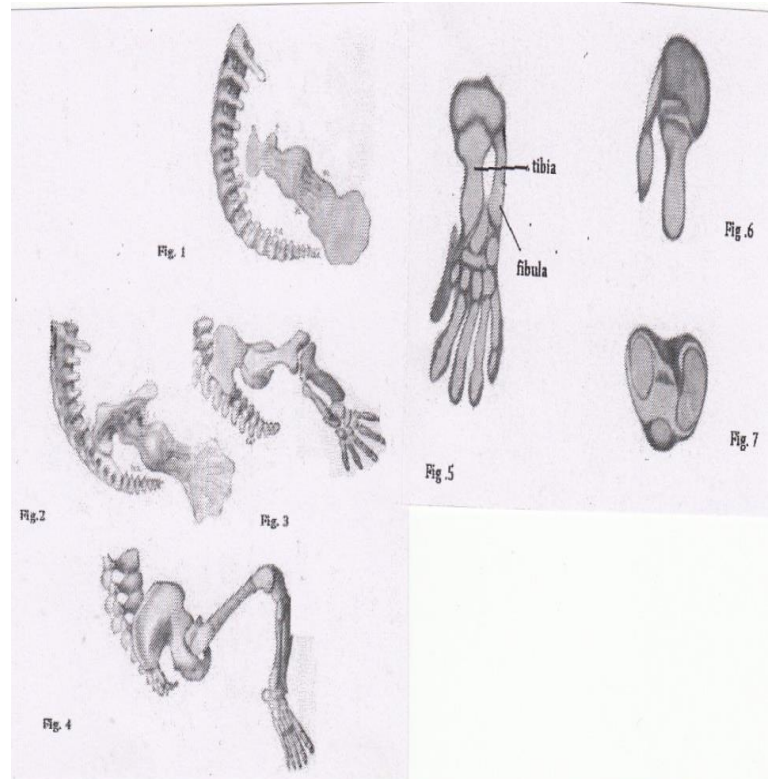


Fig. 8 & 9 shows Median section through the knee-joint of a fetus 13 cm long.
a patella, b connective tissue over patella, c ligamentum patellae

III. SUMMARY & CONCLUSION

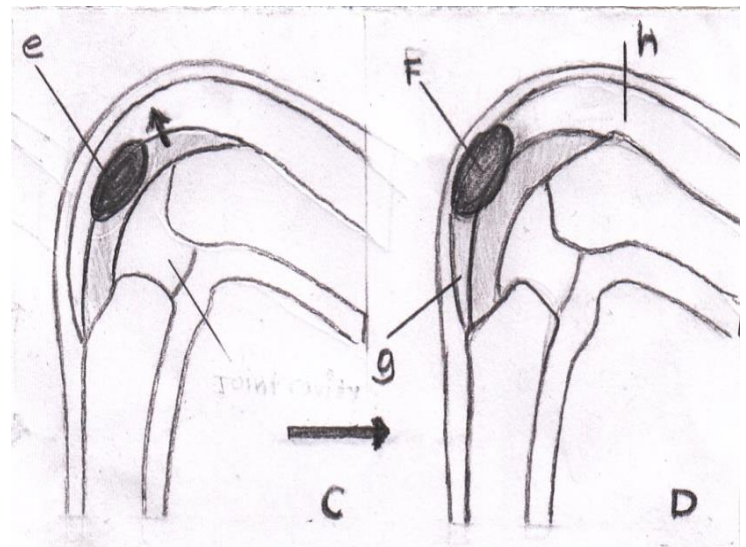
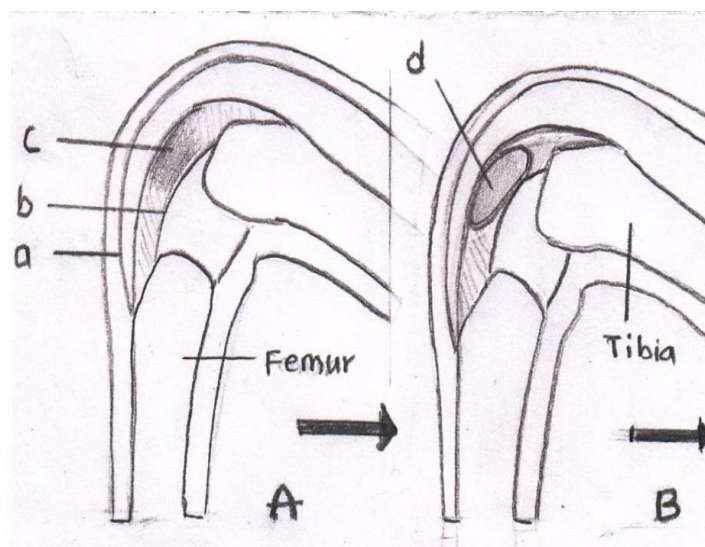
Tendons are closely fused to the joint capsule in many articulations of the extremities. In certain regions where this occurs sesamoid bones are developed. Well-marked sesamoid bones are found regularly on the flexor side of the metacarpo and metatarsophalangeal joints, usually of the first and frequently of the other digits of the hand and foot. Dorsally placed sesamoid bones have also been seen in connection with the thumb. On the flexor surface of the thumb a sesamoid bone is frequently found at the interphalangeal joint. Fibrous interphalangeal sesamoids

have been found in connection with the fingers. The sesamoid bones are better developed in some of the lower mammals than in man, and, they are more frequent in the human embryo than in the adult. They are developed at the periphery of the intermediate blastema zone. The blastema becomes condensed, and then in the better marked sesamoid bones becomes gradually transformed into cartilage. Ossification takes place relatively late in childhood²¹. In some tendons not intimately connected with a joint capsule a sesamoid bone may be developed in a region where the tendon is subjected to stress against a bone. An example, sesamoid bone often found in the tendon of the peroneus longus where it plays over the tuberosity of the cuboid. according to Lunghetti (1906), the sesamoid bone in the tendon of the peroneus longus develops in fibrous connective tissue, not in cartilage. It is commonly stated that it passes through a fibrocartilaginous stage before becoming ossified.²² Thus the development of patella is akin to a pulley which is interplaced for smoothening of conveyer belt system at bend.

How patella bone develops (Hypothesis) might be it could happened, shown in Fig.10

- A) where stress developed against bone, tendon fuses with joint capsule of knee joint
- B) blastema or fibrous tissue become condensed
- C) slowly transformation of tissue into cartilage (fibrocartilage) occurs & gradual forward movement of developing patella
- D) finally it splits the tendon and divides into quadriceps femoris proper (upper part) & ligamentum patellae (lower part)

Fig.10 shows- **a**-tendon, **b**-capsule, **c**-fusion of tendon & capsule, **d**-condensation of fibrous tissue or blastema, **e** -slowly transformation of tissue to cartilage **f**- gradual forward movement of developing patella, **g**-ligamentum patellae, **h**-quadriceps femoris



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Gram Negative Uropathogens and their Susceptibility Pattern: A Retrospective Analysis

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Abstract- Background: Urinary Tract Infection is one of the most common infections observed in clinical practice among community & hospitalized patients. Since the pattern of sensitivity is constantly changing, monitoring the antimicrobial susceptibilities has become more important. It provides information of the pathogenic organisms isolated from patients as well as assists in choosing the appropriate antimicrobial therapy.

Aims & Objectives: This retrospective study aims to analyze various Gram negative uropathogens and their antibiotic susceptibility pattern which would assist in selecting the most appropriate antibiotic therapy & for treatment of Urinary Tract Infection in a Tertiary Care Hospital.

Materials & Methods: 510 urine isolates were studied retrospectively from November 2010 to October 2011 and cultured on to Mac Conkey agar plate. The plates that showed colonies $>10^5$ were considered significant & were identified by standard biochemical tests & sensitivity of the organisms was performed by Kirby – Bauer method on Mueller Hinton agar.

Results: Out of the 510 samples processed, 118 (23.13%) gave positive urine culture, of which 73 (61.86%) were Escherichia coli, 22 (18.64%) were Klebsiella, 15(12.71%) were Pseudomonas, 4 (3.38%)were Citrobacter, and 1 isolate of Proteus and 1 isolate of Acinetobacter. The resistance to Quinolones was found to be very high 85/118 (72.03%).

Conclusion: This study discourages the indiscriminate use of antibiotics which in turn would prevent further development of bacterial drug resistance. For this, a proper knowledge of susceptibility pattern of uropathogens is necessary before prescribing empirical antibiotic therapy.

I. BACKGROUND

Urinary Tract Infection (UTI) is one of the most common infections observed in clinical practice among community & hospitalized patients¹. Despite the widespread availability of antibiotics, UTI remains the most common bacterial infection in human population.² Since the antibiotic susceptibility pattern is constantly changing, monitoring the antimicrobial susceptibility has become mandatory.³ It provides information on the pathogenic organisms isolated from patients as well as assists in choosing the most appropriate antimicrobial therapy.⁴

Antibiotics today are the frontline therapeutic means of medical intervention in an infection, which plays a central role in the control and management of infectious diseases. Antimicrobial resistance occurs in intestinal bacteria due to antibiotic therapy for treating infections outside the urinary tract. The use of antibiotics have an influence in the spread of antimicrobial resistance among bacteria.⁵ The current knowledge of

susceptibility pattern is mandatory for the proper management of Urinary Tract Infection.⁶ The present study is undertaken to determine the sensitivity profiles of urinary isolates from Vinayaka Missions Kirupananda Variyar Medical College, Salem which guides in choosing the appropriate antibiotic therapy for the treatment of UTI.

II. AIMS & OBJECTIVES

This retrospective study aims to analyze various Gram negative uropathogens and their antibiotic susceptibility pattern in a Tertiary Care Hospital, which would assist in selecting the most appropriate antibiotic therapy and for treatment of Urinary Tract Infection.

III. MATERIALS & METHODS

510 urine samples were studied retrospectively from November 2010 to October 2011. 427 samples were mid – stream urine specimens obtained by clean catch method. Others included catheterized urine samples also (Table 1). Culture was done on Blood agar plate and Mac Conkey agar plate by standard loop method. The plates were incubated at 37 ° C overnight. Samples that showed a colony count of $>10^5$ were considered significant. The colonies were identified by standard biochemical tests. Antibiotic susceptibility testing was done according to CLSI guidelines on Mueller Hinton agar by Kirby – Bauer method using 0.5 Mac Farland’s standards and ATCC *E.coli* 25922 as a control. The data was recorded and analyzed.

Table 1. Distribution of Type of Urine Samples

S.No	Type of Urine Sample	Total Number
1.	Mid – Stream Urine Samples	427
2.	Catheterized Urine Samples	83
3.	Total	510

IV. RESULTS

Out of the 510 samples processed, growth was seen in 116 (23.13%) samples. Out of the 116 isolates 73(61.86%) were *Escherichia coli*, 22 (18.64%) were *Klebsiella spp.*, 15 (12.71%) were *Pseudomonas spp.*, 4 (3.38%) were *Citrobacter spp.*, 1 sample of *Proteus spp.* (0.08%) and 1 sample of *Acinetobacter spp.* (0.08%) were obtained (Table. 2). Polymicrobial infection mounted to 12 (10.16%). 8 isolates of *Candida* were obtained.

Table 2. Percentage of various organisms isolated from Urine samples

Organism isolated	Number of organisms(n, %)
<i>Escherichia coli</i>	73 (61.86%)
<i>Klebsiella spp.</i>	22 (18.64%)
<i>Pseudomonas spp.</i>	15 (12.71%)

<i>Citrobacter spp.</i>	4 (3.38%)
<i>Proteus spp.</i>	1 (0.08%)
<i>Acinetobacter spp.</i>	1 (0.08%)
TOTAL	116

The sensitivity pattern in all the organisms were as follows :

Sensitivity to Imipenem was 100%, Nitrofurantoin was 90.57%, Amikacin was 83.02%, Netilmycin was 80.19%, Amoxyclav was 73.59%, fourth generation cephalosporin was 43.4%, Fluoroquinolones was 32.1% and Third Generation Cephalosporin was 30.8%. The sensitivity pattern of the isolated organisms to various drugs is given in Table 3.

Table 3. Sensitivity pattern of various organisms to various drugs

Name of the organism isolated (n)	Percentage of sensitivity								
	I	Ak	3GC	4GC	Nx	Nf	Nt	Ac	Pit
<i>Escherichia coli</i> (73)	100	84.93	34.24	27.39	19.17	82.19	78.08	30.13	93.15
<i>Klebsiella species</i> (22)	100	90.90	18.18	18.18	0	63.63	72.72	4.1	90.90
<i>Pseudomonas species</i> (15)	100	60	26.66	33.33	40	33.33	53.3	2	80
<i>Citrobacter species</i> (4)	100	75	0	0	0	50	50	0	50
<i>Proteus mirabilis</i> (1)	100	100	100	100	100	100	100	100	100
<i>Acinetobacter species</i> (1)	100	100	100	100	100	100	100	100	100

I – Imipenem; Ak – Amikacin; 3GC – 3rd Generation Cephalosporin; 4GC – 4th Generation Cephalosporin; Nx – Norfloxacin; Nf – Nitrofurantoin; Nt – Netilmycin; Ac – Amoxycylav; Pit – Piperacillin / Tazobactam

V. DISCUSSION

Urinary Tract infection is a commonest cause of morbidity and can lead to significant mortality. Careful diagnosis and treatment result in successful resolution of infection in most instances.⁶ Our study shows that *E.coli* is still the commonest cause of UTI in the community and hospital settings followed by *Klebsiella*, *Pseudomonas*, *Citrobacter*, *Proteus* & *Acinetobacter*. Study done by Asad U Khan and Mohd S Zaman of Aligarh also states that *Escherichia coli* is common in both the community and in hospitalized patients.⁷ This study correlates with the study done by Smitha Sood et al in Jaipur where *E.coli* was found to be predominant (61.84%) and also with the studies done by Saurabh Jain et al (65.96%) in Ujain and Mohammed Akram et al (61%) in Aligarh.^{8,9,10} In the paediatric age group also *E.coli* was found to be common.¹¹ The overall sensitivity pattern to various antibiotics were as follows: Imipenem was 100%, Nitrofurantoin was 90.57%, Amikacin was 83.02%, Netilmycin was 80.19%, Amoxycylav was 73.59%, Fourth generation cephalosporin was 43.4%, Fluoroquinolones was 32.1% and Third generation Cephalosporin was 30.8%. In the present study, the isolates showed high degree of resistance to Third generation Cephalosporin and Fluoroquinolones which indicates that they can no longer be opted for treating UTI.⁵ Nitrofurantoin and Amikacin was found to be more effective for Gram negative isolates which is in concordance with the study done by Jha VC and Yadav JN of Nepal.¹²

VI. CONCLUSION

This study discourages the indiscriminate use of antibiotics which helps to curb further development of bacterial drug resistance. For this, a proper knowledge of susceptibility pattern of uropathogens in the given locality is necessary before prescribing empirical antibiotic therapy.

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Fault Tolerant Distributed Meeting using Cloud

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Abstract- Exploiting full potential of mobile computing is difficult because of the problems such as resource scarcity, mobility, frequent disconnections. To conquer these issues Mobile cloud computing can be used. Because of the mobile nature of the devices fault-tolerance is a highly important aspect in a mobile cloud, even more than a conventional cloud. Disconnection can happen due to user mobility as devices enter and leave a network. Running out of battery power, network signal loss, or hardware failures are the other common issues .In this paper introduces a fault tolerant distributed meeting system. In this users join a meeting. Each person or group joins from different location and device. Similarly many groups and users join the meeting from different locations using different devices. They interact with each other face to face via meeting. Each group or user may be replaced with alternate resource when it fails. When a person/cloudlet fails, another person can join taking the disconnected persons place from another location or the same person can join using another device or equipment. In the case of low bandwidth the data is compressed and then send to server. The proposed system of video conferencing over android smart phones will leverage the members to assign the conference to an alias member. There by preventing interruption to the conference. Also a member online in this conference can switch over to his other communication medium for continuation of the conference session in case there is some failure. An administrator can control who can join and who can be substituted. There by substituting an important user with an alias member.

Index Terms- Mobile cloud computing, Electronic meeting system, Fault tolerance, Video Conferencing, CODEC, H.264.

I. INTRODUCTION

Smart phones, tablets, and cloud computing are coming together in the new and quickly growing field of mobile cloud computing. The main aim of mobile cloud computing is to empower the mobile user by providing a smooth and rich functionality, regardless of the resource limitations of mobile devices. Utilizing full potential of mobile computing, is difficult due to the issues such as resource scarcity, frequent disconnections, and mobility. Mobile cloud computing can address these problems by executing mobile applications on resource providers external to the mobile device. Here service and application level issues are considered. Several methods for communication exist in which video conferencing are used in organizations for the betterment of decision making. Video conferencing has become a vital part of communication and technology advancement. Video conferencing is an interactive method of communication which allows two or more

people to communicate with video and audio transmissions at the same time at a different place with the help of web conferencing. Video conferencing is dedicated for large and small group of corporation and companies where it saves time and money by travelling and meeting up potential clients in another place. Video conferencing saves time and money by meeting clients virtually through web conferencing and video technology while broadcasting it live. It allows multiple conferencing all at the same time with the rest of the panel allowing constant communication and contact at the same time instead of going from one person to another. The effects of video conferencing and web conferencing are that people no longer communicate face to face directly in the real world but every conversation is done virtually through video conferencing without having to meet but it will provide the same effect of face to face meeting. Virtual conferencing changes the important basis of communication where face to face interaction and personal touch and gestures are important in making conversation meaningful and understood. Direct communication helps to uncover hidden body language and gestures made during conversation as they are right in front of us physically. The effectiveness of video conferencing depends so much on connection and the ability to stream video and sound simultaneously without failure in terms of direct streaming. If the connection failed then the failure of delivering the full speech and video may lead to miscommunication and wrong delivery of information. The existing systems are not fault tolerant enough. The objective of the proposed system is to overcome the issues faced by conventional meeting solutions. The proposed system of video conferencing over android smart phones will leverage the members to assign the conference to an alias member. There by preventing interruption to the conference. Also a member online in this conference can switch over to his other communication medium for continuation of the conference session in case there is some failure. An administrator can control who can join and who can be substituted. There by substituting an important user with an alias member.

II. LITERATURE REVIEW

Many meeting solutions are available in the modern era. Meeting systems are used years before for many purposes. NAMBA is a location-aware collaboration system for shopping and meeting .The system exchanges position information and users' situation to one another using a PDA with built-in PHS and a GPS receiver in real time. NAMBA is a two-way communication system that sends position information and messages to one another. Using NAMBA users can see other user's position on the screen of a PDA. NAMBA has two specially devised functions, a meeting point sharing function and

a self-assessment function of a position, for meeting mutually and for exchanging position information. Position information and chat messages were important for communication with separated users. NAMBA was effective for meeting other users anywhere. E-ONIGOCO consists of a PDA, a GPS receiver and a mobile phone. E-ONIGOCO supports a non-real time mutual position information service using electronic mail and a web browser. A user can see a person's position displayed on a map on the browser of a mobile phone. NAMBA exchanges users' position information and chat messages in real time, and then supports "meeting other people" in a city. That is, we think that NAMBA can be useful for communication between friends shopping in a city. Especially NAMBA is effective for the purpose of "meeting other people". The advantages of the system are, it provides two way communications. The word of two-way communication means that users of the system should move freely and get and present positioning data of other users easily. The disadvantages are the accuracy of the GPS receiver is only 15 meters and also it does not deal with the connectivity problems[1].

Then electronic meeting systems are emerged in to the technological world. Electronic meeting support contributes to the organization if it delivers more productive meetings by reducing process losses and/or enabling process gains. Key system features that are cited as enabling gains are use of public screens, Idea anonymity, and simultaneous participation. EMS provides the ability to have participation by several individuals at once since communication is through typing. A group member may engage in both typing and "listening" at the same time as all messages are recorded and displayed electronically. That is, production blocking can be avoided. Second, anonymity can help reduce self-consciousness and discussion domination. Anonymity can also help "level the field" and reduce hierarchical or social dominance that can limit participation. In EMS environments, report higher satisfaction in larger groups. The use of EMS in organizations has resulted in labor savings and reductions in project cycle time and it promotes participation equality. EMS generates more alternatives, and thus leading to better decisions. It also has some disadvantages, EMS is possible only over a LAN, Participants number is limited, Further increases in group size would yield negative net benefits [2].

If a comparison study done in the traditional meeting solutions such as FTF, audio desktop conferencing, video desktop conferencing via the Internet, and text-only (using Web Board in a semi synchronous manner). This study is rooted in several areas, including media richness, creativity and quality, and group development and process satisfaction. There are rich media and lean media, with FTF communication being the richest and other media being leaner, with slower feedback and fewer cues. A rich communication medium allows instantaneous feedback, clarification, and questioning and correction of errors by group members. Uncertainty and equivocality can be diminished by choosing the right medium. In terms of process satisfaction, combined groups were more satisfied with the group process than those using asynchronous or synchronous only. groups having higher bandwidth (such as asynchronous web-based conferencing following initial meetings with FTF, desktop audio conferencing, and desktop videoconferencing) should have higher levels of creativity and quality, compared to the lower

bandwidth groups (e.g., using asynchronous web-based conferencing following a text-only initial meeting using the same system). FTF teams may have a greater problem in developing a shared meaning because of communications breakdowns. These breakdowns appear to be less likely in virtual teams supported by CMC. Benefits of synchronous web-based conferencing (such as desktop audio conferencing or desktop videoconferencing) are that it helps companies save on travel costs by replacing FTF meetings and allows for closer collaboration and also video conferencing provides higher creativity and performance. But some disadvantages are there in the video conferencing system such as the video would "freeze" or appear jumpy, or the audio would break up and sometimes a participant was dropped from the conference and had to be reconnected [3].

To analyze the meetings meeting analyzer system can be used. The system is designed to recognize "who is speaking what" automatically in an online manner and then provide assistance at meetings. Meeting analyzer recognizes "who is speaking what" using speech recognition and speaker diarization, and detects the activity of each participant (e.g., speaking, laughing, watching someone) and the circumstances of the meeting (e.g., topic, activeness, casualness) by integrating results obtained from several processing modules. All the analysis results are continuously displayed on a browser. Most of the existing systems generate only one enhanced speech signal even though there are multiple participants. Therefore, they cannot separate overlapping utterances. System performs source separation and thus can appropriately handle overlapping speech. ASR system designed for transcribing meeting speech in real time. The system is based on SOLON, which is a speech recognizer based on Weighted Finite-State Transducers (WFSTs). SOLON employs an acoustic model consisting of a set of hidden Markov models (HMMs), a pronunciation lexicon and language models represented as WFSTs that can be composed on the fly during decoding. The decoder efficiently finds the best-scored hypothesis in a search space organized with the given WFSTs. The input signal to the ASR system is spontaneous speech uttered by meeting participants, recorded with distant microphones, and enhanced by the audio processing techniques. In visual processing it uses a tabletop device has two cameras with two fisheye lenses. From high-resolution omni-directional images captured with the cameras, we estimated the position and poses of people's faces using a Sparse Template Condensation Tracker (STCTracker), which realizes the real-time robust tracking of multiple faces by utilizing Graphics Processing Units (GPUs). The face position/pose data output from the face tracker were used to estimate the focus of attention in the group. We also incorporated a memory-based particle filter (M-PF) into the STCTracker for more robust tracking. M-PF is a novel particle filter that can visually track moving objects with complex dynamics. The method is robust with respect to abrupt object movements, and provides quick recovery from tracking failures caused by such factors as occlusions [4].

III. PROPOSED SYSTEM

Several methods for communication exist but aren't fault tolerant enough. In existing meetings, a camera is used to connect a person/ team with another. If any equipment on either

side fails, the meeting will be spoiled. To overcome this disadvantages we can utilise these mobile cloud based fault tolerant meeting. The existing system of video conferencing over web or mobile operating system suits for one to one and one to many user with simultaneous updates from all members. The important point to note here is that one may leave the communication cannot continue the session. There is no answer to questions like

- What happens when the user losses communication?
- What happens when an important user needs to substitute?
- What happens when any one user's device fails?

ie, if a member is not available for communication due to any reason, he cannot assign an alias member to take up his position in the conference.

In the proposed system users join the meeting from their location and mobile device. Similarly many groups and users join the meeting from different locations using different mobile devices. They interact with each other face to face via this distributed meeting. Each group or user may be replaced with alternate resource when their device or connection fails.

The objective of the proposed system is to overcome the issues faced by conventional meeting solutions like teleconferencing. This project mainly focuses on the issues like frequent loss of connectivity, low computational resources and low bandwidth. It also addresses the issues like loss of Communication and failure of device

The proposed system of video conferencing over android smart phones will leverage the members to assign the conference to an alias member. There by preventing interruption to the conference. Also a member online in this conference can switch over to his other communication medium for continuation of the conference session in case there is some failure. An administrator can control who can join and who can be substituted. There by substituting an important user with an alias member.

IV. IMPLEMENTATION

The client side of the project requires an android smart phone with a front camera, microphone and an internet connection. The device should have a unique id. For that the MAC address of the device can be considered or can provide a unique id manually.

In the client side two types of members are there

1. Viewing members
2. Participating members

The viewing members can only view the live meeting and cannot have any control over the meeting. The participating member can participate the meeting and can have control over the meeting. An authentication based system is used to authenticate the participation of a member and the device. Request and response mechanism is used to verify the participating member is active in the meeting. In a fixed time interval a request is passed to the participating member .If he failed to response within three system times .The participant is considered to be inactive and the system get notification that the

failure occurred. In the server side it does the management and administration.

a. User management

The user management includes inviting the participating and viewing members, adding alternate resources. For the user management email and other communication mechanisms are used.

b. Resource management

Resource management includes verifying unique resource id, authenticating the device and if failure occurs then allocates alternate device to the meeting.

c. Recording the meeting

The meeting is recorded and the user can send request to the administrator for the recorded meeting. The recorded meeting helps for the detail study and the decision making process.

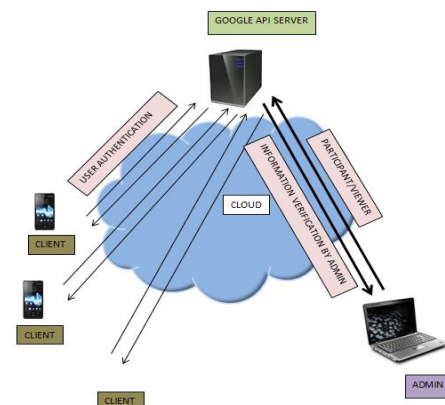


Figure 1: System Architecture

A. AUTHENTICATION MODULE

There are two cases:

- a. Already Available User
 - Admin assigns the role of the member as participant or viewer
- b. New Member
 - User registers using google id and the admin verifies the account.
 - If the member is a valid member then assigns the role as participant or viewer

The **Sign in with Google+** button authenticates the user and manages the OAuth 2.0 flow, which simplifies user integration with the Google APIs.

B. VIEW MODULE

View module determines whether the user is a viewing member or participating member. The viewing member only can view the meeting and a participating member can participate in the meeting actively. The following flow chart shows the viewing module control flow.

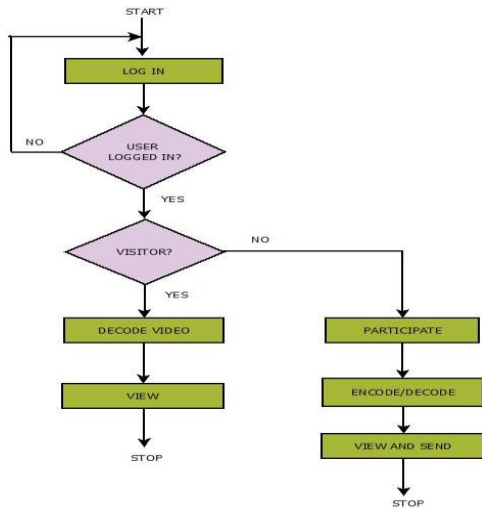


Fig: Flow chart of viewing module

C. MANAGEMENT AND ADMINISTRATION

The administrator manages the meeting. Administrator decides whether the member is a viewing member or a participating member ie .Administrator assigns roles to the users in the meeting. The administrator authenticates the user and the devices. Administrator does the user management. When a participating member is failed to continue the meeting then another user can join the meeting in the place of the failed participant. Administrator does the resource management .When a participant failed to continue the meeting due to the device failure then that member can continue the meeting using another device. The meeting can be recorded for the efficient decision making purpose .The failed user can get the recorded meeting and can analyze the meeting. The flow chart shows the control flow of the administration module.

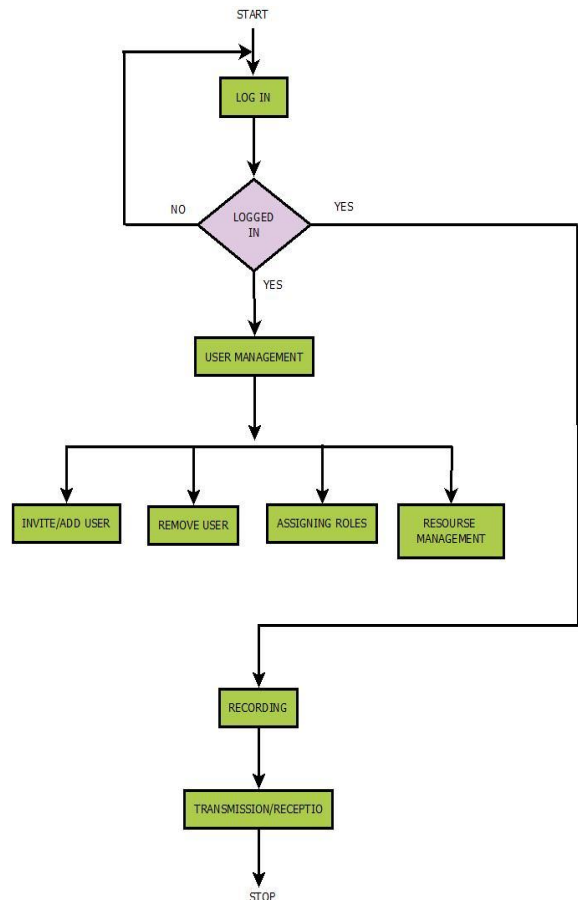


Fig: Flow chart of Administration module

D. TRANSMISSION AND RECEPTION OF VIDEO STREAMS

For transferring data, streaming (media streaming) technique is used so that it can be processed as a steady and continuous stream. Streaming technologies are becoming important with the growth of the Internet. Most of the users do not have fast internet access to download large multimedia files quickly. With streaming, client browser or plug-in can start displaying the data before the entire file has been transmitted. For streaming technique to work, the data received by the client side must be able to collect the data and send it as a steady stream to the application that is processing the data and converting it to sound or pictures. If the streaming client receives the data more quickly than required, it needs to save the excess data in a buffer. If the data doesn't come quickly enough, then the presentation of the data will not be smooth and effective.

H.264 [7] is an emerging video coding standard. This was proposed by the Joint Video Team (JVT). The H.264 is aimed at high-quality coding of video contents at very low bit-rates. H.264 uses the hybrid block-based transform coding and motion compensation model. The motion compensation model used in H.264 is more flexible and efficient than those in the early standards. Multiple reference frames for prediction is supported in the standard, and more choices of motion compensation block sizes and shapes are provided for each macroblock (e.g., 16x16, 16x8, 8x16,8x8, 8x4, 4x8, 4x4). High motion vector resolution is specified, where sub-pel interpolation could provide higher spatial accuracy at fractional positions. In addition, a well-designed in-loop deblocking filter is used to reduce visual

artifact. The new methods provide a more precise model for motion compensation, which can dramatically minimize the impact of the difference of predicted blocks, and yield a much better perceptual quality for the decoded video stream. The working of the CODEC is as follows[8].

- (1) The raw data of *Img0* is read in and pre-processed in the main thread. After that, *Img0* is ready to be encoded.
- (2) Once the working threads get the ready message, they select candidate macroblocks and encode them subsequently.
- (3) While *Img0* is being encoded, reconstructed images should be prepared in advance for temporal predictions for *Img1*. If half of *Img0* have been encoded, these encoded macroblocks are used to perform partial deblocking filtering, partial quarter-pel interpolation, and partial frame reconstruction.
- (4) When these preparations are finished, *Img1* and *Img0* can be concurrently encoded.
- (5) The working threads encode these two adjacent images according to the following sequential order: If there is no more ready macroblock to be encoded in *Img0*, the ready macroblock in *Img1* will be encoded.
- (6) When all the macroblocks in *Img0* have been encoded, the main thread will take over the macroblock encoding process and start the post-encoding procedure---generating the final VLC & output bitstream and finishing the residual deblocking filtering, quarter-pel interpolation, & frame reconstructions.
- (7) After (6), *Img0* is released. Another new image is read and pre-processed.

The above procedure continues until all candidate images are encoded.

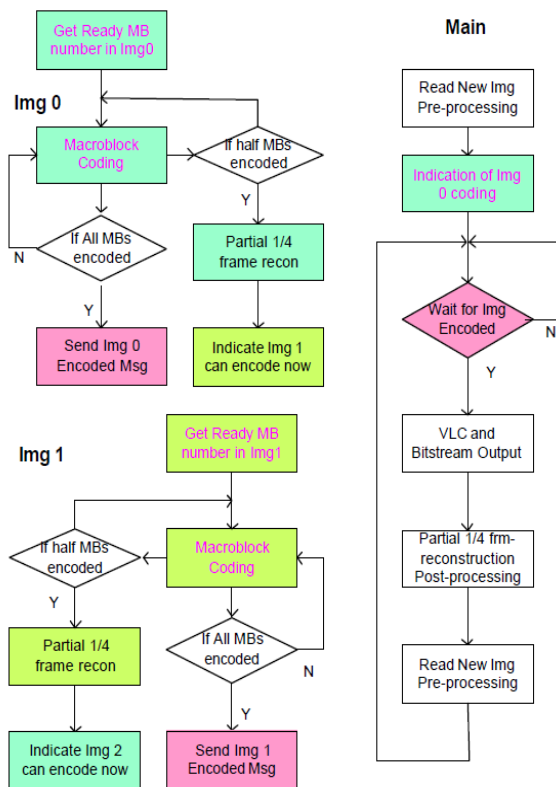


Fig:The outline of the scheme

V. CONCLUSION AND FUTURE WORKS

The proposed system is mainly focuses on the corporate meetings. Using this fault tolerant system the organization can conduct successful meeting which will save time and cost and also the meeting will leads to better and efficient decision making process. In future, this work “FAULT TOLERANT DISTRIBUTED MEETING USING CLOUD” will be playing vital role in transforming meeting and video conferencing. This distributed fault tolerant meeting can be utilized efficiently and its performance can be improved in future works.

With real-time video captured from the client’s conference device, location of the device can also be controlled. The future researches can be used for creating not only fault tolerant but also mobile conferencing abled devices. Further exploring this work leads to huge prospects of development into gesture based remote presentation and meetings as well. Adding audiences or viewers for a meeting, adding multiple groups and managing them individually with a local group admin. Admins with multiple roles can also be added in future works.

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Competency Mapping – A Drive for Garment Firms in Tirupur District

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Abstract- Human resource management is a process of bringing people and organizations together so that the goals of each other are met. Nowadays it is not possible to show a good financial operating report unless the personnel relations are in order. This calls for skill mapping through proper HRM initiatives. Competency mapping is a method through which individual assesses and determines one's potency as an individual employee and in some cases, as element of an organization. The large organizations often employ some kind of competency mapping to understand how to most competently employ the competencies of workers. They may also make use of competency mapping to examine the combination of strength of different workers to generate the most successful things and the maximum quality work. Competency mapping has been used for job-evaluation, recruitment, training and development, performance management, succession planning etc. The present study narrates the aim of competency mapping of an organization and how it influences the performance of the organization. ANOVA test also confirmed that competency mapping had an influence on the performance of the organization.

Index Terms- Tirupur, Garment Exporters, organization, Personnel, Skills, competencies, mapping.

I. INTRODUCTION

Human resource management is a tactical and logical approach to the management of an Organization's most esteemed assets- the people functioning there, who individually and together contribute to the achievements of the objectives of the company. The term 'human resource management' and 'human resources' have fundamentally replaced the term 'personnel management' as the description of the processes drawn in managing the people in the organizations. Today organizations are all discussing in terms of proficiency. Gone are the days when public used to gossip in terms of the talent sets, which would compose their organization as competitive.

Organizations of the future will have to rely more on their competent employees than any other resource. It is a major factor that determines the success of an organization. A competency is an underlying characteristic of an individual that is related to effective performance in a job or situation. This is especially significant in this recessionary environment where human capital is one of the most important assets of an organization and needs to be nurtured. The applications of competency mapping are, defining the factors for success in jobs and work roles within the organization, assessing the current performance and future

development needs of persons holding jobs and roles, mapping succession possibilities for employees within the organization, assigning compensation grades and levels to particular job and roles, selecting applicants for open positions, using competency-based interviewing techniques as well as aptitude, skill and knowledge.

The department which required competency mapping has to prepare the job description of various jobs. Through structured interviews, skill levels of individuals will be collected and evaluated with immediate superiors and other heads of concerned departments and then competencies will be mapped accordingly. The techniques of competency mapping include critical incident analysis and repertory grid. In critical incident analysis the supervisor is given training in taking notes for the reaction made by the subordinate in a particular incident. Under repertory grid the manager is interviewed and asked to place people in various categories of performance. The interviewer then prompts the manager to describe some of the examples of performance and then attempts to break these examples down to certain elements that can isolate and identify the behaviors that accompany performance at different levels. This approach only takes into account the views of the manager and not the jobholder. It is also necessary to ensure confidentiality during the process. The process requires a suitably experienced and skilled interviewer and it can be of time consuming. Now a days most of the organization use repertory grid as their technical tool in analyzing the overall performance level of employees. The organizations taken for the study uses these techniques to evaluate the competencies of their workers and to map them with suitable jobs. How for mapping useful for both the workers and the organization has been analyzed in this article.

II. STATEMENT OF THE PROBLEM

Competency mapping is a process which identifies an individual's strength and weakness in order to help them to better recognize themselves. Here, the competencies are mapped according to the individual's skill, ability and talent in the working condition. It leads to increased capacity by achieving a more holistic view of the accumulated competence of the entire organization. At this juncture the study has been conducted to identify the benefits of competency mapping.

III. REVIEW OF LITERATURE

According to Verma (2008), "competencies in education create an environment that fosters Empowerment, accountability,

and performance evaluation, which is consistent and equitable. The acquisition of competencies can be through talent, experience, or training.”

Miller, et. al. (2010) suggests, “there are two senses in which competence can be defined. The first is competence equating to performance, which is the ability to perform nursing tasks, and the second is competence as a ‘psychological construct.’

IV. OBJECTIVES OF THE STUDY

- To evaluate the organization personnel’s competency level.
- To know the aims of competency mapping.
- To study the benefits of competency mapping in an organization

V. RESEARCH METHODOLOGY

Export garment organizations of Tirupur District have been taken as sampling unit for the study. The study being analytical nature, 50 garment export organizations of total population have been selected as sample respondents by using convenient

sampling technique. Interview schedule has been used as an instrument to conduct this research. A well structured close ended interview schedule with queries relating to – level of competencies of personnel, aims of competency mapping and the benefits of competency mapping have been framed to obtain primary data from the respondent group. The secondary data for the review were sourced from news bulletin of various textile and research agencies, both official and unofficial newspapers. The study period extended for about 2 months from November 2012 to December 2012. In order to analyze the objectives of the study, statistical techniques viz., Chi square test, ANOVA have been used to test the relationship among the variables taken for study.

VI. ANALYSIS

PROFILE OF THE RESPONDENTS

Demographic details of 50 organizations varying in experience, capital employed and application level has been depicted in this section. Table No.1 has shown the personal details of the respondents.

**TABLE 1
PERSONAL FACTORS**

Personal factors like year of experience, capital employed and type of application level are described using simple percentage method.

PERSONAL FACTORS		NO.OF. RESPONDENTS	PERCENTAGE%
EXPERIENCE	Below 5 years	5	10
	5 -10 years	10	20
	10 – 15 years	20	40
	Above 15 years	15	30
	Total	50	100
CAPITAL EMPLOYED	Below 5 lakhs	10	20
	5 – 10 lakhs	5	10
	10 – 15 lakhs	10	20
	Above 15 lakhs	25	50
	Total	50	100
TYPE OF APPLICATION LEVEL	Advanced	15	30
	proficient	35	70
	Total	50	100

There has been more number (70%) of respondents with above 10 years of experience (20+15). However 20% constitutes 5-10 years of experience and 10% of them only new entrants to the business (below 5 years experience). 50% of the respondents employed above 15 lakhs as their capital, 20 % of them have employed 10 – 15 lakhs and the same number have invested below 5 lakhs and only 10% have employed 5 -10 lakhs as their capital. 70 % of the respondents have been demonstrating

proficient application level to adequately perform related tasks without guidance. 30% of the respondents have been demonstrating advanced application level to perform fully and independently related tasks with high quality standards.

Competence is a combination of knowledge, skills and behavior used to improve performance; or as the state or quality of being adequately or well qualified, having the ability to perform a specific role. Competency assessment involves the

measurement of an individual's competencies. A clear perspective of personnel's competency and skill levels has been depicted in table no.2 by using descriptive statistics method. Accepted factors have been assigned with the maximum mean value of 5 and the minimum value of 1 and the factors have been

graded from very good to very bad. The mean of the opinion score for each variable has directed the agreeability level of the respondents.

Table No: 2
Competency level of the personnel in the Organisation

Competency level of personnel		Total score	Mean
Business awareness	Accurate knowledge about financial resources	170	3.4
	Knowledge about company products	165	3.3
	Understand the industry	145	2.9
Decision-making	To understand various scenarios	165	3.3
	Able to give opinions	170	3.4
	Accept delegated authority	150	3
Team management	Managing whole business	165	3.3
	Improve team effectiveness	155	3.1
	Actively organizes activities	160	3.2
Communication skills	Able to present technical data	150	3
	Able to facilitate group	170	3.4
	Knowledge about technical writings	160	3.2
Planning skills	Able to plan strategically	165	3.3
	Understand spatial planning	170	3.4
	Able to conduct action research	150	3

While analyzing the business awareness, competence of the personnel of 50 respondents, most of the respondents have viewed that their personnel have accurate knowledge about the financial resources (mean value 3.4), have knowledge about company products (mean value 3.3) and understand the industry (mean value 2.9). In Decision making skill most of the respondents accepted that their personnel have been able to give opinion to the management (mean value 3.4), understand various scenarios of the business (mean value 3.3) and accepted to delegate the authority (mean value 3.0). While evaluating the Team management skill of the personnel, the respondents have agreed that their personnel have been able to manage the whole business (mean value 3.3 as it inculcate the employees repertory grid activity), they actively organize activities (mean value 3.2) and they have improved team effectiveness (mean value 3.1). While assessing the communication skill of the personnel, the respondents have agreed that their personnel have good communication skill to facilitate group (mean value 3.4), have knowledge about technical writings (mean value 3.2) and able to present technical data (mean value 3.0). In planning perspective of the personnel the respondents have accepted that their personnel have understand the spatial planning (mean value 3.4), able to plan strategically (mean value 3.3) and able to conduct action research (mean value 3.0).

VII. COMPETENCY MAPPING

Competency mapping is a process through which one assesses and determines one's strengths as an individual worker and in some cases, as part of an organization. It generally examines two areas: emotional intelligence and strengths of the individual. Large organizations frequently employ some form of competency mapping to understand how to most effectively employ the competencies of workers. They may also use competency mapping to analyze the combination of strengths in different workers to produce the highest quality work. By conducting job analysis and preparing competency based job description, mapping the competencies of individuals can be done which step towards the success of the organization. Finding the right fit for the right job is a matter of concern for most organizations especially in today's economic crisis. This need came about due to increased cost of manpower, need for ensuring that competent people are available for performing various critical roles. Technology, finances, customers and markets, systems and processes can all be set right or managed effectively if we have the right kind of human resources. For focus in performing roles-need for time management, several organizations have realized the importance of competency mapping. Table no.2 has shown the aim of competency mapping.

**TABLE NO.3
AIM OF COMPETENCY MAPPING**

AIM OF COMPETENCY MAPPING	No. of respondents	%
To create an excellent mind in employees by mapping their superior performance with right job	14	28
To understand the gap between present level ability and desired proficiency level that required for their job	20	40
To achieve important result for a particular job	16	32

28% of the respondents have realized the importance of competency mapping to create an excellent mind in employees. 40% of them have ensured that competency mapping helps to understand the gap that exists between the required and the present level and then train the employees to a desired level of proficiency required for their job. To achieve important result for a particular job competency mapping has been needed as opined by 32% of the respondents.

To find whether there has been any association between the **personal factors** (year of experience and capital employed) and the dependent factor “**Aim of competency mapping**”, chi-square test has been carried out in table no:3 with the null hypothesis.

Ho: There has been no association between the personal factor and the “Aim of competency mapping”.

Personal factors		Aim of competency mapping			Total	Chi-square value	Sig
		To create an excellent mind in employees	To achieve important result	To build core competition			
Year of experience	Below 5years	4	5	2	11	5.895	NS
	5-10years	3	6	4	13		
	10-15years	5	6	3	14		
	Above15year	2	3	7	12		
	Total	14	20	16	50		
Capital employed	Below 5lakhs	3	5	2	10	3.989	NS
	5-10lakhs	2	2	1	5		
	10-15lakhs	1	6	3	10		
	Above15lakh	8	7	10	25		
	Total	14	20	16	50		

Low chi-square value proved that there has been no significant association between the ‘**year of experience**’ and the dependent factor ‘**aim of competency mapping**’. Hence the hypothesis has been accepted. ‘**Capital employed**’ as a personal factor has no significant influence on ‘**aim of competency mapping**’ which has been proved with the low chi-square value. Any organization irrespective of number of years of experience and capital employed may employ some form of competency mapping to understand how most effectively employ the

competencies of workers to analyze the combination of strength in different workers to produce highest quality work.

VIII. BENEFITS OF COMPETENCY MAPPING

Competency mapping is a process which identifies the key competencies for a particular position in an organization using it for job-evaluation, recruitment, training and development, performance management, succession planning, etc. As a result

of competency mapping, all the HR processes like talent induction, management development, appraisals and training yield much better results. The competency mapping process needs to be strongly integrated to help companies “raise the bar”

of performance expectations. Table no.5 has shown the benefits of competency mapping.

**TABLE NO.4
BENEFITS OF COMPETENCY MAPPING**

Benefits of competency mapping	No.of respondents	%
Better employee retention	10	20
Ease and accuracy of the selection process	30	60
Increased productivity	10	20
Total	50	100

20% of the respondents have said that the competency mapping provides better employee retention which is a more specific and objective assessment of their strengths to enhance their skills. 60% of the respondents have viewed that the competency mapping has improved the selection process as easy and accurate one. The remaining respondents (20%) have accepted that the competency mapping has increased their productivity.

To find whether there has been any difference of opinion among the respondents who have varied with different years of experience and investment about the “**benefits of competency mapping**”, ANOVA test has been carried out and shown in table no:5 with the null hypothesis.

Ho: There has been no difference between the personal factors and the “**benefits of competency mapping**”.

**TABLE NO.5
PERSONAL FACTORS VS. BENEFITS OF COMPETENCY MAPPING**

Personal factors		Benefits			Total	Chi-square value	Sig
		Better employee retention	Ease and accuracy of the selection process	Increased productivity			
Year of experience	Below 5 years	2	7	2	11	1.5570	NS
	5-10 years	5	6	2	13		
	10-15 years	2	8	4	14		
	Above 15 years	1	9	2	12		
	Total	10	30	10	50		
Capital employed	Below 5 lakhs	2	6	2	10	0.192	NS
	5-10 lakhs	3	8	4	15		
	10-15 lakhs	2	6	2	10		
	Above 15 lakhs	3	10	2	15		
	Total	10	30	10	50		

The null hypothesis has been accepted due to low F value (1.5570) and inferred that there has been no significant difference of opinion among the respondents who have varied years of experience about the benefits of competency mapping. All the respondents have been accepting that competency mapping had a positive improvement in their organizations’ activity. Capital employed as personal factor does not have any influence on the

dependent factor ‘Benefits of mapping’. Hypothesis has been accepted due to low F value (0.192). The respondents who have different categorization of capital employment have no significant difference of opinion about the benefits of competency mapping.

IX. RESULTS AND DISCUSSION

Most of the respondents have viewed that their personnel have been aware of business and they acquired skills on decision making, communication, team management and planning to perform the required job. Dubois, Lucia & Lepsinger (1999) have accepted that to perform critical work tasks or specific functions, capability of applying or using knowledge, skills, abilities, behaviors, and personal characteristics of personnel are important. Through competency mapping techniques the organization has able to select and recruit the employees with the required skill to the organization. Egodigwe (2006) has stated that a successful organization will consider the competency model when selecting and hiring new employees and incumbent employees. In competency mapping the individual performance of employees is considered as a most important one since it leads to the achievement of the organization as a whole. The American compensation association has explained (1996) competency as the individual performance behavior that are observable, measurable and critical to successful individual or corporate performance.

X. SUGGESTIONS

In firms, competency mapping must be frequently done in order to test the competency level of the employees. Since many of the employees are performing different jobs to what they were doing at the time of their joining they need training to perform the new work allotted to them. There is an acute need of a structured knowledge management system in order to preserve and maintain the knowledge status in the company. Different sources of competency techniques must be encouraged among the employees. There is need for the support from the top management since it is considered a major hurdle in effective competency mapping system and the employees must also be made aware of importance of competency mapping techniques. Motivation should be given to the employees so that they take interest in knowledge enhancement and management.

XI. CONCLUSION

Competency is a set of knowledge, skills and attitudes required to perform a job effectively and efficiently/excellently and it describes what has to be done, not how. Competency mapping should not be seen as rewards and it is not only done for confirmed employees of an organization and it can also be done for contract workers or for those seeking employment to emphasize the specific skills which would make them valuable to a potential employer.

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Wild Edible Plants used by the Zou Tribe in Manipur, India

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Abstract- A survey of wild edible plants used by the Zou tribe was undertaken during 2011-2012 in Manipur. The Zou's are one of the recognised tribes in Manipur settling along the Burma border. "Zou" being translated as "Lofty hill ranges" are the hill people, with a population of 20,567 (Census 2001). Oral traditions and culture reveals that most of their economies have been engaged in subsistence agriculture, hunting and gathering. This paper documents 84 species belonging to 36 families. All plants are arranged alphabetically in a tabular form, followed by families, vernacular name(s), plant part(s) and used methods. The nutritional aspects of less familiar wild edible plants can be further analysed to meet the food and nutritional needs of the people. The present study is the first of its kind among the Zou tribe.

Index Terms- Wild edible plants, Zou tribe, Traditional, Manipur.

I. INTRODUCTION

India is extremely rich in its floristic wealth and native plant genetic resources. About 800 species of wild edible plants occur in different floristic regions and are consumed by the tribal communities (Singh & Arora, 1978). Tribal dominated tracts are the storehouse of knowledge about the multiple uses of plants. Such ethno botanically/agro-ecologically distinct pockets are found in North Eastern region, parts of Western Himalayas, Central India and Western and Eastern Peninsular tract. (Arora R.K. 1981). Manipur is one of the eight states of North Eastern region. It lies in the extreme Northeast of India bordering Burma within 23°51' N and 25°41' N Latitudes and 93°3' E and 94°4' E longitude (Singh et al. 1996) Manipur falls in the biogeographically tri-junction of three distinctive biogeographical regions : oriental regions of India, extensions of the Himalayan region and Malayan archipelago. Consequently this region forms an active centre for transfer of gene pools between India and other South East Asian countries, which may lead to speciation and evolution of new and novel gene pools. Manipur is rich in flora and fauna and falls in the Indo-Burma Global Biodiversity Hotspots (Myers et. al. 2000). It covers a geographical area of 22,327 sq. km of which 90% are hilly region largely characterised by dense forests and inaccessible terrains. This hilly region are inhabited by 34 ethnic tribes practising their own culture, traditions and had survived through successive generations depending on wild plants and animals. Several works have been done on wild edible plants used by different communities in India such as Dietary uses of wild plant

resources Sikkim, Himalaya. (Sundriyal et. al., 2004) ; Karbi Anglong of Assam (Kar. and Borthakur, 2007); Annamalais of Coimbatore district (Ramachandran, 2007); Meghalaya, North East India (Kayang, 2007); Majuli Island and Darrang district, Assam (Baruah et. al., 2007); Traditional edible bio-resources Imphal, Manipur (Sunnanda et. al., 2010); Melghat Forest, Maharashtra (Bhogaonkar et. al., 2010); Nokrek Biosphere Reserve, Meghalaya (Bikarma et. al., 2011); Ethnobotany of western Mizoram (Lalfakzuala et. al., 2007). Some plants reportedly used in the Melghat forest, western Mizoram, Chothe and Garo tribes are also used by the Zous. However, this is the first report on the Zou tribe in Manipur. The present work is an attempt to access and study the wild edible plants consumed by the Zous. The Zous are recognised as a Scheduled Tribes of Manipur in 1956. They are one of the indigenous communities of Mongoloid race inhabiting the border areas of India and Burma. They are concentrated in Chandel and Churachandpur district of Manipur with a population of 20,567 (Census 2001). 'Zou' being translated as 'Lofty Hill Ranges' are hill people living and maintaining close link with their plant environment, practising their own culture, custom and traditions. Oral traditions and culture reveals that most of their economies have been engaged in subsistence agriculture, hunting and gathering (Mannuamching, 1999). In remote Zou villages, they still depend on Jhum cultivation where rice, maize, beans, chillies, yam etc., are cultivated. Jhum or slash and burn cultivation is a major component of the larger agro system that comprises of agriculture, forestry, hunting and fishing. It is a land used system based on a traditional method, year round, community wide, largely self contained and ritually sanctioned way of life (Vishal Gupta, 2005). They make a sustainable use of available plant resources directly or indirectly for their livelihood. Wild edible plants and fruits are consumed as a supplement for cultivated crops and also as a survival strategy during 'Mau tam' (famine due to flowering of bamboos which occur after every 45-50 years). They gather different wild edible plants from the forest for their own food and also sell them in the local make shift markets.

II. METHODOLOGY

An extensive field work was carried out during 2011-2012 covering all seasons of the year. Prior to this, literatures were thoroughly searched for references on the subject. Knowledgeable informants were identified with the help of village chiefs, church leaders and philanthropic organisation leaders of different villages. 50 males and 25 females between

the age group of 40-85 years were personally contacted. Prior consent was obtained from the informants before collection of data through oral questioning and repeated discussion. The information collected on wild edible plants, local name(s), part used and use methods were recorded in a data sheet following standard ethnobotanical methods (Jain and Rao, 1997). As far as possible photographs were taken in their natural habitats.

Collected specimens were identified with the help of experts, relevant published papers and books such as (Singh & Arora, 1978); (Sukla et. al., 1982) and (Deb DB, 1961). The specimens are deposited in the Herbarium, Department of Botany, Churachandpur College.

Table 1. Wild edible plants used by the Zous Tribe of Manipur

Sl. No	Plant Name & Family	Local name(s)	Part(s) used	Use Method
1	<i>Allium hookerii</i> Thw. Liliaceae	Phulun pah, Kaisuon	Leaves, Roots	Cooked or raw eaten
2	<i>Amaranthus spinosus</i> Linn. Amaranthaceae	Bawngheh tehlian	Tender shoots, leaves	Cooked as vegetables
3	<i>Amaranthus viridis</i> Amaranthaceae	Bawngheh tehneu	Tender shoots, leaves	Cooked as vegetables
4	<i>Amomum dealbatum</i> Roxb. Zingiberaceae	Aigia	Inflorescence	Cooked or steamed
5	<i>Amorphophallus campanulatus</i> Blume, Ex. Decne Araccae	Kolbot	Corm	Cooked as vegetable and food.
6	<i>Aporusa dioica</i> Muell. Arg. Euphorbiaceae	Sawntuol	Tender shoots, leaves	Cooked as Vegetable
7	<i>Anisomeles indica</i> Linn. Lamiaceae	Sii	Seeds	<ul style="list-style-type: none"> • Roast and make into paste. Used as side dish • Fermented for future use.
8	<i>Argyria nervosa</i> (Burm. f.) Boj. Convolvulaceae	Uisul	Pods	Scrape the black pods. Boiled the pods and discard water. Used as vegetable or in chutneys.
9	<i>Arisaema leschenaultia</i> Araceae	Telong	Tuber	Roasted, pounded and soaked in ash water for about 3 nights. Washed off the ash water. Add salt and chillies to consume.
10	<i>Asparagus racemosus</i> Wild. Liliaceae	Aipah	Inflorescence	Cooked as vegetable.
11	<i>Bambusa arundinaceae</i> (Retz.) Wild. Poaceae	Gokhatuoi	Tender shoots	<ul style="list-style-type: none"> • Boiled and discard the water. Then, cooked as vegetable. • Fresh shoots fermented as food. • Dried for future use.
12	<i>Bambusa tulda</i> Roxb. Poaceae	Govatuoi	Tender shoots	<ul style="list-style-type: none"> • Boiled and discard the water. Then, cooked as vegetable. • Fresh shoots fermented as food. • Dried for future use.
13	<i>Benincasa hispida</i> Thunb Gogn. Cucurbitaceae	Maipuong	Fruit	Cooked as vegetable

14	<i>Brassica campestris</i> Linn. Brassicaceae	Ankam	Leaves, tender shoots, Inflorescence	<ul style="list-style-type: none"> • Boiled as vegetable • Tender shoots eaten raw. • Leaves dried for future use.
15	<i>Cajanus cajan</i> Linn. Papilionaceae	Behieng	Pods	Cooked as vegetable
16	<i>Calamus erectus</i> Roxb. Arecaceae	Chingpi ngeh	Stem pith	Cooked as vegetable
17	<i>Calamus latifolia</i> Roxb. Arecaceae	Taichiing	Stem pith	Cooked as vegetable
SL. NO	Plant Name & Family	Local name(s)	Part(s) used	Used method
18	<i>Capsicum frutescens</i> Linn. Solanaceae	Malta	Fruit	<ul style="list-style-type: none"> • Used as spices/condiments. • Fruits dried for future use.
19	<i>Caryota urens</i> Linn. Arecaceae	Tuum	Stem pith	Cooked as vegetable
20	<i>Centella asiatica</i> Linn. Apiaceae	Tangkuongteh	Whole plant except roots	Cooked or eaten raw as vegetable
21	<i>Cinnamomum verum</i> Presl. Lauraceae	Singguithah	Bark	Used as spices and condiments
22	<i>Cissus repanda</i> Vahl. Vitaceae	Khaupuong, Lenpuongteh	Tender shoots, Leaves	Cooked as vegetables
23	<i>Citrus latipes</i> (Swingle). Tanaka. Rutaceae	Hatkora	Rind of the fruit.	Dried and used as spices/condiments.
24	<i>Clerodendrum</i> (Li). Kuntze. Verbanaceae	Anphui	Leaves	Cooked as vegetable.
25	<i>Conyza stricta</i> Wild. Asteraceae	Buohthah Buoldap	Tender shoots, Leaves	Cooked as vegetable
26	<i>Colocasia esculenta</i> (Linn.) Schott. Araceae	Baal	Corm, Petioles, leaves	<ul style="list-style-type: none"> • Corm used as food and vegetables. • Petioles and leaves dried and preserve for future use.
27	<i>Colocasia laurentii</i> Schott. Araceae	Dol sielngheh	Petiole	<ul style="list-style-type: none"> • Cooked or eaten raw as vegetable
28	<i>Curcuma longa</i> Linn. Zingiberaceae	Ai-eng	Rhizome	Used as species/condiments
29	<i>Cucurbita maxima</i> Duchesne. Cucurbitaceae	Maai	Leaves, fruits, Inflorescence, seeds	Cooked as vegetable
30	<i>Cycas pectinata</i> Griff. Cycadaceae	Tanglu	Tender buds, shoots	Cooked as vegetable
31	<i>Derris wallichii</i> Prain Papilionaceae	Huihu	Tender shoots	Tender shoots boiled and water discarded. Tender shoots then fried as vegetable or used in chutney.
32	<i>Dioscorea alata</i> Linn. Dioscoreaceae	Hakai san	Tuber	Cooked as food
33	<i>Dioscorea glabra</i> Roxb. Dioscoreaceae	Hakaingou	Tuber	Cooked as food
34	<i>Dioscorea sativa</i> Hook Dioscoreaceae	Gam hakai	Tuberous root	Cooked and used as food during famine.

35	<i>Dolichos lablab</i> Linn. Papilionaceae	Bepi	Pods, Leaves	Cooked as vegetable
36	<i>Dryopteris marginate</i> (Wall) Christ. Polypodiaceae	Tekoh	Fronde	Cooked as vegetable
37	<i>Dysoxylum gobara</i> Buch. Meliaceae	Singthupi	Tender shoots	Boiled and the water is discarded. Used as vegetable.
38	<i>Entada scadens</i> Benth. Mimosaceae	Kaang	Tender shoot	Boiled and the water is discarded. Used as vegetable.
39	<i>Eryngium toetidum</i> Lam. Umbelliferae	Pasikhawm	Leaves	Used as spices/condiments.
SL. NO	Plant Name & Family	Local name(s)	Part(s) used	Used method
40	<i>Eurya acuminata</i> DC. Fl. Br. Theaceae	Sizou	Leaves, Tender shoots	<ul style="list-style-type: none"> • Cooked as vegetable. • Tender shoot eaten raw as salad • Leaves dried for future use.
41	<i>Ficus roxburghii</i> . Moraceae	Theiba	Tender shoots, leaves	Cooked as vegetable
42	<i>Ficus rumphii</i> Linn. Moraceae	Mawnglaw	Tender shoot, Inflorescence	Cooked as vegetable
43	<i>Glycine max</i> Merr. Papilionaceae	Bekan	Seeds	Fermented and eaten
44	<i>Hibiscus aculeatus</i> Roxb. Malvaceae	Mehnal	Fruit	Cooked or fried as vegetable
45	<i>Hibiscus sabdariffa</i> Linn. Malvaceae	Vaianthuh	Leaves, seeds	<ul style="list-style-type: none"> • Cooked as vegetable • Seeds fermented • Leaves dried and preserved
46	<i>Hordeum vulgare</i> Linn. Poaceae	Tangbuang	Grains	<ul style="list-style-type: none"> • Cooked as food. • Pounded into powder. Make paste with water. Wrap with banana leaves and cooked
47	<i>Houttuynia cordata</i> Thunb. Saururaceae	Aithanglou	Leaves, roots	Cooked or eaten raw as spices/condiments
48	<i>Ipomoea botatas</i> Linn. Convolvulaceae	Kawlkai	Tuber	Cooked as food
49	<i>Lagenaria vulgaris</i> Cucurbitaceae	Uum	Fruit	Cooked as Vegetable
50	<i>Lepionurus sulvestris</i> BL. Olacaceae	Anapangthu am, Anmang	Leaves	Cooked as vegetable
51	<i>Leucaena leucocephala</i> (Lam.) De Wit. Mimosaceae	Jongta lem	Pods	Eaten raw in salads
52	<i>Litsea cubeba</i> (Louv.) Pres Lauraceae	Sehnam	Leaves, fruits	Used as spices/condiments
53	<i>Luffa cylindrica</i> (Linn.)MJ. Roem. Cucurbitaceae	Umpawng, Tangmui	Fruit	Tender fruit cooked as vegetable
54	<i>Lycianthes laevis</i> Bun. Solanaceae	Ansingteh	Leaves	Cooked as vegetable
55	<i>Manihot esculenta</i> Crantz Euphorbiaceae	Singkawkai	Leaves, fruit	Cooked as vegetable

56	<i>Meriandra strobilifera</i> Benth Lamiaceae	Lengmasel	Leaves Inflorescence	<ul style="list-style-type: none"> • Cooked or eaten raw • Leaves dried for future use
57	<i>Mimosa himalayansis</i> Mimosaceae	Linguih, Khangkhuh	Tender shoots	Cooked as vegetable
58	<i>Momordica charanita</i> Linn. Cucurbitaceae	Tangkha	Fruit	Cooked or fried as vegetable
59	<i>Momordica cochinchinesis</i> Lour. Cucurbitaceae	Tangkhwat	Fruit	Cooked as vegetable
60	<i>Musa paradisiaca</i> Musaceae	Nahtang	Inflorescence, soft stem	Cooked as vegetable
61	<i>Musa superba</i> Roxb. Musaceae	Saisuong	Soft stem	Cooked as vegetable
SL. NO	Plant Name & Family	Local name(s)	Part(s) used	Used method
62	<i>Osimum americanum</i> Linn. Lamiaceae	Lunmui	Leaves	<ul style="list-style-type: none"> • Cooked or eaten raw in salad • Leaves dried for future use.
63	<i>Oroxylum indicum</i> Linn. Bignoniaceae	Bahlawng	Tender shoot, young pods	Cooked as vegetable.
64	<i>Panicum miliaceum</i> Linn. Poaceae	Taang	Seeds	Cooked as food.
65	<i>Parkia roxburghii</i> G. Don. Mimosaceae	Jongta	Pods	Cooked or eaten raw after scrapping off the epidermal layer
66	<i>Passiflora edulis</i> Sims. Passifloraceae	Sapthei	Leaves	Cooked as vegetable
67	<i>Piper longum</i> Linn. Piperaceae	Singmalta	Fruits	Used as spices and condiments
68	<i>Plantago depressa</i> Linn. Plantaginaceae	Vohpibil the	Leaves	Cooked as vegetable
69	<i>Rumex vesicarius</i> Linn. Polygonaceae	Anbongteh	Leaves	Cooked as vegetable
70	<i>Schima wallichii</i> (DC.) Korth. Thaeaceae	Khieng	Tender shoots	Eaten raw or boiled vegetable
71	<i>Semecarpus suspendiriformis</i> Anacardiaceae	Uilusiin, Kawtebel	Fruits	Cooked as vegetable
72	<i>Sesbania sesban</i> Merr. Papilionaceae	Leiphagah, Leihoihsing	Tender fruits	Cooked or eaten raw in chutneys and salads
73	<i>Solanum indicum</i> Linn. Solanaceae	Anjangkha neu, Samphoh	Berry (fruit)	Cooked or eaten raw
74	<i>Solanum melongena</i> Linn. Solanaceae	Vohbual, Manta	Fruit	Cooked as vegetable
75	<i>Solanum nigrum</i> Linn. Solanaceae	Anjou	Leaves	Cooked as vegetable
76	<i>Solanum torvum</i> Swartz. Solavaceae	Anjang kha	Berry (fruit)	Cooked as vegetable
77	<i>Spilentes acmella</i> Linn. Asteraceae	Ansateh	Leaves, stem	Cooked as vegetable
78	<i>Trichosanthes anguira</i> Linn. Cucurbitaceae	Begul	Fruits	Cooked as vegetable
79	<i>Vigna sinensis</i> Savi ex Hassk. Papilionaceae	Belawi	Leaves, pod	<ul style="list-style-type: none"> • Cooked as vegetable

				• Leaves dried for future use.
80	<i>Xanthosoma sagithifolia</i> Schott. Araceae	Dolsielngeh vom	Petiole	Cooked or eaten raw in chutney
81	<i>Zanthoxylum armatum</i> DC. Rutaceae	Ah hihlou, Lingnamsia	Leaves	Cooked or eaten raw as spices/condiments
82	<i>Zanthoxylum budranga</i> Rutaceae	Singzual	Tender stem, leaves	Cooked as vegetable
83	<i>Zeamays</i> Linn. Poaceae	Vaimiim	Corn	Cooked as food
84	<i>Zingiber officinals</i> Rose. Zingiberaceae	Siing	Rhizome, Inflorescence	Used as spices and condiments

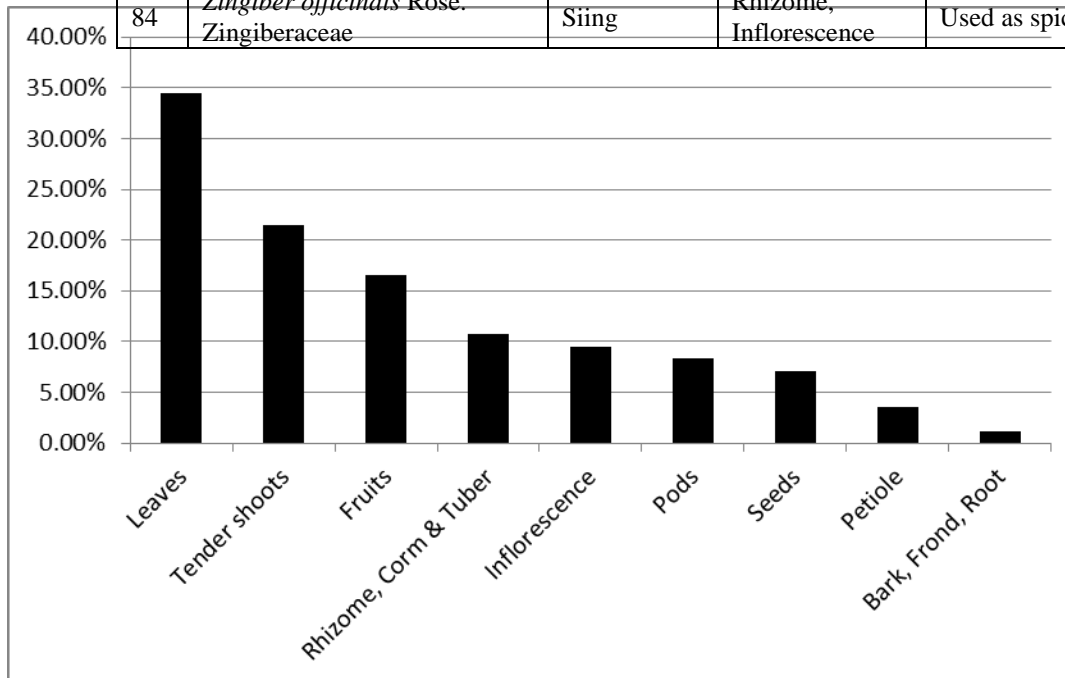


Fig. 1. Percentage of Plant parts used by the Zou tribe, Churachandpur, Manipur.

III. RESULTS AND DISCUSSIONS

The present study is a pioneering work among the Zou's in Manipur. It reveals that 84 wild edible plants belonging to 36 families are being used by the Zou's. Out of these 84 species, 70 species are used as vegetables & food, 13 species are used as spices and condiments and 1 species *Dioscorea sativa* is used as famine food (Table. 1).

The most common part of the plant consumed is leaves with 29 species (34.5%), tender shoots with 18 species (21.4%), fruits with 14 species (16.6%), rhizome, corm and tuber with 9 species (10.7%), inflorescence with 8 species (9.5%), pods with 7 species (8.3%), seeds with 6 species (7.14%), petioles with 3 species (3.5%) and fruit cover (rind), bark, frond and root with 1 species (1.19%) each (Fig. 1).

The study also found that maximum of the plant species belongs to Cucurbitaceae and Araceae with 7 species each, Papilionaceae and Solanaceae with 6 species each, Poaceae with 5 species, Mimosaceae with 4 species, Zingiberaceae, Rutaceae, Lamiaceae and Dioscoreaceae with 3 species each. Theaceae, Convolvulaceae, Liliaceae, Amarantheaceae, Asteraceae, Malvaceae, Lauraceae, Moraceae, Musaceae and Euphorbiaceae

with 2 species each. The rest of the family is represented by 1 species each.

Some plant parts such as seeds and tender shoots are traditionally fermented and preserved, leaves of certain plants are also dried under the sun or above the Chulha(thuh) and preserved to be used during off seasons. Plants such as *Derris wallichii*, *Argyrea nervosa*, *Entada scandens*, *Dysoxylum gobara* are pre boiled and the water discarded before consumption. Tuber of *Arisaema speciosum* needs special treatment before used. They are roasted, pounded and soaked with ash water (a substitute for Sodium bicarbonate) for about 72 hours. Then the ash water is washed off many times. The lump tuber mixed with salt and chillies is the consumed.

The following plants used by different communities are also used by the Zou tribes such as *Amomum dealbatum*, *Capsicum frutescens*, *Caryota urens*, *Dysoxylum gobara*, *Eryngium foetidum*, *Litsea cubeba*, *Spilanthes acemella*, *Centella asiatica*, *Arisaema leschenaultii* in Western Mizoram (Lalfakzuala, R.et.al.,2007) *Amaranthus spinosus*, *Amorphophallus campanulatus*, *Bambusa tulda*, *Benincasa hispida*, *Colocasia esculenta*, *Cucurbita maxima* and *Musa paradisiaca* by the chothe tribe (Purbashree.S.et. al., 2012) *Asparagus racemosus*,

Calamus erectus, *Eurya acuminata* & *Houttuynia cordata* by Garo tribe.(Bikarma S. et. al., 2012) *Amaranthus spinosus*, *Amaranthus viridis* and *Oroxylum indicum* in Melghat forest (Bhogaonkar P.Y. et. al.,2010).

It is found that the collections of wild edible plants from deep forest were mostly done by the males. Though some of the forest products having high commercial value are gradually domesticated, many are still growing wild and over exploited. These wild edible plants with high commercial value are also threatened by many factors such as deforestation, repeated Jhum cultivation, forest fire and rapid land transformation etc. The Study also found out that this traditional knowledge on wild edible plants is now mostly confined to elderly persons only, as the new generations have adapted to consuming and cultivating the modern high yielding varieties. In general, traditional knowledge exists among the Zou tribe on preparing nutritionally rich food items from various indigenous crop plants and forest products. These foods are part and parcel of their social spectrum of life (Devi and Suresh, 2012). They are not only rich in nutrients but also have certain curative properties against many diseases and disorders.

IV. CONCLUSION

Therefore, efforts made to collect this information will provide avenues for future work and further investigation of the nutritional aspects of less familiar wild edible plants. With the spread of high yielding varieties and due to many factors these valuable plant genetic resources vis-à-vis traditional knowledge has been depleting at an alarming rate. It is therefore necessary to readvocate the domestication of wild edible plant and to take up proper conservative measures to preserve these local gene pools before they are lost forever from the face of earth.

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A Review of Sudoku Solving using Patterns

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Abstract- A novel technique for very fast Sudoku solving using recognition of various patterns like Naked Singles, Hidden Singles, Locked Candidates, etc. is reviewed by conducting experiments and plotting the observations. Evaluation of the technique in solving random set of Sudoku puzzles collection show that the rate of solving can be greatly improved. However, only selected patterns are used for Sudoku solving in this review while even further improvement in solving rate may be possible if some more patterns could be detected and solved.

Index Terms—*Sudoku, Naked Singles, Hidden Singles, Naked Pair, Hidden Pair, Locked Candidates*

Introduction

Sudoku was developed by an American architect, Howard Garnes, in 1979, as a numerical combinatorial puzzle. The puzzle gained popularity in 2004, when Wayne Gould convinced The Times in London to publish it.^[1] There are 6,670,903,752,021,072,936,960 possible combinations for completing a 9-by-9 Sudoku grid, but only 5,472,730,538 of them really count for different solutions and hence one needs a handful of lifetimes to solve all of them.^[5]

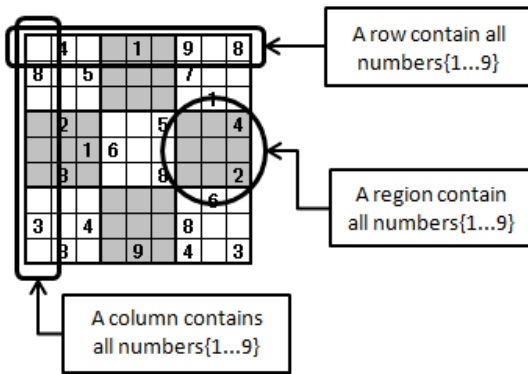
Various Sudoku solving guides have explained the presence of a variety of patterns in Sudoku. These patterns are mostly aimed at, and also used by, humans to solve Sudoku by deducing hints. A machine or a processor is expected to solve the puzzle faster by rapid guessing and backtracking, rather than understanding every puzzle and solving it step by step.

This paper attempts to feed the tips meant for Human Sudoku solving by detecting different patterns, to a machine and also using its power to guess rapidly and backtrack, to gain a remarkable improvement in Sudoku solving than a simple Backtracking approach. Section II explains the basic rules of solving a Sudoku puzzle. Section III

demonstrates the patterns used in our approach to solve a Sudoku. Section IV presents an experimental review to the theory of Sudoku solving and presents observations in a graphical and tabular manner.

THE RULES OF SUDOKU

The Sudoku rules^[2] are explained in Figure 1. General Sudoku puzzles consist of a 9 x 9 matrix of square cells, some of which already contain a numeral from 1 to 9. The arrangement of given numerals when the puzzle is presented is called the starting point. In Figure 1, it contains 24 non-symmetrical given numbers, and the correct number for the other 57 points should be solved. The degree of difficulty varies with the number of given numerals and their placement. Basically, fewer given numerals means a higher number of combinations among which the solution must be found, and so raises the degree of difficulty. But, there are about 15 to 20 factors that have an effect on difficulty rating. A Sudoku puzzle is completed by filling in all of the empty cells with numerals 1 to 9, but no row or column and no 3 x 3 sub-block (the sub-blocks are bound by heavy lines in Figure 1 may contain more than one of any numeral. An example solution to the example Sudoku puzzle given in Figure 1 is shown in Figure 2. In this figure, the given numbers marked in bold-face.



a. An example of Sudoku puzzles, 24 positions contain a given number, the other position should be solved.

	4		1		9	8		
8	5				7			
						1		
	2			5				4
		1	6					
	3			8				2
							6	
3	4				8			
8			9	4	3			

6	4	3	5	1	7	9	2	8
8	1	5	3	2	9	7	4	6
2	9	7	8	6	4	3	1	5
9	2	8	1	7	5	6	3	4
4	7	1	6	3	2	5	8	9
5	3	6	9	4	8	1	7	2
7	5	9	4	8	3	2	6	1
3	6	4	2	5	1	8	9	7
1	8	2	7	9	6	4	5	3

b. A solution for the Sudoku puzzles given in Figure 1. The given numbers marked in bold-face

PATTERNS IN SUDOKU

Our approach to fast Sudoku Solving employs detecting the patterns like Naked Singles, Hidden Singles, Naked Pairs, Hidden Pairs and Locked Candidates.

A. The Naked Singles Pattern

For any given Sudoku position, imagine listing all the possible candidates from 1 to 9 in each unfilled square. Next, for every square S whose value is v, erase v as a possible candidate in every square that is a buddy of S. The remaining values in each square are candidates for that square. When this is done, if only a single candidate v remains in square S, we can assign the value v to S. This situation is referred to as a “naked single”.

	1	2	3	4	5	6	7	8	9
a	² _{7 9}	² ₉	1	3	8	^{2 5 6} _{7 9}	^{5 9} _{7 9}	4	^{5 9} _{7 9}
b	5	4	6	^{7 9} _{7 9}	^{7 9} _{7 9}	1	³ ₉	2	³ _{7 8 9}
c	^{2 3} _{7 8 9}	² _{8 9}	^{2 3} _{7 8}	² _{7 8}	^{2 5 6} _{7 9}	^{2 5 6} _{7 9}	^{2 5 6} _{7 9}	^{1 3 1} _{5 9 7 8 8}	^{1 5 6} _{5 6 7 8 9}
d	6	^{1 2} _{8 7 8}	² _{7 8}	^{1 2} _{7 5}	^{1 2} _{7 5}	² _{7 8}	4	9	^{2 3} _{7 5}
e	4	² _{7 9}	5	^{2 6} _{7 9}	3	^{2 6} _{7 9}	8	⁷ ₇	1
f	^{1 2} _{7 8}	3	9	^{1 2} _{4 5 7}	^{1 2} _{7 5}	² _{4 5 7 8}	^{2 5} _{5 7}	⁵ ₇	6
g	^{1 2 3} _{8 9}	^{1 2} _{5 8 9}	^{2 3} _{4 8}	^{1 2} _{7 9}	^{1 2} _{7 9}	^{2 5 6} _{7 9}	^{2 5 6} _{7 9}	^{1 2} _{5 8 8}	^{1 2} _{5 8 9}
h	^{1 2} ₉	7	² ₈	8	^{1 5} ₉	^{2 5} ₉	6	3	4
i	^{1 2} _{8 9}	6	² ₈	^{1 2} _{5 9}	4	3	7	^{1 5} _{8 8}	^{2 5 8} _{8 9}

	1	2	3	4	5	6	7	8	9
a	² _{7 9}		1	3	8	^{2 5 6} _{7 9}	^{5 9} _{7 9}	4	^{5 9} _{7 9}
b	5	4	6	^{7 9} _{7 9}	^{7 9} _{7 9}	1	³ ₉	2	³ _{7 8 9}
c	^{2 3} _{7 8 9}		³ _{8 9}	² _{7 8}	² _{7 8}	^{2 5 6} _{7 9}	^{2 5 6} _{7 9}	^{1 3 1} _{5 9 7 8 8}	^{1 5 6} _{5 6 7 8 9}
d	6	¹ _{8 7 8}		^{1 2} _{7 5}	^{1 2} _{7 5}	² _{7 8}	4	9	^{2 3} _{7 5}
e	4	² _{7 9}	5	^{2 6} _{7 9}	3	^{2 6} _{7 9}	8	7	1
f	¹ _{7 8}	3	9	^{1 2} _{4 5 7}	^{1 2} _{7 5}	² _{4 5 7 8}	^{2 5} _{5 7}	⁵ ₇	6
g	^{1 3 1} _{8 9}	^{1 2} _{5 8 9}	^{4 3} _{4 8}	^{1 2} _{7 9}	^{1 2} _{7 9}	^{2 5 6} _{7 9}	^{2 5 6} _{7 9}	^{1 2} _{5 8 8}	^{1 2} _{5 8 9}
h	¹ ₉	7	2	8	^{1 5} ₉	⁵ ₉	6	3	4
i	¹ _{8 9}	6		^{1 2} _{5 9}	4	3	7	^{1 5} _{8 8}	^{2 5 8} _{8 9}

c. Candidate Elimination and Naked Singles

In the example on the first Sudoku in Figure 3 the larger numbers in the squares represent determined values. All other squares contain a list of possible candidates, where the elimination in the previous paragraph has been performed. In this example, the puzzle contains three naked singles at e2 and h3 (where a 2 must be inserted), and at e8 (where a 7 must be inserted).

Notice that once you have assigned these values to the three squares, other naked singles will appear. For example, as soon as the 2 is inserted at h3, you can eliminate the 2's as candidates in h3's buddies, and when this is done, i3 will become a naked single that must be filled with 8. The second Sudoku of Figure 3 shows the same puzzle after the three squares have been assigned values and the obvious candidates have been eliminated from the buddies of those squares.

B. The Hidden Singles Pattern

Sometimes there are cells whose values are easily assigned, but a simple elimination of candidates as described in the last section does not make it obvious. If you re-examine the situation on the left side of Figure 2, there is a hidden single in square g2 whose value must be 5. Although at first glance there are five possible candidates for g2 (1, 2, 5, 8 and 9), if you look in column 2 it is the unique square that can contain a 5. (The square g2 is also a hidden single in the block ghi123) Thus 5 can be placed in square g2. The 5 in square g2 is "hidden" in the sense that without further examination, it appears that there are 5 possible candidates for that square. To find hidden singles look in every virtual line for a candidate that appears in only one of the squares making up that virtual line. When that occurs, you've found a hidden single, and you can immediately assign that candidate to the square. To check your understanding, make sure you see why there is another hidden single in square d9 in Figure 3. The techniques in this section immediately assign a value to a square. Most puzzles that are ranked "easy" and many that are ranked "intermediate" can be completely solved using only these methods. The remainders of the methods that we will consider usually do not directly allow you to fill in a square. Instead, they allow you to eliminate candidates from certain squares. When all but one of the candidates have been eliminated, the square's value is determined.

C. The Locked Candidates Pattern

	1	2	3	4	5	6	7	8	9
a	1 ^{4 5}	8	6	7	2	4 ⁵	9	3	
b	7 ^{5 3}	7 ^{5 3}	9	8	1	4	6	7 ⁵	2
c	4 ²	6	7 ²	9	5	3	8	4 ⁷	1
d	4 ^{5 3}	4 ^{5 3}	6	4 ^{2 3}	2 ³	7	1	8	5 ⁹
e	4 ⁵	2	1	4 ⁵	9	8	7	3	6
f	4 ^{5 3}	8	7 ^{5 3}	1	2 ³	6	4 ^{2 3}	4 ^{2 3}	5 ⁹
g	2 ⁵	1	4	3	8	9	2 ⁵	6	7
h	6	7 ^{5 3}	7 ^{5 3}	7 ²	4	1	9	2 ⁵	8
i	8	9	7 ²	7 ²	6	5	3	1	4

d. Locked Candidates Pattern Example

Locked candidates are forced to be within a certain part of a row, column or block. Sometimes you can find a block where the only possible positions for a candidate are in one row or column within that block. Since the block must contain the candidate, the candidate must appear in that row or column within the block. This means that you can eliminate the candidate as a possibility in the intersection of that row or column with other blocks.

A similar situation can occur when a number missing from a row or column can occur only within one of the blocks that intersect that row or column. Thus the candidate must lie on the intersection of the row/column and block and hence cannot be a candidate in any of the other squares that make up the block.

Both of these situations are illustrated in Figure 4. The block def 789 must contain a 2, and the only places this can occur are in squares f 7 and f 8: both in row f. Therefore 2 cannot be a candidate in any other squares in row f, including square f 5 (so f 5 must contain a 3). Similarly, the 2 in block ghi456 must lie in column 4 so 2 cannot be a candidate in any other squares of that column, including d4. Finally, the 5 that must occur in column 9 has to fall within the block def 789 so 5 cannot be a candidate in any of the other squares in block def 789, including f 7 and f 8.

D. The Naked and Hidden Pairs Pattern

	1	2	3	4	5	6	7	8	9
a	1	2 7	4 2 3	5	4 3 6	8	9	7 2	4 2 3 7 6

e. A Naked Pair Example

These are similar to naked singles, discussed in Section III.C, except that instead of having only one candidate in a cell, you have the same two candidates in two cells

Figure 5 shows how to use a naked pair. In squares a2 and a8 the only candidates that appear are a 2 and a 7. That means that 7 must be in one, and 2 in the other. But then the 2 and 7 cannot appear in any of the other squares in that row, so 2 can be eliminated as a candidate in a3 and both 2 and 7 can be eliminated as candidates in a9.

Hidden pairs are related to Naked Pairs in the same way that hidden singles are related to naked singles.

EXPERIMENT

We use the above explained patterns to solve bulk Sudoku puzzles using a Java program and plot the various observations using JFreeChart API^[3].

E. Experiment Details

File used for solving Sudoku consists of 1000 Sudoku puzzles randomly selected by repeating 20 very hard Sudokus 50 times.

The puzzles in the file are arranged in the following format

```
10867209300981460206095380100600718002109
8736080106000014389067600041908890065314
(Sudoku in Figure 4)
```

i.e. 81 integers in every line and 0s indicating unsolved cells

Every single line denotes a separate puzzle to be solved

The file we use contain a variety of Sudokus which can be found here →

<https://docs.google.com/file/d/0B3NNpon4i9lfb3NraG54VkM4V1k/edit?usp=sharing>

We solve this file using a Java program that detects patterns like Naked Singles, followed by Hidden Singles, Naked Pair, Hidden Pairs, Locked Candidates and answers are obtained in the same format in a separate file.

F. Experiment Result

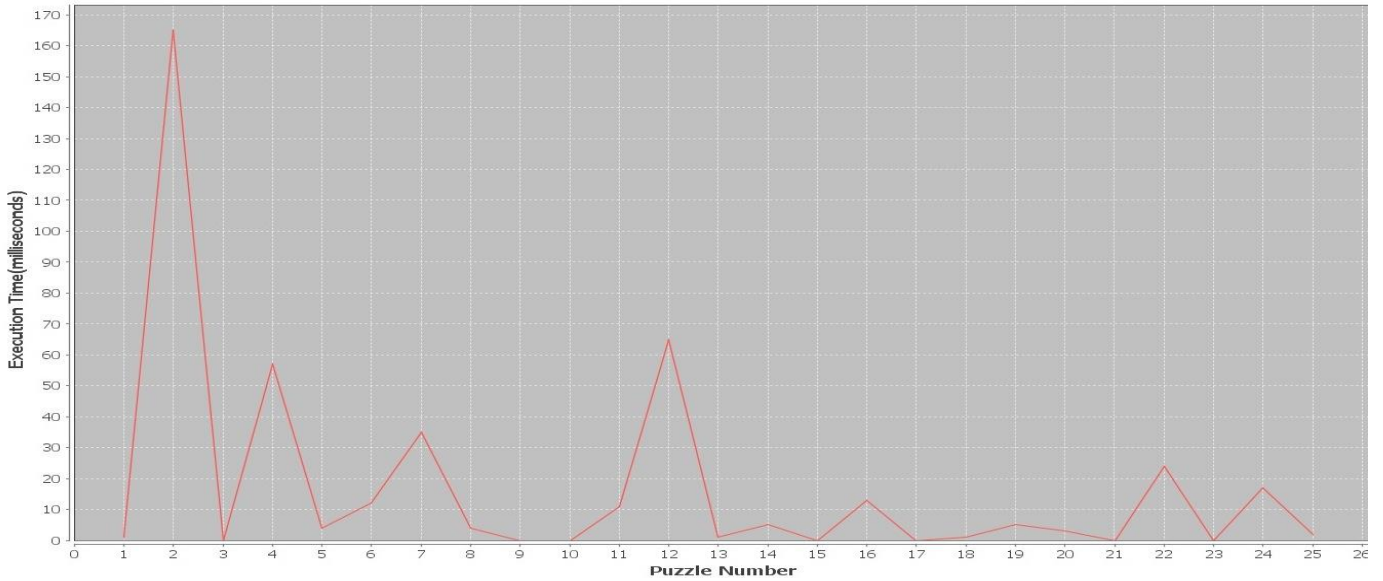
Our approach solved the 1000 puzzles in 6810 milliseconds on a machine with following configuration:

Processor Intel Core i3
RAM: 4 GB
OS: Windows 7 Home Edition

Graphical plot of our results are presented below

Plot of Execution Time vs. Puzzle Number (Figure 6)
 The plot below, contains only 25 puzzles for clarity
 1 Unit= 10 milliseconds on Y axis

Intelligent

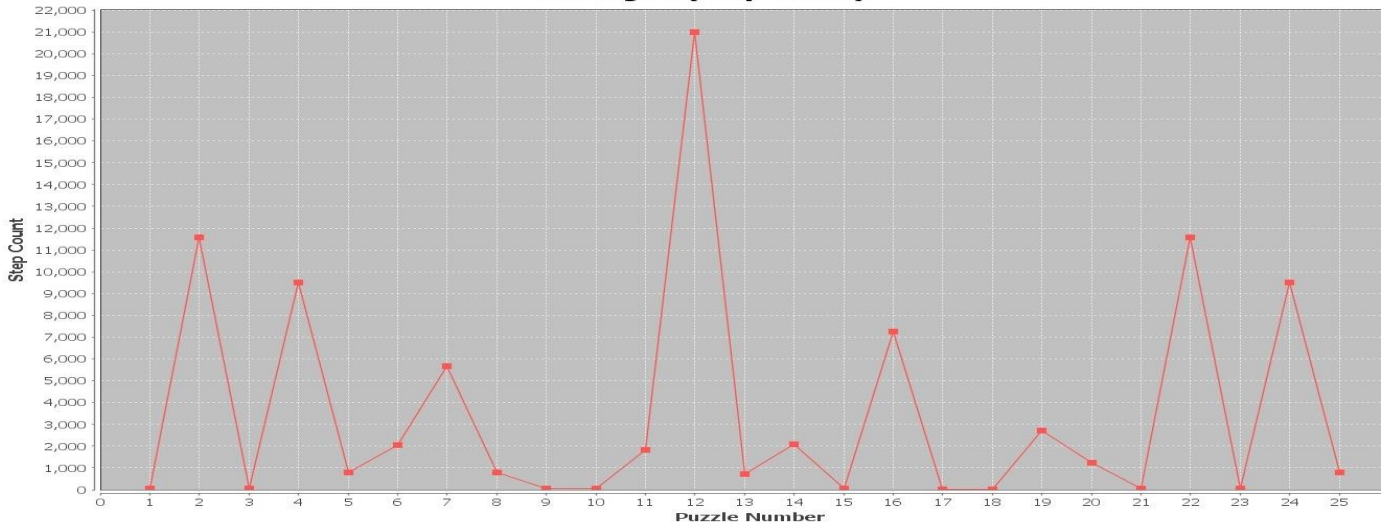


f. Graph : Execution Time vs. Puzzle Number
 (1 Unit= 10 milliseconds steps on Y axis)

- I. Our approach required 6810 milliseconds time to solve 1000 Sudokus. (485 milliseconds to solve the 25 puzzles shown on the graph).
- II. On an average it required 40 milliseconds to solve a puzzle(evident from the graph)

Figure 7 shows another graph - the number of steps required in solving these 25 Sudokus using patterns.

Intelligent(Step Count)



g. Graph : Step Count vs. Puzzle Number
 (1 Unit= 1000 steps on Y axis)

We can observe that number of steps required is around 13000 on an average.

G. Comparison with Top Sudoku Solvers

An existing review of the performance of many Sudoku Solvers on the web [4] shows the following result.

Solver	Algorithm	Test Unique?	Language	Time (sec)
JSolve	backtracking	Yes	C	0.25
kudoku	backtracking	Yes	C	1.1
fast_solv_9r2	DLX	Yes	C	1.4
kudoku	backtracking	Yes	Java	2.0
kudoku	backtracking	Yes	JavaScript	6.3
kudoku	backtracking	Yes	Lua	7.5
sudoku-bb	Backtrack	No	Python	33.5
sudoku-gh	DLX	Yes	JavaScript	41.2
Peter Norvig's	backtracking	No	Python	147.4
kudoku	backtracking	Yes	Python	190.5
sudoku-pk	backtracking	No	Javascript	278.4
sudoku-aa	DLX	Yes	Python	514.0
sudoku_db	backtracking	No	Python	1915
Sudoku_bc	backtracking	Yes	Java	2180
Sudoku_dl	unknown	No	Java	2975
Sudoku_6l	brute-force	No	Java	25385

h. Image showing tabular comparison of Sudoku Solvers^[4]

The above table shows performance of various solvers on the same set of 1000 puzzles collection.

CONCLUSION

Sudoku solving using patterns surely lowers the execution time required to solve huge number of Sudokus. The graphs and tables presented in this paper effectively prove the same.

FUTURE WORK

The motive of this paper was to review the performance of a brute-forced based Sudoku Solver using pattern matching.

This review used limited number of patterns that were comparatively easier to detect than some complex patterns. However, detecting more patterns may give considerably better results.

ACKNOWLEDGMENT

We would sincerely like to thank Dr. Sunil Patekar and Prof. Mahesh Bhawe, for their constant support and inspiration in this project.

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- [5] <http://www.afjarvis.staff.shef.ac.uk/sudoku/>

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Assessment among Single and Three Phase 14 – Echelon Cascaded Multilevel Inverter

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Abstract- Multilevel inverters have attracted a great deal of attention in medium voltage and high power application. Due to their lower switching losses, EMI, high efficiency. Among the several multilevel inverters topology it is more attractive due to the simplicity of control. This paper proposes to CHMLI output voltage level is increase to reduced total harmonic Distortion. Hence the paper mainly focused on 14 level multilevel inverter using 12 switches (3H-bridge inverters). The result shows that the proposed method evaluate single and three phase cascaded multilevel inverter effectively minimizes a large number of specific harmonics and reduced switching loss, the output voltage in addition of very low total harmonic distortion. This paper proposed on HCMLI that uses only one power source for each phase. It can produce desired multilevel voltage wave from the multilevel inverter topology can overcome some of its limitations the conventional method. Echelon.

Index Terms- Cascaded Multi level inverter (CHMLI), Total Harmonic Distortion (THD), Pulse Width Modulation (PWM).

I. INTRODUCTION

Modern power semiconductor devices have made the Cascaded H-bridge multilevel converter, patented in 1975, practical for use as medium/high-voltage inverters, the output voltage and reduce the undesired harmonics; different sinusoidal pulse width modulation (PWM) and space-vector PWM schemes are suggested for multilevel inverters however, PWM techniques are not able to eliminate low-order harmonics completely. This paper discusses about the cascaded multilevel inverter and how to reduce the Total Harmonic Distortion using the control of switching angle i.e. Conduction angle control method. Conventional 14- echelon pulse width-modulated (PWM) inverters. They offer improved output waveforms, smaller filter size, lower EMI, lower total harmonic distortion (THD), and others. In addition, several modulation and control strategies have been developed or adopted for multilevel inverters, including the following: multilevel sinusoidal (PWM), multilevel selective harmonic elimination, and space vector modulation.

A typical single-phase echelon inverter adopts full-bridge configuration by using approximate sinusoidal modulation technique as the power circuits. The output voltage then has the following three values: zero, positive (+Vdc), and negative (-Vdc) supply dc voltage (assuming that Vdc is the supply voltage). The harmonic components of the output voltage are determined by the carrier frequency and switching functions.

Simulation and experimental results are presented to validate the proposed inverter configuration.

This paper presents a single & three-phase 14-echelon inverter topology for dc systems with a novel Pulse width-modulated (PWM) control scheme. In our project HBMLI is used. It is main reason to simplicity of control and a cascade multilevel inverter is built to synthesize a desired AC voltage from several levels of DC voltages. Though the cascaded has the disadvantage to need separate dc sources the problem of the dc link voltage unbalancing does not occur, thus easily expanded to multilevel. Unlike the diode clamp or flying capacitors inverter, the cascaded inverter does not require any voltage clamping diodes or voltage balancing capacitors.

The result shows that the proposed method effectively minimizes a large number of specific harmonics, and the output voltage result in very low total harmonic distortion and switching frequency. In our project HBMLI is used

II. EXISTING TECHNOLOGY

In conventional method they are used 11- level Inverter with 5 H-Bridge circuits. By using this method inverter offers high total harmonic distortion.

III. PROPOSED TECHNOLOGY & BLOCK DIAGRAM

In proposed method we implied a 14- echelon Inverter with 3 H-Bridge circuits. By using this proposed idea it minimizes the high total harmonic distortion through the appending of echelons. In this paper both single and three phase total harmonic distortion has minimized.

A cascaded multilevel inverter consists of a series of H-bridge (single phase, full bridge) inverter units. The general function of this multilevel inverter is to synthesize a desired voltage from several separate dc sources (SDCSs), which may be obtained from batteries, fuel cells, or solar cells. Figure shows the basic structure of a single phase cascaded inverter with SDCSs. Each SDCS connected to an H bridge inverter. The ac terminal voltages of different level inverters are connected in series. Unlike the diode clamped or flying capacitors inverter, the cascaded inverter does not require any voltage clamping diodes or voltage balancing capacitors.

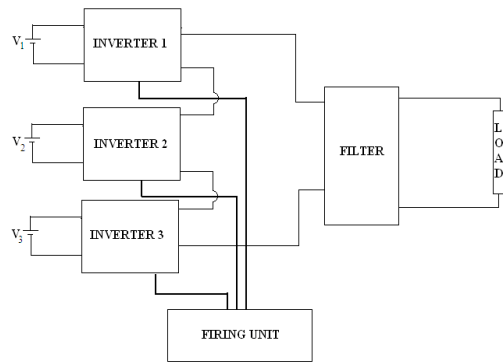


Fig 3.1 Block Diagram

One multilevel inverter topology incorporates cascaded single-phase H-bridges with separate dc sources (SDCSs) from the transformer secondary. This requirement makes renewable energy sources such as fuel cells or photovoltaic a natural choice for the isolated dc voltage sources needed for the cascade inverter. Fig shows a single-phase structure of an m-level cascade inverter. Each SDCS is connected to a single phase full-bridge, or H-bridge inverter. Each inverter level can generate three different voltage outputs, $+V_{dc}$, 0, and $-V_{dc}$, by connecting the dc source to the ac output by different combinations of the four switches one of the main advantages of the cascaded inverter is that the series of H-bridges makes for modularized layout and packaging. This will enable the manufacturing process to be done more quickly and inexpensively. Also, redundant voltage levels can be included in an application design so that the inverter can still operate even with the loss of one level. This enables the multilevel inverter to continue to function even when there is a problem with one of the dc sources or with one of the power electronics devices that make up the H-bridge. This paper discusses about the cascaded multilevel inverter and how to reduce the Total Harmonic Distortion using the control of switching angle i.e. Conduction angle control method.

Multilevel inverter is constructed depends on the number of echelons. Totally it requires $(m-1)$ capacitors and $2(m-1)$ switches for the construction of m level inverters. And also it needs $2(m-1)(m-2)$ diodes to clamp the voltage at various level of voltage. Gate signal is generated using the comparator. The ramp signal is compared with DC voltage. By adjusting the DC magnitude the pulse width is controlled. Here the lower switch conducts for long time than the upper switch.

IV. PROPOSED MANEUVER

This paper presents a new control method for the cascaded H-bridge multi-level inverter. Although the proposed method results in a slight reduction in voltage levels, only one isolated dc source per phase is required. This reduces the inverter cost and complexity. This new method is first applied to the traditional cascaded H-bridge inverter for two and three cells per phase. The control is then applied to an inverter with multi-level cells. A joint-phase redundancy technique is also explored for extending the power quality of the proposed technique

A cascaded multilevel inverter consists of a series of H-bridge (single phase, full bridge) inverter units. The general

function of this multilevel inverter is to synthesize a desired voltage from several separate dc sources (SDCSs) from transformer secondary, which may be obtained from batteries, fuel cells, or solar cells. Figure4.2 shows the basic structure of a single phase cascaded inverter with SDCSs. Each SDCS connected to an H bridge inverter. The ac terminal voltages of different level inverters are connected in series. Unlike the diode clamp or flying capacitors inverter, the cascaded inverter does not require any voltage clamping diodes or voltage balancing capacitors.

Among three types of topologies, the proposed paper topology is cascaded multi level inverter method. In this method, the diode clamps the voltage across the switch to one level. And all diodes are selected as same type. i.e. same voltage withstanding capacity. The diode provides the forward path and feedback path to the current.

V. MODES OF OPERATION

The operation of echelon inverter is explained in different modes. During each mode what are devices are in on and off condition. There are totally 14 modes for full cycle operation. But for half cycle there are seven modes. i.e. To produce the positive half cycle of output voltage leg A operation of single phase inverter is explained. The remaining negative half cycle operation is for leg B.

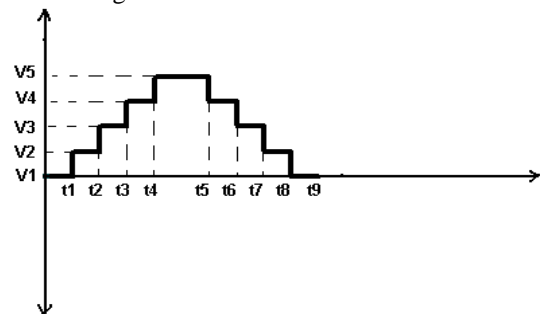


Figure5.1 output voltage waveform to explain the modes of operation

Mode 1 ($0 < t < t_1$)

In this mode the output voltage is zero. No devices of upper arm of leg A are turned on. But lower arm switches are in on condition. So the output voltage across the load is zero and equal to V_1 . And all switches of lower arm of leg B are in on condition.

The circuit diagram shows the five level diode clamped inverter with separate DC sources instead of capacitors.

Mode 2 ($t_1 < t < t_2$)

In this mode the switch in upper arm M_{A1} is switched on and M_{A1} in lower arm is switched off. So the output voltage is equal to V_2 . The current flows from the lower diodes D_5 , D_9 and D_{11} and through switch M_{a1} to load. And all switches of lower arm of leg B are in on condition.

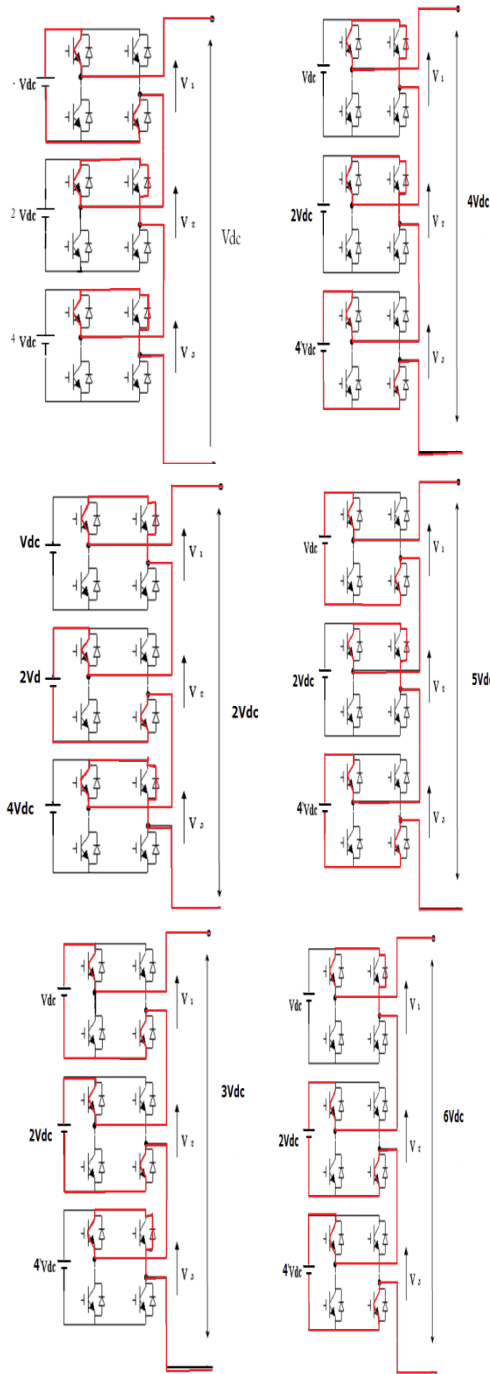


Figure 5.2 Positive and Negative Mode of Operation mode 1 operation ($0 < t < t_1$), Mode 2 operation, ($t_1 < t < t_2$), Mode 3 operation ($t_2 < t < t_3$), Mode 4 operation ($t_3 < t < t_4$), Mode 5 operation ($t_4 < t < t_5$), Mode 6 operation ($t_5 < t < t_6$), Mode 6 ($t_5 < t < t_6$)

In this mode the switches in upper arm M_{a1} and M_{a2} are switched on and M_{A1} & M_{A2} in lower arm are switched off. So the output voltage is equal to V_3 . The current flows from the diodes D_8 , D_7 and through switch M_{a1} & M_{a2} to load. And all switches of lower arm of leg B are in on condition.

Mode 4 ($t_3 < t < t_4$)

In this mode the switches in upper arm M_{a1} , M_{a2} and M_{a3} are switched on and M_{A1} , M_{A2} & M_{A3} in lower arm are switched off. So the output voltage is equal to V_4 . The current flows from

diode D_1 through switches M_{a1} , M_{a2} & M_{a3} to load. And all switches of lower arm of leg B are in on condition.

Mode 5 ($t_4 < t < t_5$)

In this mode the all switches in upper arm M_{a1} , M_{a2} , M_{a3} and M_{a4} are switched on and M_{A1} , M_{A2} , M_{A3} & M_{A4} in lower arm are switched off. So the output voltage is equal to V_5 . The current flows from the through switches M_{a1} , M_{a2} , and M_{a3} & M_{a4} to load. And all switches of lower arm of leg B are in on condition.

Mode 6 ($t_5 < t < t_6$)

In this mode the switches in upper arm M_{a1} , M_{a2} and M_{a3} are switched on and M_{A1} , M_{A2} & M_{A3} in lower arm are switched off. So the output voltage is equal to V_4 . The current flows from diode D_1 through switches M_{a1} , M_{a2} & M_{a3} to load. And all switches of lower arm of leg B are in on condition.

Mode 7 ($t_6 < t < t_7$)

In this mode the switches in upper arm M_{a1} and M_{a2} are switched on and M_{A1} & M_{A2} in lower arm are switched off. So the output voltage is equal to V_3 . The current flows from the diodes D_8 , D_7 and through switch M_{a1} & M_{a2} to load. And all switches of lower arm of leg B are in on condition.

Mode 8 ($t_7 < t < t_8$)

In this mode the switch in upper arm M_{a1} is switched on and M_{A1} in lower arm is switched off. So the output voltage is equal to V_2 . The current flows from the lower diodes D_5 , D_9 and D_{11} and through switch M_{a1} to load. And all switches of lower arm of leg B are in on condition.

Mode 9 ($t_8 < t < t_9$)

In this mode the output voltage is zero. Because all devices of upper arm of leg A are turned off. But lower arm switches are in on condition. So the output voltage across the load is zero and equal to V_1 . And all switches of lower arm of leg B are in on condition.

5.1 Principle of Operation

A cascaded multilevel inverter consists of a series of H-bridge (single phase, full bridge) inverter units. The general function of this multilevel inverter is to synthesize a desired voltage from several separate dc sources (SDCSs), which may be obtained from batteries, fuel cells, or solar cells. Figure 4.3 shows the basic structure of a single phase cascaded inverter with SDCSs. Each SDCS connected to an H bridge inverter. The ac terminal voltages of different level inverters are connected in series. Unlike the diode clamp or flying capacitors inverter, the cascaded inverter does not require any voltage clamping diodes or voltage balancing capacitors.

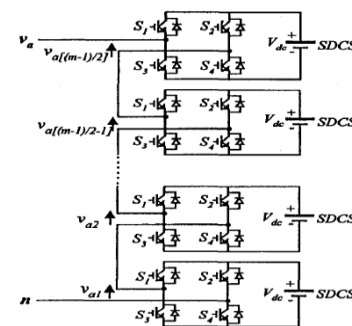


Fig 5.1 Single-phase structure of a multilevel cascaded H-bridges inverter

One multilevel inverter topology incorporates cascaded single-phase H-bridges with separate dc sources (SDCSs) from the transformer secondary. This requirement makes renewable energy sources such as fuel cells or photovoltaic a natural choice for the isolated dc voltage sources needed for the cascade inverter. Fig 5.1 shows a single-phase structure of an m-level cascade inverter. Each SDCS is connected to a single phase full-bridge, or H-bridge inverter. Each inverter level can generate three different voltage outputs, $+V_{dc}$, 0, and $-V_{dc}$, by connecting the dc source to the ac output by different combinations of the four switches, $S_1, S_2, S_3,$ and S_4 .

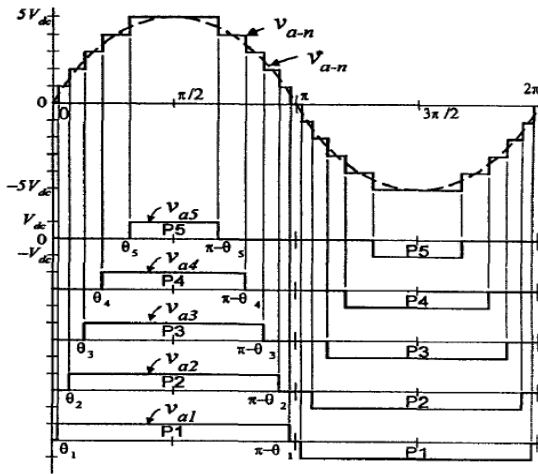


Fig 5.2 Waveforms and switching method of the 14-level cascade inverter.

To obtain $+V_{dc}$, switches S_1 and S_4 are turned on. Turning on switches S_2 and S_3 yields $-V_{dc}$. By turning on S_1 and S_2 , or S_3 and S_4 , the output voltage is 0. The ac outputs of each of the different full-bridge inverter levels are connected in series such that the synthesized voltage waveform is the sum of the inverter outputs. The number of output phase voltage levels m in a cascade inverter is defined by $m = 2s+1$, where s is the number of separate dc sources (photovoltaic modules or fuel cells). An example phase voltage waveform for an 14- level cascaded H-bridge inverter with 5 SDCSs and 3 full bridges is shown in Fig 4.3. 1phase voltage $V_{an} = V_{a1} + V_{a2} + V_{a3} + V_{a4} + V_{a5}$. The output voltage of the inverter is almost sinusoidal, and it has less than 5% total harmonic distortion (THD) with each of H Bridge switching only at fundamental frequency.

The conducting angles, $\theta_1, \theta_2, \dots, \theta_s$. can be chosen such that the voltage total harmonic distortion is a minimum. Normally, these angles are chosen so as to cancel the predominant lower frequency harmonics.

For the 14-level case in Fig. the 5th, 7th, 11th and 13th harmonics can be eliminated with the appropriate choice of the conducting angles. From Fig.5.2, note that the duty cycle for each of the voltage levels is different. If this same pattern of duty cycles was used continuously, then the level of voltage source would be required to generate much more power than the level-5 voltage source.

VI. HARMONIC ANALYSIS

The proposed system analyses the frequency spectrum and voltage control. In conduction angle control the lower order harmonics are reduced. By adjusting the turn on angle to various levels, it is possible to reduce the lower order harmonics and the efficiency, power factor is improved. The Fourier expression is also obtained for the output voltage of five-level inverter.

For 14-echelon inverter

$$V_o (wt) = \sum (4V_{dc}/n\pi) (\cos\alpha_1 + \cos\alpha_2 + \cos\alpha_3 + \cos\alpha_4) \sin n\theta \dots \dots \dots 5.3$$

$n = 1, 3, 5 \dots \dots$

Where V_{dc} is the supply dc voltage.

In the above expression there are four angles related to output voltage. So it is possible to reduce four odd harmonics. Because even harmonics are not present in output voltage. But our aim is to control the output voltage and reduction of harmonics. From the above expression four equations are formed and the four angles are found.

If the no of levels are increased it is not easy to find the switching angles to remove particular order of harmonics. For that elimination theory is used. The modulation index is chosen as 0.8 for low THD. In 14- level inverter, to reduce the LOH from the output voltage, the turn-on angles are calculated from the output voltage equation. To reduce the lower order harmonics 5th, 7th and 11th in the proposed system, the conduction angle is found by solving the following equation.

VII. PROPOSED HARMONIC REDUCTION TECHNIQUE

There are four equations to find the angles to reduce LOH especially 5th, 7th and 11th in the output voltage. At the same time we can control the required output RMS voltage using the equation 5.4 The other equations 5.5, 5.6 and 5.7 are used to reduce the fifth, seventh and eleventh order harmonics. Totally the THD is reduced.

The four equations are

$$\begin{aligned} \cos\alpha_1 + \cos\alpha_2 + \cos\alpha_3 + \cos\alpha_4 &= m \dots \dots \dots 7.1 \\ \cos 5\alpha_1 + \cos 5\alpha_2 + \cos 5\alpha_3 + \cos 5\alpha_4 &= 0 \dots \dots \dots 7.2 \\ \cos 7\alpha_1 + \cos 7\alpha_2 + \cos 7\alpha_3 + \cos 7\alpha_4 &= 0 \dots \dots \dots 7.3 \\ \cos 11\alpha_1 + \cos 11\alpha_2 + \cos 11\alpha_3 + \cos 11\alpha_4 &= 0 \dots \dots \dots 7.4 \end{aligned}$$

Using MathCAD program, the conduction angles were found to satisfy the above equations and they are $\alpha_1 = 12.834^\circ$; $\alpha_2 = 29.908^\circ$; $\alpha_3 = 50.993^\circ$; $\alpha_4 = 64.229^\circ$; The total harmonic distortion is defined as

$$THD = \frac{\sqrt{(V_3^2 + V_5^2 + V_7^2 + \dots \dots \dots V_{31}^2)}}{V_1} \dots \dots \dots 7.5$$

VIII. SIMULATION RESULTS

The simulation result shows that the developed 14-echelon PWM inverter has many merits such as reduces number of switches, lower EMI, less harmonic distortion and the THD of

the proposed inverter is consider by alleviated and the dynamic response are also improved significantly.

The simulation result proposed to minimize the THD. With using of reduced low number switches. The voltage of DC link for each H-bridge units is considered to be $V_1 < V_2 < V_3$, and simulation is done The simulation result shown in single & three phase and compare THD ,the simulation result shows that FFT Analysis to find the THD. The first simulation result was minimizing single phase 14 – level HCMLI the THD level was 15.16%. The Second Simulation result was minimizing three phase 14 – level HCMLI the THD level was 13.74%. So three phase total harmonics distortion is very less 1.42%. Main advantages of project thus proposed inverter involves many advantages over the convention inverter.

The study can further be investigated by employing control schemes to have higher dynamic response and by using high level inverters.

8.1 Simulation Model (1Φ)

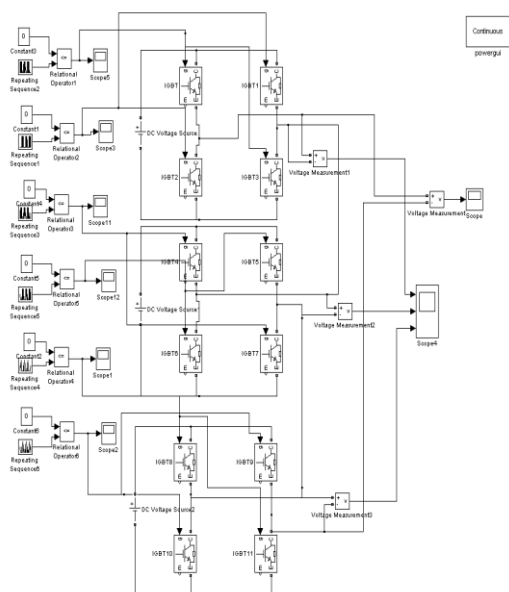


Fig 8.1 Single Phase 14 –echelon Cascaded Multilevel Inverter

8.2 Simulation Output Diagram

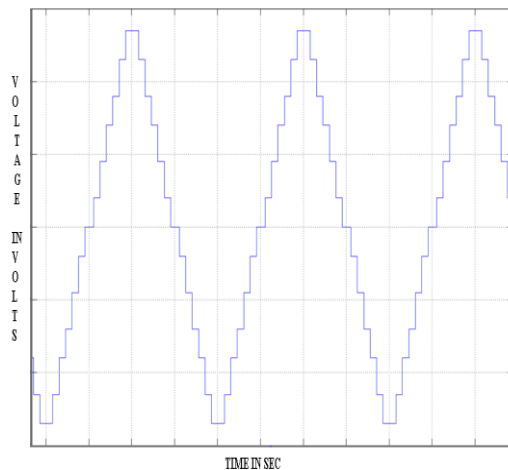


Fig8.2Simulation Output

8.3 TOTAL HARMONIC DISTORTION (1Φ)

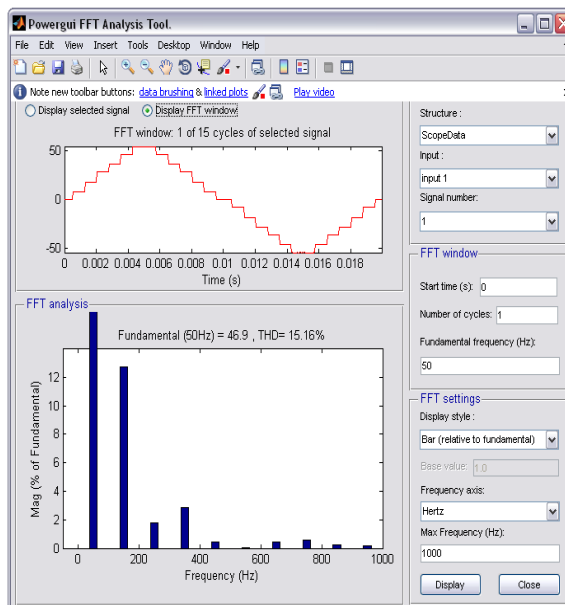


Fig 8.3 Total Harmonic Distortion (THD)

8.4 Simulation Model (3 Φ)

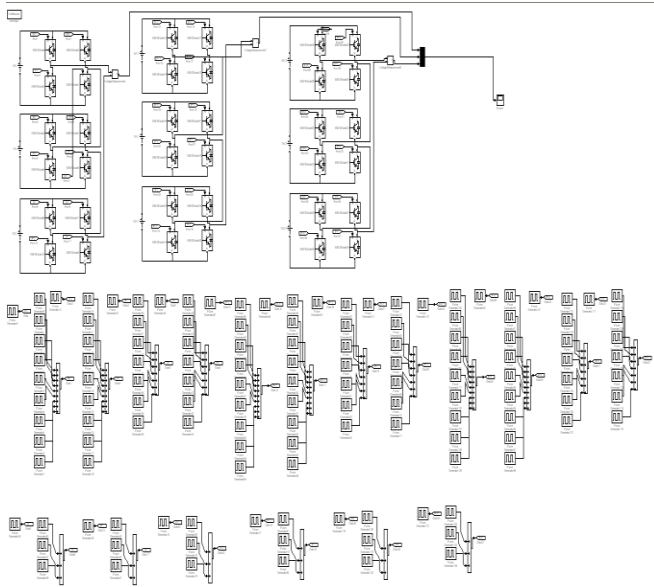


Fig 8.4 Three Phase 14 –level CMLI

8.5 Simulation Output Diagram (3Φ)

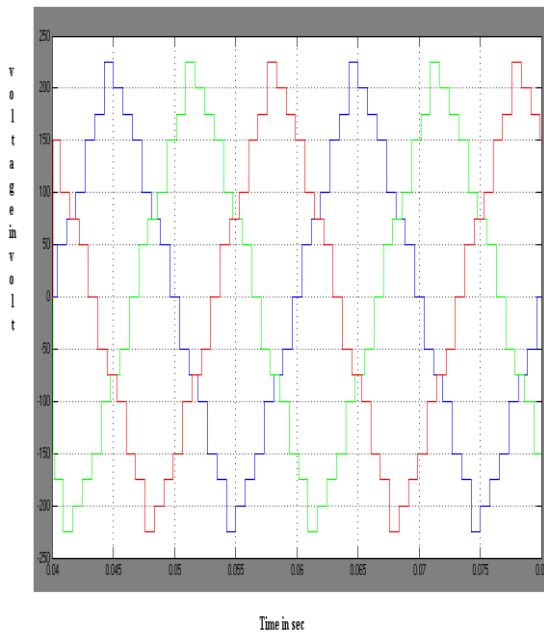


Fig 8.5 Simulation Output Diagram (3Φ)

8.6 Total Harmonic Distortion (3 Φ)

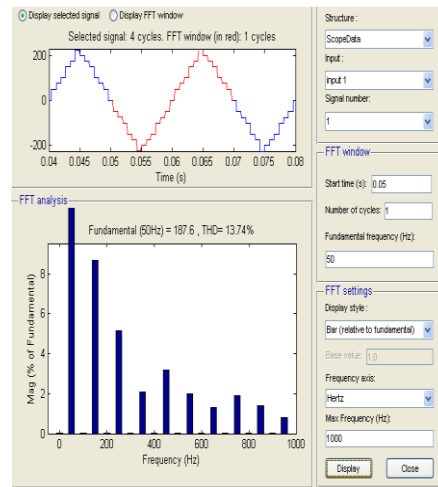


Fig 8.6 Total Harmonic Distortion (3Φ)

s.no	Order of Harmonics	Frequency in HZ	Harmonics in%
1.	3 rd	150	12.07%
2.	5 th	250	1.95%
3.	7 th	350	2.84%
4.	9 th	450	0.41%
5.	11 th	550	0.06%
6.	13 th	650	0.41%
7.	15 th	750	0.55%
8.	17 th	850	0.22%
9.	19 th	950	0.17%
		TOTAL	15.16%

Table:1 Single phase 14 echelon CMLI

Three Phase 14-Echelon CMLI

s. no	Order of Harmonics	Frequency in HZ	Harmonics in%
1.	3 rd	150	11.70%
2.	5 th	250	1.73%
3.	7 th	350	0.44%
4.	9 th	450	0.21%

5.	11 th	550	0.06%
6.	13 th	650	0.41%
7.	15 th	750	0.10%
8.	17 th	850	0.22%
9.	19 th	950	0.02%
		TOTAL	13.74%

Table: 2Three phase 14 echelon CMLI

IX. CONCLUSION

This paper is mainly focused on, to reduce Total Harmonic Distortion (THD) and number of switch& improve output voltage level. In conventional method, used 11- echelon Inverter with 5 H-Bridge circuits. In proposed method we implied a 14-echelon Inverter with 3 H-Bridge circuits. By using this proposed idea it minimizes the high total harmonic distortion through the appending of echelons. In this paper both single and three phase total harmonic distortion has minimized. Simulation result is providing for a 14-level cascade H-bridge inverter to validate the accuracy of computational result. Single and Three phase simulation result was minimizing 14 – level HCMLI the THD level was 15.16%&13.74%. Comparison of result with active harmonics elimination techniques shows that the total harmonics distortion and switching frequency of output voltage decreased dramatically

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Application of Ground Penetrating Radar in delineating zones of Gold Mineralization at the Subenso-North Concession of Newmont Ghana Gold Limited

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Abstract- The growing interest in Ghana's gold mining sector due to the recent upsurge in the price of gold has impacted greatly on the economy of the country with regard to its revenue generation capacity. There is therefore the need to develop this sector. Hence, any new method which is relatively low cost and has comparable efficiency compared to prevailing conventional methods in delineating new potential gold fields would be highly recommended. This study therefore aims at using the ground penetrating radar (GPR) a hitherto unknown geophysical method in the mining industry in Ghana, to detect possible zones of gold mineralization in Ghana. The GPR survey was conducted over the Subenso-north gold deposit, a property of Newmont Ghana Gold Limited to delineate geological structures that possibly host gold mineralization. The Mala GPR equipment with 25 MHz unshielded rough terrain antenna frequency in the common offset mode was used to conduct the survey. The survey was conducted over an area of 1 km² with a total of 21 profiles at a 50 m profile separation. Results of the survey indicated weathered saprolitic topsoil up to a depth of about 12 m. In addition two structural patterns possibly hosting gold mineralization were delineated as S1 and S2. The S1 and S2 inferred structures were found between the depth ranges of (12 m and 42 m) and (31 m and 48 m respectively. Comparison of results from co-located electrical resistivity and chargeability measurements confirmed the mineralization trend of the surveyed site.

Index Terms- radar, mineralization, delineate, chargeability, saprolite

I. INTRODUCTION

Geophysical methods have played a major role in the discovery and development of the gold exploration sector. These methods have enhanced and increased the chances of discovery of potential gold reserves. Geophysics also gives a full insight into the depositional environment. A few of the methods commonly used for the prospecting of gold mineralization are; magnetic, gravity, resistivity, and transient electromagnetic (TEM) methods. Despite the benefits derived from the application of these methods in gold exploration they have not been extensively employed in the development of the century old mining sector in Ghana. Most companies both foreign and local in the past and present have used conventional geological mapping, drilling and other techniques based mainly on the geological structure of the formations in the exploration for gold from the reconnaissance to the exploitation stages. The main

mining company in Ghana which uses the geophysical tools to aid in the exploration of gold deposit is the Newmont Ghana Gold Limited. The Newmont Ghana Geophysical crew has embarked on a number of geophysical surveys in ground magnetic, induce polarization, 3-D resistivity, transient electromagnetic and ground gravity measurements in the search of economic gold deposits. Although the used of geophysical methods have potentially contributed greatly to the success history of the company in Ghana, the potential of ground penetrating radar (GPR) in the delineation of gold targets have not been tested. Literature shows the success of this method in exploration in many fields. Over the past decades, GPR has been used extensively on quite a number of applications. For example, the GPR technique has been successfully used to explore gem tourmaline pockets and vugs (Patterson and Cook, 1999; Patterson, 2001); voids and cavities (Leggo and Leech 1983); iron oxide deposits (Van Dam and Schlager, 2000, Van Dam et al 2003), the depth of water table (Van Heteren et al 1998, Van Overmeeren 1998, Neal and Roberts, 2000) and geological structures hosting mineral deposits (Ulriksen 1982, Davis et al. 1984, Birkhead et al 1996, Hofmann et al 1997, Eisenburger and Gundelach, 2000, Franke and Yelf 2003, Slater and Niemi 2003, Da Silva et al. 2004, Leucci 2006)

Scientific publications on the use of GPR application on hard crystalline granitic rocks, for locating mineralized zones have also received less attention by many researchers and mineral prospectors as compared to the conventional gravity, electrical resistivity, induced potential and magnetic methods. This study demonstrates how the GPR can be used to delineate possible structures that host gold mineralization at the Subenso-north Concession of Newmont Ghana Gold Limited.

II. MATERIALS AND METHODS

2.1 Description of study area

The measurements were taken at the Subenso North gold mine concession of Newmont Ghana Gold Limited, a 1 km² block located on the Universal Transverse Mercator (UTM) coordinate of longitude 590294 north and latitude 80106 west and between Teekyere and Adrobaa in the Brong Ahafo region of Ghana (Figure 1). Road access to the project site is via bitumen sealed road from Accra to Sunyani through Kumasi. The main town in the area is Teekyere which is located just by the road side about 2.5 km from Duayaw Nkwanta. About 1 km to the south of the deposit and almost parallel to the strike direction is a feeder road which connects two main towns in the area, Teekyere

on the south and Adrobaa on the north. The Project area comprises of low rounded hills with elevations ranging from 291 m to 326 m above mean sea level. Seasonal streams and

tributaries of the Tano River basin drain the broad, relatively flat valleys.

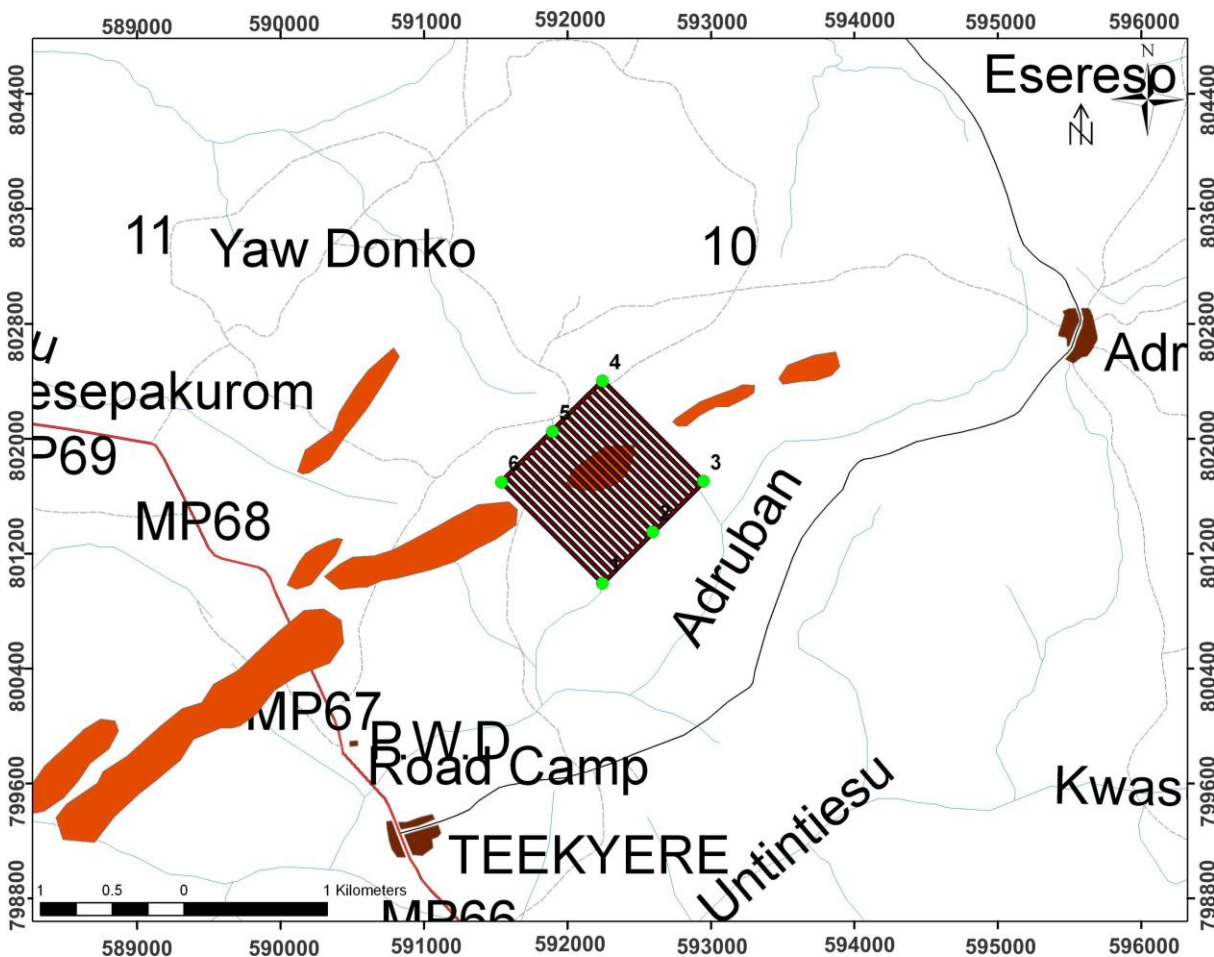


Figure 1: Location map of Subenso-North gold deposit (Cees, 2006)

2.2 Geological Setting and Mineralization

Three discrete geological zones are recognized within the Ahafo Project, relating to currently-identified mineralization styles. The Ahafo district currently consists of 12 discrete deposits, localized along multiple northeast-striking structural zones. Several additional exploration targets remain to be tested. All of the “shear zone” type deposits appear to be part of the same system. As with many deposits located in tropical climates, a saprolite zone, typically between 5 and 50 m thick, is developed at the surface. The saprolite zone gives way at depth to a sulphide zone within which gold mineralization occurs in structurally-controlled zones of hydrothermal alteration. Most of the Ahafo deposits remain open both along strike and down dip. Excellent potential exists for connecting some of the deposits into single pits and for discovery of deposits. The deposit has

dimensions of 1400 × 3-25 m and has been tested to a vertical depth of 140 m. Geologically, the Subenso-North concession falls within the Sefwi gold belt which is a 40 – 60 km wide typical Birimian volcanic belt, striking 220 km in Ghana and extends south-west to the coast in Ivory Coast (Kesse, 1985). It is located north of and parallel to the prolific Ashanti Gold Belt, which hosts many of Ghana’s active producing gold mines. The Sefwi Belt (Figure 2) is dominated by mafic volcanics, metasediments and intrusive granitoids. The belt is sandwiched between adjacent sedimentary basins (Sunyani Basin to the west and the Kumasi Basin to the east) and the shared margins are highly faulted and sheared. These north-east trending marginal faults are traceable along the full length of the belt (Kesse, 1985).

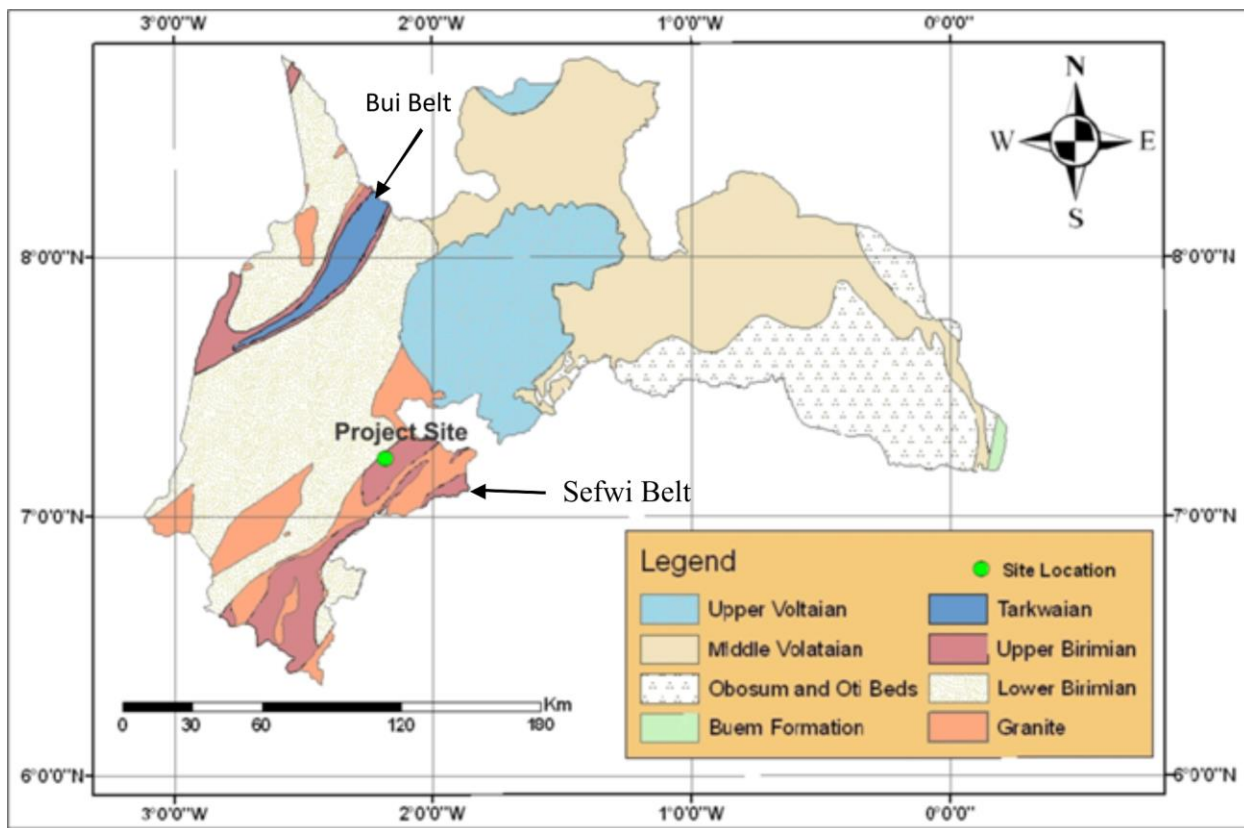


Figure 2: Geological Map of Brong Ahafo region showing the study site (Cees, 2006)

2.3 Methods

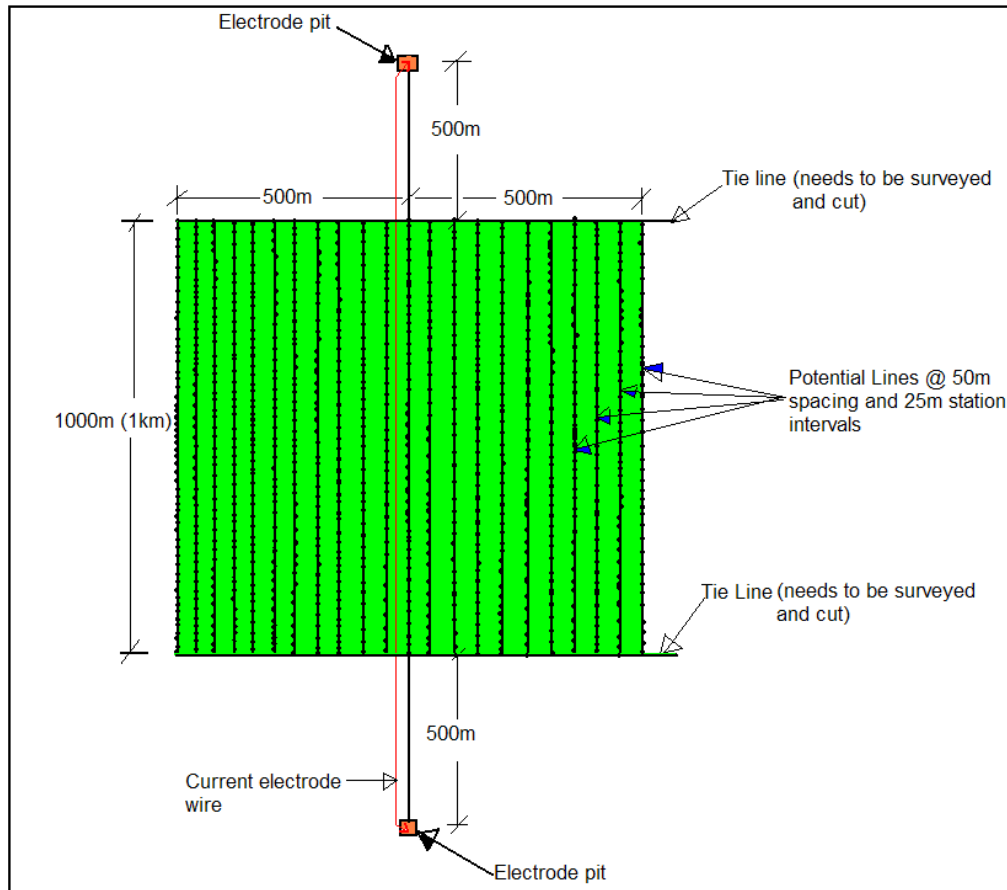
2.3.1 GPR measurements

The datasets were taken using the RAMAC GPR system (Figure 4) at a central frequency of 25 MHz with the rough terrain antenna (RTA) in the common offset mode. Investigations were made along a total of 21 profile lines each of length 1 km and labelled L1-L21 (Figure 3b). The ruggedly designed RTA was pulled along the profiles at pace speed. The field work took approximately 2 weeks.

2.3.2 Induced polarization and resistivity measurements

The induced polarization (IP) and resistivity data were collected using Incorporated Research Institutions for Seismology (IRIS) IP/Resistivity Instruments with ELREX PRO receiver and 1000 V transmitter over the 1 km² block in a gradient array configuration at a maximum exploration depth of 12.5 m. The survey lines were oriented northwest-southeast in

order to cut across strike. The study area was divided into 21 profile lines each having a length of 1 km and inter-spacing separation of 50 m. Measurements were taken using the gradient array electrode configuration. The whole field exercise took 2 months to complete. Figure 3a shows the setup of the profiles with current injection points in red with a potential electrode separation (black dots) of 25 m. The 11th line called the “electrode line” was extended 500 m at both ends and the current electrode pit constructed for the survey. A limitation of the gradient array is that the depth of penetration is not exactly known. The subsurface resistivity distributions were mapped and where there were anomalies in resistivity, the pole dipole electrode array was used to probe the vertical extent of these anomalous zones. The pole dipole electrode array was used to survey 6 profile lines namely L6, L7, L8, L9, L10 and L11 in Fig 3a.



2.3.2 Data

Figure 3a: Setup of 50 m × 25 m grid for induced polarization and resistivity surveys

III. DATA PROCESSING AND INTERPRETATION

Due to the large volume of the data acquired from the field, an effective maintenance of the data was needed to ensure good data quality and interpretation. Prominent errors that occurred during data acquisition were immediately sorted out and deleted. The main aim for GPR data processing was to sharpen the signal waveform in order to improve the signal to noise ratio as reported in Akinpelu (2010). The REFLEXW Scientific software (Sandmeier, 2012) was employed for the data processing. The *dewow* tool helped to remove the low frequencies from the data. In order to bring all the traces to a common time zero position, the *static correction* or *Time-zero correction* was applied. The *background removal filter* tool was applied to remove temporally coherent noise from the data. Due to attenuation of the radar signals which is mostly caused by

conductivity and geometrical spreading, the *gain tool* was applied to enhance low amplitudes from deeper depths. In this way the drastic fall of the radar signal at greater depths was compensated for. Other processing steps included time-varying bandpass frequency filter to help remove dominant frequencies seen in the data and a low cut filter to remove induction effects. Velocity estimates were made using the hyperbola fitting tool. The various subsurface structures of interest were differentiated and picked with the help of the phase follower and continuous pick tools. The resulting ASCII files containing the data of the traced structures were plotted graphically. The induced polarization and resistivity datasets were processed with the Geosoft (Oasis montaj) software to generate resistivity and chargeability image maps.

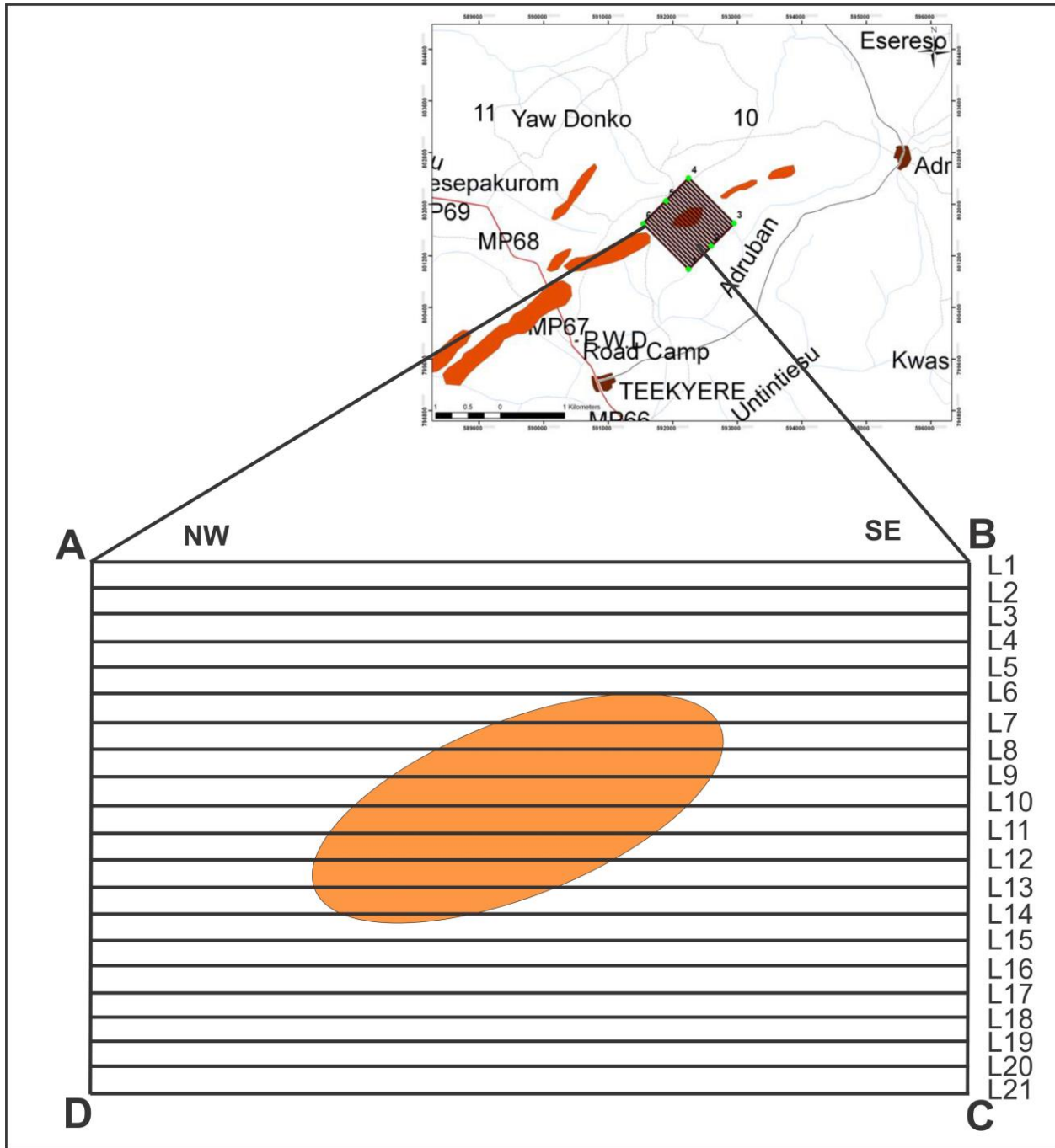


Figure 3b: Map of Subenso-North gold deposit showing the 1 km squared block ABCD with 21 profile lines L1 to L21

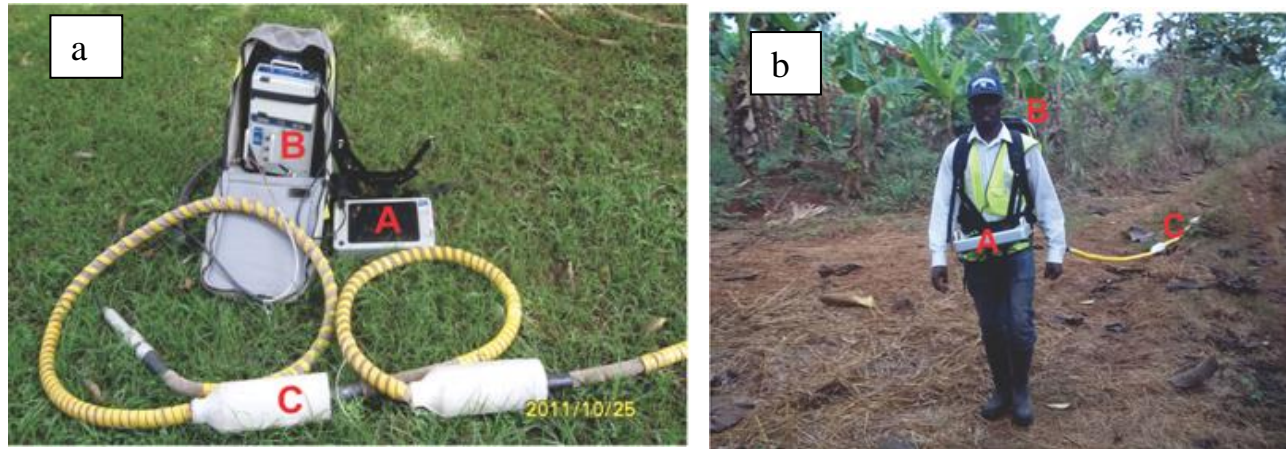


Figure 4: A: MALA GPR equipment used for the survey: A is XV monitor, B is Control unit, C is the RTA, B: GPR data collection in a continuous mode operation

IV. RESULTS AND DISCUSSION

4.1 Interpretation of radar records

Figures 5 and 6 show the radar results of 12 profiles obtained from the study site. In all, 21 profile lines were surveyed but due to unforeseen errors in the antenna electronics coupled with a lot of noise from the roots of trees only 12 profiles will be presented and discussed. The radargrams of profiles L2 and L4 in Figure 5 and L13 and L17 in Figure 6 show possible hyperbolic diffractions between average depth intervals of 8 m and 12 m. These hyperbolic diffractions are air reflections of little geological significance. A transition zone marked D represents the duricrust-saprolite transition. The duricrust has an average thickness of about 8 m from the ground surface.

Horizontal, sub-horizontal and sub-vertical reflectors also evident in these profiles were delineated and marked as S1 and S2. These are fractured and weathered zones located between the depths of about 33 m and 48 m. These are possible structures hosting gold mineralization. Fractured zones are usually weak zones that facilitate the migration and eventual deposition of hydrothermal solutions. Due to antenna reverberation and other error sources encountered in the field, some of the radar images recorded multiple reflections. Though these were suppressed traces of these are evident in the radar images of profiles L3 and L15 in Figures 5 and 6 respectively. Geologically, the multiple reflections have no meaning and do not account for any feature present within the earth surface.

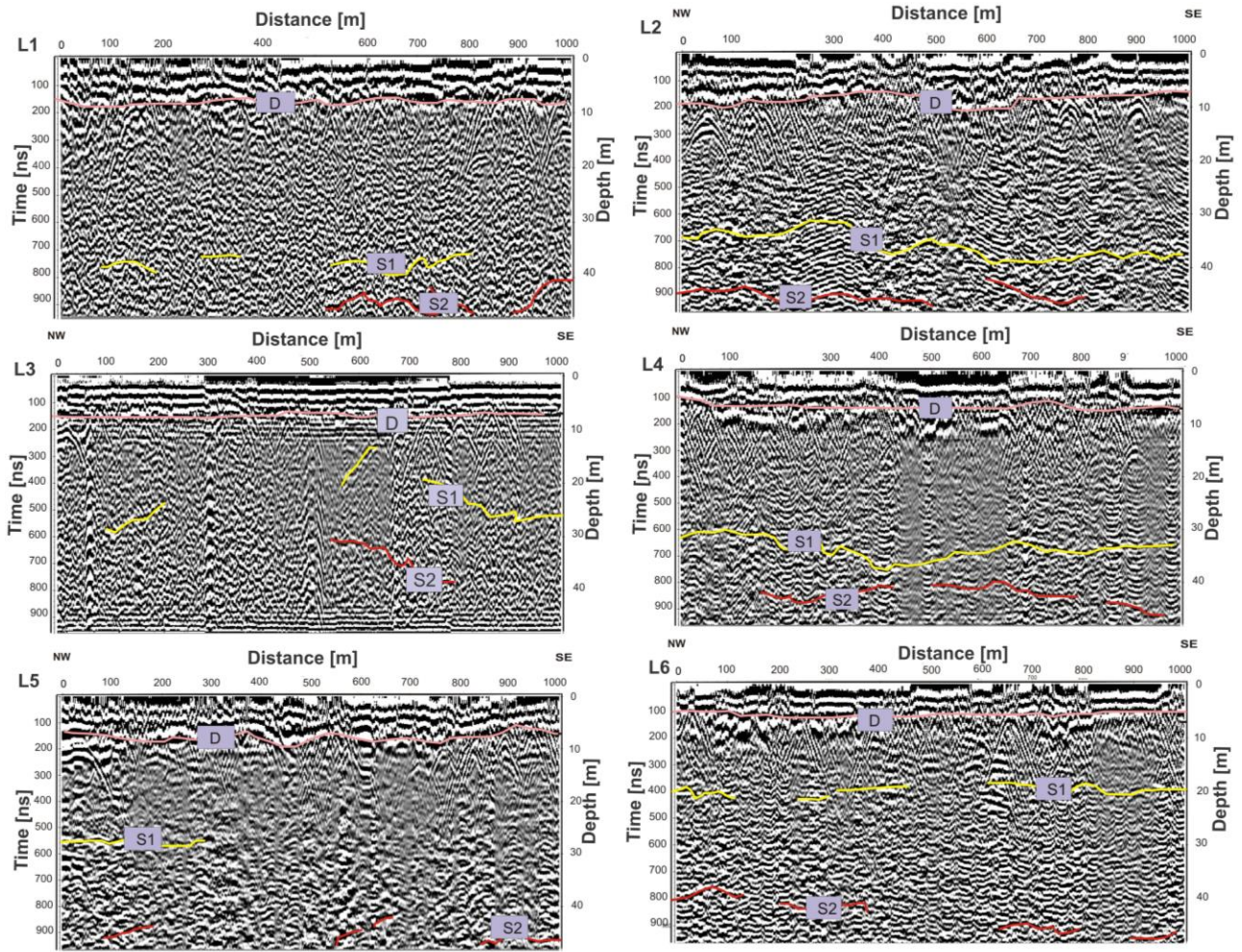


Figure 5: Radar images for profiles L1, L2, L3, L4, L5 and L6

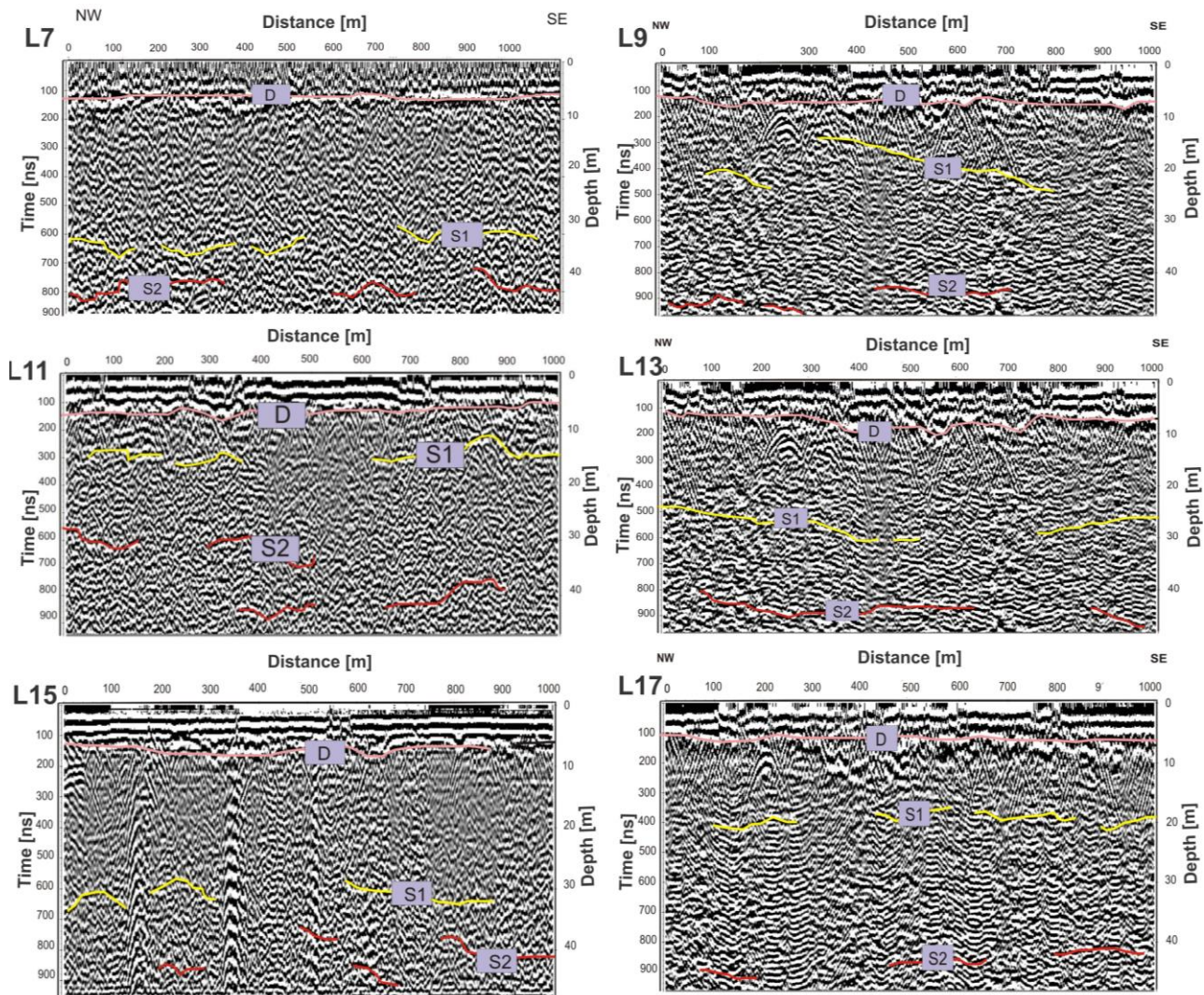


Figure 6: Radar images for profiles L7, L9, L11, L13, L15 and L17

4.1.1 Interpretation of Inferred S2 and S1 Structural Depth Run

Figure 7 (A) shows the S2 structures delineated between the depth range of 37.0 m and 44.5 m. In general, the inferred structures depict possible structural deformation in the NW- SE direction. There is an inferred dipping structure Z1 which occurs between the profile spacing of about 200 m and 600 m and stretches over a total distance of about 500 m. The depth range of Z1 is between 38.5 m and 44.5 m. This structural trend could be a potential zone for gold mineralization. In addition, there is a structural pattern Z2 showing a near horizontal feature between

the profile intervals of 600 m and 800 m. The depth range at which the Z2 dipping structure occurs is between 42.0 m and 44.5 m and has a length of about 300 m. Figure 7 (B) shows the structures between the depth range of 15 m and 36 m. There is a possible structural deformation in the NW - SE direction which falls within the profile spacing of 300 m and 700 m. Within this range, lie dipping structures labeled Z1 and Z2 which are real representation of the trend of mineralization as mapped with the resistivity and chargeability survey (see Figure 8).

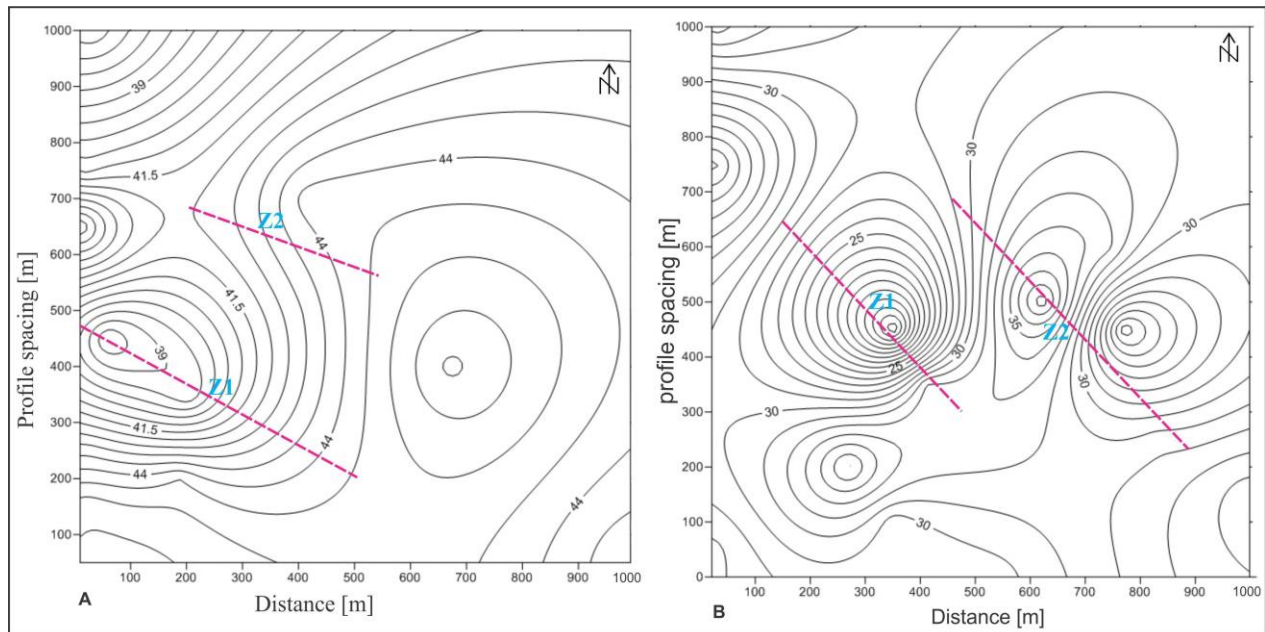


Figure 7: A) Spatial plot of inferred S2 structures and B) inferred S1 structures hosting zones of possible mineralization.

4.2. Comparison of GPR, electrical chargeability and resistivity measurements

Results from the GPR measurements were compared with that of electrical chargeability and resistivity results. Figure 8 shows the results of the chargeability and resistivity datasets respectively. The chargeability and resistivity results do not give the exact depths at which mineralization occur. The GPR results however, have shown the possible structures hosting mineralization and the depths at which these structures hosting gold mineralization can be intercepted. In Figure 8 (A) the chargeability results show a clear evidence of high chargeability values within the range 14 mV/V and 17 mV/V which is indicated in the red color code. This anomalous zone is seen to be dipping in the North West South East direction. This NW - SE

trend of mineralization falls within the profile spacing of 200 m and 700 m which stretches at about a total distance of 700 m marked (M). The high chargeable zones indicate the weaker zones (conductive zones) within the saprolite which could be due to fractures, shear zones, cracks etc. These conductive zones are potential zones of gold mineralization.

Furthermore, the resistivity results shown in Figure 8 (B) show a clear evidence of high resistivity value of 2545 Ω m which is indicated in red color code. The high resistivity anomaly seen in red dips in the NW - SE direction between 200 m and 750 m. This structural trend conforms to that of the anomalous zone marked M in the chargeability results (see Figure 8)

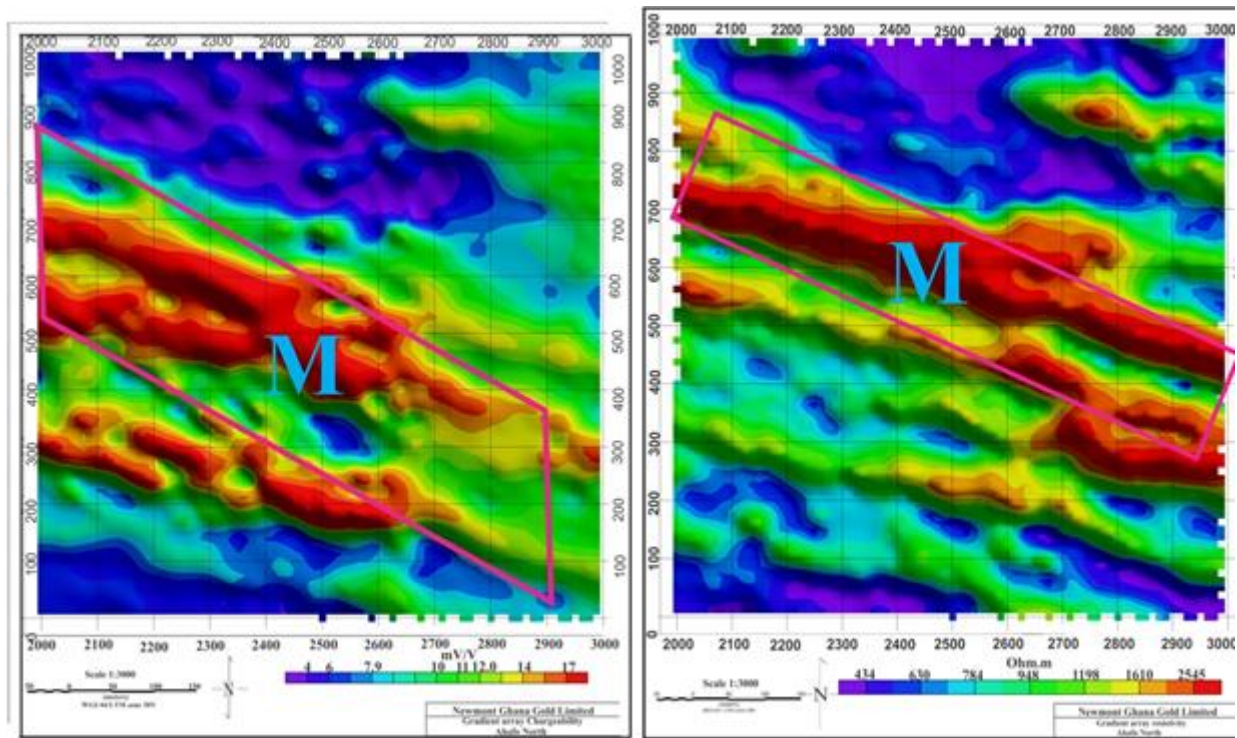


Figure 8: A) Gridded image of chargeability data B) Grid image of resistivity data

V. CONCLUSION

Ground penetrating radar survey has been carried out successfully to map possible structural trends hosting gold mineralization at the Subenso north concession of Newmont Ghana Gold Limited. The ground-based ground penetrating radar (GPR) survey was conducted over an already known gold deposit mapped by the Newmont Company Limited as an orientation survey to prove the efficacy of the GPR in mapping structures hosting gold mineralization. Results from the GPR compared very well with the chargeability and resistivity datasets over the study area. The GPR survey was quasi-continuous, faster and more affordable as compared to the resistivity and chargeability survey. The structures (primary lithologic unit as well as the duricrust) in the highly weathered saprolite were successfully delineated by the application of the ground penetrating radar method. The exploration depth was approximately 925 ns corresponding to 50 m with an average soil electromagnetic wave velocity of 0.1 m/ns. Two sets of inferred structural patterns were established. The structural patterns were S1 and S2. The S1 inferred structures were found between the depth range of 12 m and 42 m and the S2 a between 31 m and 48 m. Furthermore, the heterogeneous radar signatures recorded suggest that, weathering is more intense between the depth ranges of 32 m and 39 m, and 43 m and 47 m for S1 and S2 structures respectively. These sets of structures are inferred structures possibly hosting gold mineralization. The study has also revealed that, mineralization is more intense at greater depth, but decreases as close to the surface. The trend of anomalies hosting gold mineralization as predicted by the

resistivity and the chargeability datasets was found to conform to the structural trend presented by the GPR dataset.

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Modeling of the Compressive Strength of River Sand-Termite Soil Concrete Using Osadebe's Second-Degree Polynomial Function

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Abstract- In this article, a model of the compressive strength of river sand- termite soil concrete was formulated using Osadebe's second degree polynomial equation. The formulated model can be used for determining the compressive strength obtainable from a given mix proportions of its constituents.

Besides, it can be used for determining the mix proportions that can yield a given or desired compressive strength of a five-component concrete containing a percentage of termite soil. The validity of the formulated model was tested Using student's t-test. At 5 percent significant level, the model was found to be valid. This implies that there is no significant difference between the results. The results obtained from the model agrees with the corresponding experimental results.

Index Terms- termite soil, modeling, concrete, compressive strength, river sand, Osadebe polynomial function

I. INTRODUCTION

Concrete is a composite material composed primarily of aggregates (fine and coarse), cement and water. Cement and aggregates remain the major constituents while aggregates alone constitute a major portion of the volume of concrete. According to Alexander and Sydney (2005), between 70 to 80 per cent out of the total volume of concrete is occupied by aggregate. With this large proportion of the concrete occupied by aggregate, it is expected that aggregate will have a profound influence on the concrete properties, production cost and its general performance. Aggregates are generally coarse gravel or crushed rocks such as limestone or granite along with fine aggregate such as sand. These are responsible partly for the durability, quality and strength of the resulting concrete. Portland cement and other cementitious materials such as fly ash and slag cement etc. serve as a binder for the aggregates, while various chemical admixtures may be added to achieve varied properties.

Aggregates for concrete are either naturally or artificially produced. Natural aggregates are seen on the sea-shore, in river beds or in deserts while the artificially produced aggregates are found in crusher plants. Sand as fine aggregate is naturally extracted from sand quarries.

In developing countries like Nigeria, the high costs of procuring concrete materials for construction works, have over the years constrained the users to compromise quality, this has resulted in poor performance of infrastructure in service; a major factor that has contributed to the increase in maintenance costs

and the series of collapsed structures with attendant loss of lives and properties (Falade, et.al, 2010). For some time now, the Nigerian government has been clamoring for the use of local materials and recycled waste materials in the construction industry to limit costs of construction. There has therefore been a greater call for the sourcing and development of alternative, non-conventional local construction materials.

Amongst the basic constituent of concrete, aggregate and cement are the most expensive; thus, the major determinant factors in the cost of producing concrete are aggregate and cement. Following the fact that concrete is one of the most used man-made material in the world, its demands has been on the increase despite its high cost. Nigeria in the pursuit of vision 2020, has re-awakened serious need to relate research to production especially in the use of local materials as alternatives for the construction of functional, but low-cost dwellings both in the urban and rural areas of Nigeria. Presently, there is need for exploration of means to partially or totally replacing sand in a concrete mixture with a local material while still maintaining the required high compressive strength.

The high demand for concrete in construction industry has resulted to a rapid decrease in natural soil deposit such as the river sand and granite, leading to escalation of environmental problem. The excessive usage of natural soil deposit causes ecological imbalance, thus the need to find and explore an alternative material that could be used as a replacement to the conventional aggregate becoming necessary.

In this work, a mathematical model for the optimization of compressive strength of concrete is developed with different percentages of termite soil as partial replacement of fine aggregate. Concrete produced from the different mix ratios, with fine aggregate partially replacing termite soil were subjected to compression test. Then, the model for determining the compressive strength of river sand-termite soil concrete, was developed using Osadebe's second degree polynomial function and the compression test result.

II. THEORITICAL BACKGROUD

According to Osadebe (2003), concrete is a four-component composite produced by mixing water, cement, fine aggregate (sand) and coarse aggregate. These ingredients are mixed in reasonable proportions to achieve desired strength of the concrete. In this paper, the fifth component termite soil shall be added as one of the component materials of concrete.

Let us consider an arbitrary amount 'S' of a given concrete mixture and let the portion of the i^{th} component of the five constituent materials of the concrete be S_i , (where $i= 1, 2, 3, 4, 5$). This was carried out with the principle of absolute mass.

Thus,

$$S_1 + S_2 + S_3 + S_4 + S_5 = S \tag{1}$$

where S_1, S_2, S_3, S_4 and S_5 are the quantities of water, cement, river Sand, termite soil and coarse aggregate.

Dividing Eqn(1) through by S , gives:

$$\frac{S_1}{S} + \frac{S_2}{S} + \frac{S_3}{S} + \frac{S_4}{S} + \frac{S_5}{S} = 1$$

where $\frac{S_i}{S}$ is the fractional proportion of the i^{th} constituent component of the concrete mixture.

Let $\frac{S_i}{S} = Z_i$, (3)

Substituting Eqn (3) into Eqn (2) yields:

$$Z_1 + Z_2 + Z_3 + Z_4 + Z_5 = 1 \tag{4}$$

where Z_1, Z_2, Z_3, Z_4 and Z_5 are fractional proportions of water, cement, river sand, termite soil and coarse aggregate respectively. In general, for any given concrete mixture, exists a vector $Z (Z_1, Z_2, Z_3, Z_4)$. In this paper where five component materials are considered, the vector is transformed to $Z (Z_1, Z_2,$

$$f(Z) = f(Z^{(0)}) + \sum_{i=1}^5 \frac{\partial f(Z^{(0)})}{\partial Z_i} (Z_i - Z_i^{(0)}) + \frac{1}{2!} \sum_{i=1}^4 \sum_{j=1}^5 \frac{\partial^2 f(Z^{(0)})}{\partial Z_i \partial Z_j} (Z_i - Z_i^{(0)}) (Z_j - Z_j^{(0)}) + \frac{1}{2!} \sum_{i=1}^5 \frac{\partial^2 f(Z^{(0)})}{\partial Z_i^2} (Z_i - Z_i^{(0)})^2 + \dots \tag{8}$$

The point, $Z^{(0)}$ will be chosen as the origin for convenience sake without loss of generality of the formulation. The predictor, Z_i is not the actual portion of the mixture component, rather, it is Consequently, the origin, $Z^{(0)} = 0$, implies that:

$$Z_1^{(0)}= 0, Z_2^{(0)}= 0, Z_3^{(0)}=0, Z_4^{(0)}= 0, Z_5^{(0)}= 0 \tag{9}$$

Let: $b_0 = f(0)$, $b_i = \frac{\partial f(0)}{\partial Z_i}$, $b_{ij} = \frac{\partial^2 f(0)}{\partial Z_i \partial Z_j}$ and $b_{ii} = \frac{\partial^2 f(0)}{\partial Z_i^2}$

Then, Eqn (8) can be rewritten as follows:

Z_3, Z_4, Z_5) whose elements satisfy Eqn (4). Also, for each value of Z_i , the following inequality holds:

$$Z_i > 0 \tag{5}$$

It is important to note that the proportion of relative constituent ingredient of concrete govern the strength of the concrete at its hardened state. Thus, the compressive strength, Y , of concrete can be expressed mathematically using Eqn (6) as:

$$Y = f(Z_1, Z_2, Z_3, Z_4, Z_5) \tag{6}$$

where $f(Z_1, Z_2, Z_3, Z_4, Z_5)$ is a multi-variate response function whose variables Z_i are subject to the constraints defined in Eqns (4) and (5).

2.1 Osadebe's regression equation

This theory assumed that the response function is continuous and differentiable with respect to its variables, Z_i , hence, it can be expanded using Taylor's series in the neighbourhood of a chosen point $Z^{(0)} = Z_1^{(0)} + Z_2^{(0)} + Z_3^{(0)} + Z_4^{(0)} + Z_5^{(0)}$ as follows:

$$f(Z) = \sum f^m(Z^{(0)}) + \frac{(Z_i - Z_i^{(0)})}{m!}$$

for $0 \leq m \leq \infty$

where m is the degree of polynomial of the response function and $f(Z)$ is the response function. Expanding Eqn (7) to the second order yields:

the ratio of the actual portions to the quantity of concrete. For convenience sake, let Z_i be called the term of "fractional portion". The actual portions of the mixture components are S_i .

$$f(0) = b_0 + \sum_{i=1}^5 b_i Z_i + \sum_{i=1}^4 \sum_{j=1}^5 b_{ij} Z_i Z_j + \sum_{i=1}^5 b_{ii} Z_i^2 + \dots \quad (10)$$

Multiplying Eqn (4) by b_0 , gives the following expression:

$$b_0 = b_0 Z_1 + b_0 Z_2 + b_0 Z_3 + b_0 Z_4 + b_0 Z_5 \quad (11)$$

Similarly, multiplying Eqn (4) by Z_i will give the following expression:

$$Z_1 = Z_1^2 + Z_1 Z_2 + Z_1 Z_3 + Z_1 Z_4 + Z_1 Z_5 \quad (12a)$$

$$Z_2 = Z_1 Z_2 + Z_2^2 + Z_2 Z_3 + Z_2 Z_4 + Z_2 Z_5 \quad (12b)$$

$$Z_3 = Z_1 Z_3 + Z_2 Z_3 + Z_3^2 + Z_3 Z_4 + Z_3 Z_5 \quad (12c)$$

$$Z_4 = Z_1 Z_4 + Z_2 Z_4 + Z_3 Z_4 + Z_4^2 + Z_4 Z_5 \quad (12d)$$

$$Z_5 = Z_1 Z_5 + Z_2 Z_5 + Z_3 Z_5 + Z_4 Z_5 + Z_5^2 \quad (12e)$$

Rearranging Eqns (12a) to (12e), the expression for Z_i^2 becomes;

$$Z_1^2 = Z_1 - Z_1 Z_2 - Z_1 Z_3 - Z_1 Z_4 - Z_1 Z_5 \quad (13a)$$

$$Z_2^2 = Z_2 - Z_1 Z_2 - Z_2 Z_3 - Z_2 Z_4 - Z_2 Z_5 \quad (13b)$$

$$Z_3^2 = Z_3 - Z_1 Z_3 - Z_2 Z_3 - Z_3 Z_4 - Z_3 Z_5 \quad (13c)$$

$$Z_4^2 = Z_4 - Z_1 Z_4 - Z_2 Z_4 - Z_3 Z_4 - Z_4 Z_5 \quad (13d)$$

$$Z_5^2 = Z_5 - Z_1 Z_5 - Z_2 Z_5 - Z_3 Z_5 - Z_4 Z_5 \quad (13e)$$

Substituting Eqn (13a) to (13e) into Eqn (10) and setting $f(0) = Y$ will give in the expanded form below:

$$Y = b_0 Z_1 + b_0 Z_2 + b_0 Z_3 + b_0 Z_4 + b_0 Z_5 + b_1 Z_1 + b_2 Z_2 + b_3 Z_3 + b_4 Z_4 + b_5 Z_5 + b_{12} Z_1 Z_2 + b_{13} Z_1 Z_3 + b_{14} Z_1 Z_4 + b_{15} Z_1 Z_5 + b_{23} Z_2 Z_3 + b_{24} Z_2 Z_4 + b_{25} Z_2 Z_5 + b_{34} Z_3 Z_4 + b_{35} Z_3 Z_5 + b_{45} Z_4 Z_5 + b_{11} (Z_1 - Z_1 Z_2 - Z_1 Z_3 - Z_1 Z_4 - Z_1 Z_5) + b_{22} (Z_2 - Z_1 Z_2 - Z_2 Z_3 - Z_2 Z_4 - Z_2 Z_5) + b_{33} (Z_3 - Z_1 Z_3 - Z_2 Z_3 - Z_3 Z_4 - Z_3 Z_5) + b_{44} (Z_4 - Z_1 Z_4 - Z_2 Z_4 - Z_3 Z_4 - Z_4 Z_5) - b_{55} (Z_5 - Z_1 Z_5 - Z_2 Z_5 - Z_3 Z_5 - Z_4 Z_5) \quad (14a)$$

Factorizing Eqn (14a) gives

$$Y = Z_1(b_0 + b_1 + b_{11}) + Z_2(b_0 + b_2 + b_{22}) + Z_3(b_0 + b_3 + b_{33}) + Z_4(b_0 + b_4 + b_{44}) + Z_5(b_0 + b_5 + b_{55}) + Z_1 Z_2(b_{12} - b_{11} - b_{22}) + Z_1 Z_3(b_{13} - b_{11} - b_{33}) + Z_1 Z_4(b_{14} - b_{11} - b_{44}) + Z_1 Z_5(b_{15} - b_{11} - b_{55}) + Z_2 Z_3(b_{23} - b_{22} - b_{33}) + Z_2 Z_4(b_{24} - b_{22} - b_{44}) + Z_2 Z_5(b_{25} - b_{22} - b_{55}) + Z_3 Z_4(b_{34} - b_{33} - b_{44}) + Z_3 Z_5(b_{35} - b_{33} - b_{55}) + Z_4 Z_5(b_{45} - b_{44} - b_{55}) \quad (14b)$$

The summation of the constants is equal to a constant thus; let

$$\alpha_i = b_0 + b_i + b_{ii} \text{ and } \alpha_{ij} = b_{ij} + b_{ii} + b_{jj} \quad (15)$$

Eqn (14b) becomes:

$$Y = \alpha_1 Z_1 + \alpha_2 Z_2 + \alpha_3 Z_3 + \alpha_4 Z_4 + \alpha_5 Z_5 + \alpha_{12} Z_1 Z_2 + \alpha_{13} Z_1 Z_3 + \alpha_{14} Z_1 Z_4 + \alpha_{15} Z_1 Z_5 + \alpha_{23} Z_2 Z_3 + \alpha_{24} Z_2 Z_4 + \alpha_{25} Z_2 Z_5 + \alpha_{34} Z_3 Z_4 + \alpha_{35} Z_3 Z_5 + \alpha_{45} Z_4 Z_5 \quad (16a)$$

Rewriting Eqn (16a) in a compact form, gives:

$$Y = \sum_{i=1}^5 \alpha_i Z_i + \sum_{1 \leq i < j \leq 5} \alpha_{ij} Z_i Z_j \quad (16b)$$

And, Y is the response function at any point of observation Z_i and Z_j are the predictors, and α_i and α_{ij} are the coefficients of the regression equation.

2.2 The Coefficients of the Regression Equation

Let the n^{th} response (compressive strength at n^{th} observation point) be $Y^{(n)}$ and the vector of the corresponding set of variables be as follows:

$$Z^{(n)} = (Z_1^{(n)}, Z_2^{(n)}, Z_3^{(n)}, Z_4^{(n)}, Z_5^{(n)})$$

Different points of observation will have different predictor at constant coefficient. At n^{th} observation point, the response function, $Y^{(n)}$, will correspond with the predictors $Z_i^{(n)}$.

Thus,

$$Y^{(n)} = \sum_{i=1}^5 \alpha_i Z_i^{(n)} + \sum_{1 \leq i < j}^5 \alpha_{ij} Z_i Z_j^{(n)} \quad (16)$$

Where $1 \leq i < j \leq 5$ and $n = 1, 2, 3, \dots, 15$

Eqn (16) can be written in a matrix form as,

$$[Y^{(n)}] = [Z^{(n)}] [\alpha] \quad (17)$$

Expanding Eqn (17) yields:

$$\begin{pmatrix} Y^{(1)} \\ Y^{(2)} \\ Y^{(3)} \\ \vdots \\ Y^{(15)} \end{pmatrix} = \begin{pmatrix} Z_1^{(1)} & Z_2^{(1)} & Z_3^{(1)} & \dots & Z_4^{(1)}Z_5^{(1)} & \alpha_1 \\ Z_1^{(2)} & Z_2^{(2)} & Z_3^{(2)} & \dots & Z_4^{(2)}Z_5^{(2)} & \alpha_2 \\ Z_1^{(3)} & Z_2^{(3)} & Z_3^{(3)} & \dots & Z_4^{(3)}Z_5^{(3)} & \alpha_3 \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ Z_1^{(15)} & Z_2^{(15)} & Z_3^{(15)} & \dots & Z_4^{(15)}Z_5^{(15)} & \alpha_{45} \end{pmatrix} \cdot \begin{pmatrix} \\ \\ \\ \\ \\ \end{pmatrix} \quad (18)$$

The actual mixture proportions $S_i^{(n)}$ and the corresponding fractional portions, $Z_i^{(n)}$ are shown in Table 1. And the values of the constant coefficient α in Eqn (17) are determined with the values of $Y^{(n)}$ and $Z^{(n)}$. Rearranging Eqn (17) gives

$$[\alpha] = [Z^{(n)}]^{-1} [Y^{(n)}] \quad (19)$$

Expressing equation (19) in expanded form yields:

$$\begin{pmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \vdots \\ \alpha_{45} \end{pmatrix} = \begin{pmatrix} Z_1^{(1)} & Z_2^{(1)} & Z_3^{(1)} & \dots & Z_4^{(1)}Z_5^{(1)} \\ Z_1^{(2)} & Z_2^{(2)} & Z_3^{(2)} & \dots & Z_4^{(2)}Z_5^{(2)} \\ Z_1^{(3)} & Z_2^{(3)} & Z_3^{(3)} & \dots & Z_4^{(3)}Z_5^{(3)} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ Z_1^{(15)} & Z_2^{(15)} & Z_3^{(15)} & \dots & Z_4^{(15)}Z_5^{(15)} \end{pmatrix}^{-1} \begin{pmatrix} Y^{(1)} \\ Y^{(2)} \\ Y^{(3)} \\ \vdots \\ Y^{(15)} \end{pmatrix} \quad (20)$$

The values of α_1 to α_{45} are obtained from Eqn (20) and substituted into Eqn. (16a) to obtain the regression equation. The values of $Z^{(n)}$ matrix are shown in Table 2 and the values of the inverse of $[Z^{(n)}]$ matrix are presented in Table 3; while the values of $[Y^{(n)}]$ matrix are obtained from the experimental investigation.

III. MATERIALS

The materials used for the laboratory test included:

- (i) Water that is good for drinking obtained from a borehole at the premises of Federal University of

Technology Owerri, Imo State, Nigeria. The water was clean, fresh and free from dirt, unwanted chemicals or rubbish that may affect the desired quality of concrete.

- (ii) Ibeto cement, a brand of ordinary Portland cement that conforms to BS 12(1978)

- (iii) The fine aggregate, river sand used for this research work were obtained from a flowing river (Otamiri). As at the time of purchase the sharp river sand was wet but free from debris and deleterious matter and clay.
- (iv) The coarse aggregate used for this research work was granite chippings quarried from a quarry in Ishiagu, along Enugu-Port Harcourt express way, a town in Ebonyi state, Nigeria. The granite was sun dried for seven days so they can be free from water. They were sieved through a 20mm British test sieve and the materials passing through the sieve were used to produce concrete with various proportions of termite soil.
- (v) The termite soil was obtained from termite mound above ground termite nest, which was located at the strategic places in the premises of Federal University of Technology Owerri. The soil was sun- dried for two weeks; they were broken down into finer, and sieved to sand-sized particles before it was used in the preparation of concrete.

The mix ratios used for the simplex design points were obtained using pentahedron factor space for five –component mixture.

IV. COMPRESSIVE STRENGTH TEST

Batching of the ingredients was done by mass. Cement was thoroughly mixed together in the dry state with a mixture of river sand/termite soil and granite and then, water added. The mixing continued until a uniform and consistent concrete mix is obtained. The entire concrete was cast in concrete mould of sizes 150 x 150x 150 mm. In all, sixty concrete cubes, two from each mix incorporating various proportions of termite soil, were cast and cured in a curing water tank for 28 days, and then crushed in a universal testing machine. Thirty of the concrete cubes served as control test. Compressive strength of the cubes was calculated using Eqn (21):

$$\text{Compressive strength} = \frac{\text{compressive load of cube at failure (N)}}{\text{cross sectional area of mould (mm}^2\text{)}} \quad (21)$$

The results of the compressive strength test of the concrete cubes are presented in Table 4

Table 1: Selected mix proportions, S, and their corresponding fractional portions, Z, based on Osadebe's second-degree polynomial

OP	Mix Proportions, S_i					$\sum_{i=1}^{n=5} S_i$	Fractional Portions, Z_i				
	S_1	S_2	S_3	S_4	S_5		S	Z_1	Z_2	Z_3	Z_4
	1	0.50	1.0	1.42	0.08	2.50	5.500	0.090909	0.181818	0.258182	0.014545
2	0.55	1.0	1.8	0.2	3.00	6.550	0.083969	0.152672	0.274809	0.030534	0.458015
3	0.6	1.0	1.70	0.30	4.00	7.600	0.078947	0.131579	0.223684	0.039474	0.526316
4	0.45	1.0	1.60	0.40	4.25	7.700	0.058442	0.129870	0.207792	0.051948	0.551948
5	0.65	1.0	1.80	0.60	3.50	7.550	0.086093	0.132450	0.238411	0.079470	0.463576
12	0.525	1.0	1.61	0.14	2.75	6.025	0.087137	0.165975	0.267220	0.023237	0.456432
13	0.55	1.0	1.56	0.19	3.25	6.550	0.083969	0.152672	0.238168	0.029008	0.496183
14	0.475	1.0	1.51	0.24	3.375	6.600	0.071970	0.151515	0.228788	0.036364	0.511364
15	0.575	1.0	1.61	0.34	3.00	6.525	0.088123	0.153257	0.246743	0.052107	0.459770
23	0.575	1.0	1.75	0.25	3.500	7.075	0.081272	0.141343	0.247350	0.035336	0.494700
24	0.5	1.0	1.7	0.3	3.625	7.125	0.070175	0.140351	0.238596	0.042105	0.508772
25	0.6	1.0	1.8	0.4	3.250	7.050	0.085106	0.141844	0.255319	0.056738	0.460993
34	0.525	1	1.65	0.35	4.125	7.650	0.068627	0.130719	0.215686	0.045752	0.539216
35	0.625	1.0	1.75	0.45	3.750	7.575	0.082508	0.132013	0.231023	0.059406	0.495050
45	0.55	1.0	1.7	0.5	3.875	7.625	0.072131	0.131148	0.222951	0.065574	0.508197
CONTROL											
AC ₁	0.546	0.993	1.828	0.192	3.143	6.702	0.0815	0.148	0.273	0.029	0.469
AC ₂	0.513	0.993	1.562	0.258	3.556	6.882	0.075	0.144	0.227	0.037	0.517
AC ₃	0.530	0.993	1.595	0.357	3.391	6.866	0.077	0.145	0.232	0.052	0.494
AC ₄	0.525	1.0	1.630	0.245	3.438	6.838	0.077	0.146	0.238	0.036	0.503
AC ₅	0.550	1.0	1.630	0.345	3.563	7.088	0.078	0.141	0.230	0.049	0.503
AC ₆	0.575	1.0	1.680	0.295	3.250	6.800	0.085	0.147	0.247	0.043	0.478
AC ₇	0.538	1.0	1.585	0.165	3.000	6.288	0.086	0.159	0.252	0.026	0.477
AC ₈	0.600	1.0	1.680	0.395	3.375	7.050	0.085	0.142	0.238	0.056	0.479
AC ₉	0.520	1.0	1.588	0.212	3.250	6.570	0.079	0.152	0.242	0.032	0.495
AC ₁₀	0.550	1.0	1.664	0.316	3.450	6.980	0.079	0.143	0.238	0.045	0.494
AC ₁₁	0.545	1.0	1.626	0.304	3.400	6.875	0.079	0.145	0.237	0.044	0.494
AC ₁₂	0.545	1.0	1.682	0.348	3.625	7.200	0.076	0.139	0.233	0.048	0.503
AC ₁₃	0.570	1.0	1.642	0.283	3.200	6.695	0.085	0.149	0.245	0.042	0.478
AC ₁₄	0.545	1.0	1.650	0.305	3.375	6.875	0.079	0.145	0.240	0.044	0.491
AC ₁₅	0.538	1.0	1.589	0.306	3.175	6.608	0.081	0.151	0.240	0.046	0.480

Legend: OP is Observation Point

Table 2: $Z^{(n)}$ Matrix

OP	Z_1	Z_2	Z_3	Z_4	Z_5	Z_1Z_2	Z_1Z_3	Z_1Z_4	Z_1Z_5	Z_2Z_3	Z_2Z_4	Z_2Z_5	Z_3Z_4	Z_3Z_5	Z_4Z_5
1	0.0909	0.1818	0.2582	0.0145	0.4545	0.0165	0.0235	0.0013	0.0413	0.0469	0.0026	0.0826	0.0038	0.1174	0.0066
2	0.0840	0.1527	0.2748	0.0305	0.4580	0.0128	0.0231	0.0026	0.0385	0.0420	0.0047	0.0699	0.0084	0.1259	0.0140
3	0.0789	0.1316	0.2237	0.0395	0.5263	0.0104	0.0177	0.0031	0.0416	0.0294	0.0052	0.0693	0.0088	0.1177	0.0208
4	0.0584	0.1299	0.2078	0.0519	0.5519	0.0076	0.0121	0.0030	0.0323	0.0270	0.0067	0.0717	0.0108	0.1147	0.0287
5	0.0861	0.1325	0.2384	0.0795	0.4636	0.0114	0.0205	0.0068	0.0399	0.0316	0.0105	0.0614	0.0189	0.1105	0.0368
12	0.0871	0.1660	0.2672	0.0232	0.4564	0.0145	0.0233	0.0020	0.0398	0.0444	0.0039	0.0758	0.0062	0.1220	0.0106
13	0.0840	0.1527	0.2382	0.0290	0.4962	0.0128	0.0200	0.0024	0.0417	0.0364	0.0044	0.0758	0.0069	0.1182	0.0144
14	0.0720	0.1515	0.2288	0.0364	0.5114	0.0109	0.0165	0.0026	0.0368	0.0347	0.0055	0.0775	0.0083	0.1170	0.0186
15	0.0881	0.1533	0.2467	0.0521	0.4598	0.0135	0.0217	0.0046	0.0405	0.0378	0.0080	0.0705	0.0129	0.1134	0.0240
23	0.0813	0.1413	0.2473	0.0353	0.4947	0.0115	0.0201	0.0029	0.0402	0.0350	0.0050	0.0699	0.0087	0.1224	0.0175
24	0.0702	0.1404	0.2386	0.0421	0.5088	0.0098	0.0167	0.0030	0.0357	0.0335	0.0059	0.0714	0.0100	0.1214	0.0214
25	0.0851	0.1418	0.2553	0.0567	0.4610	0.0121	0.0217	0.0048	0.0392	0.0362	0.0080	0.0654	0.0145	0.1177	0.0262
34	0.0686	0.1307	0.2157	0.0458	0.5392	0.0090	0.0148	0.0031	0.0370	0.0282	0.0060	0.0705	0.0099	0.1163	0.0247
35	0.0825	0.1320	0.2310	0.0594	0.4950	0.0109	0.0191	0.0049	0.0408	0.0305	0.0078	0.0654	0.0137	0.1144	0.0294
45	0.0721	0.1311	0.2230	0.0656	0.5082	0.0095	0.0161	0.0047	0.0367	0.0292	0.0086	0.0666	0.0146	0.1133	0.0333

Table 3: Inverse of $Z^{(n)}$ Matrix

S/N	Z_1	Z_2	Z_3	Z_4	Z_5	Z_1Z_2	Z_1Z_3	Z_1Z_4	Z_1Z_5	Z_2Z_3	Z_2Z_4	Z_2Z_5	Z_3Z_4	Z_3Z_5	Z_4Z_5
1	80.9	1287.0	5558.1	3805.1	238.1	-650.1	1376.1	-1141.1	284.5	-5378.7	4454.9	-1112.7	-9198.1	2300.7	-1903.8
2	1143.7	772.1	1798.2	399.4	22.1	-1845.6	-2926.6	1686.7	593.1	2046.6	-1178.2	-415.0	-1822.3	-642.8	369.7
3	350.9	1306.3	144.3	2.2	29.7	-1364.5	461.9	-56.6	209.4	-873.0	106.9	-396.1	-35.3	131.0	-16.0
4	0.6	114.7	877.0	169.2	782.8	-16.2	-45.6	20.1	43.0	637.8	-280.4	-602.3	-770.5	-1657.2	728.0
5	5.7	7.8	77.1	3.7	16.9	13.5	-43.2	-9.5	20.2	-49.2	-10.8	23.0	33.9	-72.3	-15.9

12	-615.3	-58.5	-13691.8	-6692.7	-93.4	-557.2	6297.3	-4667.4	404.6	2370.4	-1754.9	152.4	19344.5	-1682.1	1244.2
13	-768.7	-5186.4	-7493.3	-3988.5	-436.0	4024.0	-4926.7	3602.1	-1187.2	12537.1	-9156.0	3022.8	10934.3	-3615.2	2637.8
14	-67.9	-633.3	-10850.7	-5579.3	-157.5	418.0	-1762.5	1266.6	212.1	5271.9	-3784.1	-634.8	15562.0	2614.5	-1874.9
15	-129.7	-1095.0	-4326.0	-4047.0	-382.0	759.6	-1537.8	1490.6	-456.5	4376.9	-4237.7	1300.0	8368.7	-2571.0	2486.9
23	-2763.8	-4093.9	-921.7	-342.3	-110.8	6784.3	3112.2	-2404.0	-1513.2	-3449.0	2661.2	1677.9	1190.8	751.9	-579.6
24	-1093.5	-289.6	-158.6	-43.9	-502.4	1050.1	733.5	-712.9	1431.4	-304.5	295.6	-594.5	201.4	-405.6	393.4
25	-1311.9	-624.6	-2621.4	-325.2	-83.5	1754.7	3811.3	-1647.9	-955.2	-2226.0	961.3	558.2	2036.8	1184.4	-511.0
34	-379.6	-2195.0	-309.9	-133.2	-1117.6	1839.6	704.0	-462.5	-1335.6	-1658.5	1088.4	3148.4	406.3	1177.0	-771.7
35	-266.9	-1515.3	-432.3	-0.2	-1.8	1281.5	-697.2	-15.5	-44.8	1627.7	36.2	104.6	-19.2	-55.6	-1.2
45	-9.9	-62.8	-1474.2	-122.7	-1030.0	50.3	248.0	-71.7	-207.1	-611.9	176.7	511.2	850.7	2464.5	-711.2

Table 4: Compressive strength in N/mm² of 28th day old concrete cubes

OP	Replicate 1 Compressive strength(N/mm ²)	Replicate 1 Compressive strength(N/mm ²)	Replicate 1 Compressive strength(N/mm ²)	Average Laboratory Compressive strength(N/mm ²)	Osadebe's Model compressive strength (N/mm ²) result
1	25.77	26.22	20.44	24.14	24.14
2	24.44	21.33	27.11	24.29	24.29
3	24.89	26.67	27.78	26.45	26.45
4	24.22	23.33	23.11	23.55	23.55
5	25.11	22.22	23.56	23.63	23.63
12	24.89	25.33	23.56	24.59	24.59
13	22.67	24.89	23.56	23.71	23.71
14	22.22	23.56	25.33	23.70	23.70
15	24.00	24.00	22.67	23.56	23.56
23	29.11	30.22	31.11	30.15	30.15
24	21.78	19.11	19.11	20.00	20.00
25	20.89	18.22	18.67	18.96	18.96
34	16.89	17.33	17.33	17.19	17.19
35	16.89	17.11	16.89	16.96	16.96
45	11.56	11.11	11.11	11.26	11.26
AC ₁	25.40	25.20	25.30	25.30	26.87
AC ₂	19.78	19.56	19.64	19.66	19.80
AC ₃	18.98	19.00	19.08	19.02	16.92
AC ₄	21.83	22.12	22.20	22.05	22.06
AC ₅	21.78	20.00	20.89	20.89	15.86
AC ₆	22.91	22.53	22.78	22.74	21.70
AC ₇	23.78	25.11	24.22	24.37	25.57
AC ₈	20.44	20.02	20.44	20.30	19.32
AC ₉	22.54	22.33	22.69	22.52	22.52
AC ₁₀	18.24	18.25	18.59	18.36	18.11
AC ₁₁	19.98	20.07	20.07	20.04	18.09
AC ₁₂	17.33	18.67	17.33	17.78	16.42
AC ₁₃	22.35	22.35	22.20	22.30	21.42
AC ₁₄	18.63	18.67	18.62	18.64	18.38
AC ₁₅	21.00	21.04	21.20	21.08	19.22

Legend: OP is the Observation points

5.1 The Regression Equation

The solution of Eqn (20), using the responses in Table 4 and the Z matrix, gives the unknown coefficients of the regression equation as follows:

$$\alpha_1 = 159629.7, \alpha_2 = 15708.88, \alpha_3 = -3495.77, \alpha_4 = 2978.45, \alpha_5 = 353.809$$

$$\alpha_{12} = -307398, \alpha_{13} = -206593, \alpha_{14} = -83697.6, \alpha_{15} = -214636, \alpha_{23} = -34564.4$$

$$\alpha_{24} = -61995.4, \alpha_{25} = 19052.46, \alpha_{34} = -42807.7, \alpha_{35} = 37643.54, \alpha_{45} = -6773.03$$

Hence, the regression equation is given by Eqn (16a) becomes:

$$Y = 159629.7Z_1 + 15708.88Z_2 - 3495.77Z_3 + 2978.45Z_4 + 353.809Z_5 - 307398Z_1Z_2 - 206593Z_1Z_3 - 83697.6Z_1Z_4 - 214636Z_1Z_5 - 34564.4Z_2Z_3 - 61995.4Z_2Z_4 + 19052.46Z_2Z_5 - 42807.7Z_3Z_4 + 37643.54Z_3Z_5 - 6773.03Z_4Z_5 \quad (22)$$

Eqn (22) is the final second degree polynomial function for the optimization of compressive strength of river sand-termite soil concrete based on Osadebe's second-degree equation.

Test of Adequacy of the Model

The test for adequacy of second degree polynomial was done using statistical student's t-test at 95% accuracy level. The compressive strength at the control points

(i.e. AC₁, AC₂, AC₃, AC₄, AC₅, AC₆, AC₇, AC₈, AC₉, AC₁₀, AC₁₁, AC₁₂, AC₁₃, AC₁₄, AC₁₅) were used for the test. The following two hypotheses were tested using statistical student's t-test.

- a) **Null Hypothesis:** There is no significant difference between the laboratory concrete cube strengths and predicted compressive strength results at 95% accuracy level.
- b) **Alternative Hypothesis:** There is a significant difference between the laboratory concrete cube strengths and 1 predicted strength compressive strength results at 95% accuracy level.

The test is carried out and presented in Table 5 using the following equations:

Let:

Y_E = Responses (compressive strength) from the experim

Y_M = Responses (compressive strength) from the Second

N = Number of observations

D_i = Difference of **Y_E** and **Y_M**
 $\frac{\sum D_i}{N}$

D_A = $\frac{N}{\sum (D_A - D_i)^2}$ = Mean of difference of **Y_E** and **Y_M**

S² = $\frac{N-1}{D_A * N^{0.5}}$ = Variance of difference of **D_i** and **D_A**

t = $\frac{S}{S}$ = Calculated value of t

Table 5: Statistical Student's t-test for Osadebe's Regression Model

OP	TWO-TAILED t-TEST				
	Y_E	Y_M	D_i = Y_E - Y_M	D_A - D_i	(D_A - D_i)²
AC ₁	25.30	26.87	-1.57	2.4227	5.8695
AC ₂	19.66	19.80	-0.14	0.9927	0.9855
AC ₃	19.02	16.92	2.10	-1.2473	1.5558
AC ₄	22.05	22.06	-0.01	0.8627	0.7443
AC ₅	20.89	15.86	5.03	-4.1773	17.450
AC ₆	22.74	21.70	1.04	-0.1873	0.0351
AC ₇	24.37	25.57	-1.20	2.0527	4.2136
AC ₈	20.30	19.32	0.98	-0.1273	0.0162
AC ₉	22.52	22.52	0.00	0.8527	0.7271
AC ₁₀	18.36	18.11	0.25	0.6027	0.3632
AC ₁₁	20.04	18.09	1.95	-1.0973	1.2041
AC ₁₂	17.78	16.42	1.36	-0.5073	0.2574
AC ₁₃	22.30	21.42	0.88	-0.0273	0.0007
AC ₁₄	18.64	18.38	0.26	0.5927	0.3513

AC ₁₅	21.08	19.22	1.86	-1.0073	1.0147
		□□□□□□□Di =	12.79	□□(DA - Di) ² =	34.7885

Legend: OP is the observation point

Here,

$$\sum Di = 12.79$$

$$N = 15$$

$$DA = \frac{\sum Di}{N} = 0.8527$$

$$\sum (DA - Di)^2 = 34.7885$$

$$S^2 = \frac{\sum (DA - Di)^2}{N-1} = 2.4849$$

$$S = \sqrt{S^2} = 1.5746$$

Actual value of total variation in t-test is:

$$t = \frac{DA \cdot N^{0.5}}{S} = 2.09$$

Allowable value of total variation in t-test:

$$\text{Degree of freedom} = N-1 = 15-1 = 14$$

$$5\% \text{ significance for Two-Tailed Test} = 2.5\%$$

$$1 - 2.5\% = 97.5\% = 0.975$$

Allowable Total Variation in t-test = $t_{(0.975, N-1)} = t_{(0.975, 14)} = 2.14$ (Obtained from statistical table).

From table 5, the calculated $t = 2.09$. Thus, $t_{(table)} > t_{(calculated)}$

This implied that difference between the two set of cubes compressive strength is less than allowable difference. Hence null hypothesis is accepted and alternative hypothesis rejected. Hence, Osadebe regression model is adequate.

V. CONCLUSION

Using Osadebe's second degree polynomial regression equation, mix design model for a five component river sand-termite soil concrete cube was developed. This model could predict the compressive strength of concrete cube when the mix ratios are known and vice versa. The predictions from this model were tested at 95% accuracy level using statistical student's t-test and found to be adequate.

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Optimization of Compressive Strength of River Sand-Termite Soil Concrete Using Simplex Design

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Abstract- The high demand for concrete in the construction industry has led to a rapid decrease in natural soil deposit such as river sand and granite. The excessive usage of natural soil deposit has resulted into ecological imbalance and environmental problems. There is need to explore an alternate material that could be used as a replacement for the conventional aggregates. This had directed attention to by-product and wastes such as termite soil.

The focus of this research is the development of a function for the optimization of the compressive strength of river sand – termite soil concrete based on simplex design. The response function was used to optimize the compressive strength of concrete made from water, cement, river sand, termite soil and granites. The results of the response function compared favourably with the corresponding experimental results and the predictions from the response function were tested for adequacy using the statistical student's t-test and found to be adequate at 95% confidence level. The optimum compressive strength of concrete at twenty-eight (28) days was found to be 30.15 N/mm². This strength corresponds to a mix ratio of 0.575:1:1.75:0.25:3.5 (i.e.water: cement: river sand: termite soil: granites). With the optimization function developed in this work, any desired compressive strength of river sand- termite soil concrete can be predicted from known mix proportions and vice versa.

Index Terms- optimization; compressive strength; river sand; termite soil; concrete; simplex design

I. INTRODUCTION

Concrete is the most commonly used building material in the world. It is use in majority of engineering projects like construction of housing units, culverts, rigid pavements, gravity dams, etc. In the last century, the escalation in the need for construction project has led to an increase in the use of concrete. This demand is estimated to double in the next thirty years.

With the global economic recession, coupled with the market inflationary trends, the constituent materials used for these structures had led to a very high cost of construction. Hence, researchers in material science and engineering are committed to having local materials to partially or fully replacing these costly conventional materials (Adewuyi et.al, 2008). Numerous achievements have been made in these regards and the subject is attracting attention due to its functional benefit of waste reusability and sustainable development. Reduction in construction costs and the ability to produce light-weight structures, are added advantages.

The use of river sand as an aggregate, for construction does not overrule the fact that its source is usually at some distance from the final user, thereby necessitating its transportation to where it is needed, hence, it increases the cost of construction. Also the growing concern of resource depletion and global pollution has challenged many researchers and engineers to seek and develop new materials relying on renewable resources (Afolayan and Alhassan, 2010). These include the use of by-products and waste materials such as termite soil in building construction.

Therefore, considering the degree of availability of sand, its cost of transportation which can be meaningfully employed in other areas of construction, preservation of the environment and ecosystem, there is a need to replace a portion of the sand in the concrete mix with another local material that will help overcome the above challenges. In this research work, termite soil is used to replace sand partially in the production of concrete (i.e. river-sand termite soil concrete). The river sand- termite soil concrete produced from various mix ratios were test in compression and the results used to model the compressive strength of the concrete.

II. MATERIALS

The concrete test is a five component composite consisting cement, coarse aggregate, fine aggregate, termite soil and water. The cement used in this work is Ibeto brand of ordinary Portland cement. It conforms to the requirement of BS 12 (1978).

The coarse aggregate consists of crushed granite rock having a maximum size of 20mm. It was obtained from crushed rock industries quarry located in Ishiagu in Ebonyi state, Nigeria. River sand obtained from Otamiri River was the fine aggregate. The river sand was sharp and free from clay, debris and other deleterious materials. The grading of the sand was carried out to BS 812 (BS 812). The sand belongs to grading zone C (Neville, 1996).

The termite soil was obtained from termite mounds above ground termite nest which are located at various places within the premises of Federal University of Technology, Owerri (FUTO). The soil was sun dried for two weeks, and the sieved to sand-sized particles before being used in preparing the concrete. Portable water obtained from a borehole in FUTO was used in producing the concrete.

3.0 METHODS

The objective of this work was achieved by employing Scheffe's experimental mixture equation and experimental results obtained after compression test of the concrete cubes of river sand-termite soil concrete. The simple design method was adopted in this work.

3.1 SIMPLEX DESIGN

Simplex is a factor space or a polygon. The simplest simplex is a straight line. A straight line is a one dimensional factor space. Other factor spaces could be two dimensional (a plane), three dimensional (a tetrahedron .i.e. solids) or any other imaginary factor space, whose dimension is above three. Scheffe's factor was considered in this work for formulation of the response function. Scheffe's method of optimization is applicable to mixtures in which the desired response depends on the proportion of components present in the mixture, rather than on the quality of the mixture (Scheffe, 1958). River sand-termite soil concrete is a five-component mixture consisting of water, cement, river sand, termite soil and crushed granite rock. This was analyzed using four-dimensional simplex lattice. The four-dimensional simplex lattice factor space is shown in fig 1 below:

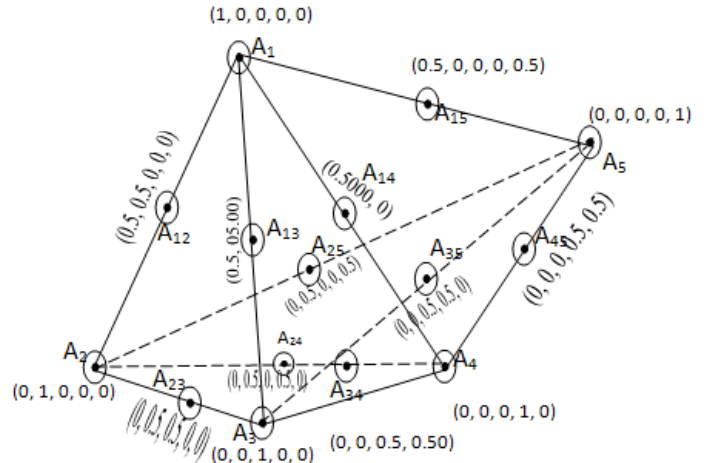


Fig 1: A four-dimensional factor space

According to Scheffe (1958), for a five-component mixture such as like river sand-termite soil concrete, the proportion, X_i of the i^{th} component of the mixture must satisfy the following constraint:

$$X_i \geq 0 \quad (i = 1, 2, 3, 4, 5) \tag{1}$$

And the sum of all proportions of the constituents of the five-component of river sand-termite soil concrete must be equal to unity, i.e.

$$\sum_{i=1}^q X_i = 1 \tag{2}$$

For the five- component river sand-termite soil concrete,

$$X_1 + X_2 + X_3 + X_4 + X_5 = 1 \tag{3}$$

The response sought or the performance criterion of interest (i.e. compressive strength of the river sand-termite soil concrete) is presented using a polynomial function of pseudo components. According to Onwuka et al (2011), the equation of response represented by a polynomial function is given by Eqn(4):

$$Y = b_o + \sum b_i X_i + \sum b_{ij} X_i X_j + \sum b_{ijk} X_i X_j X_k + \dots + e \tag{4}$$

where;

b_i, b_{ij}, b_{ijk} are constants; X_i, X_j, X_k are pseudo components and e is the random error term which represents the combined effect of all variables not included in the model.

The number of coefficients, k, of the polynomial, is determined using Eqn(5).

$$k = \frac{(q + m - 1)!}{(q - 1)! * m!} \tag{5}$$

Where

q is the number of components of the mixture, and, m is the degree of the polynomial.

For the five pseudo component mixture with two degrees of reaction, the number of coefficients is fifteen. The equation of the response, Y, for the five-pseudo component mixture is given as:

$$Y = b_o + \sum b_i X_i + \sum b_{ij} X_i X_j + \dots + e \tag{6}$$

where $0 \leq i \leq j \leq 5$

Expanding Eqn(6) by substituting the values of 'l' and 'j' yields Eqn(7)

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_{12}X_1X_2 + b_{13}X_1X_3 + b_{14}X_1X_4 + b_{15}X_1X_5 + b_{23}X_2X_3 + b_{24}X_2X_4 + b_{25}X_2X_5 + b_{34}X_3X_4 + b_{35}X_3X_5 + b_{45}X_4X_5 + b_{11}X_1^2 + b_{22}X_2^2 + b_{33}X_3^2 + b_{44}X_4^2 + b_{55}X_5^2 \quad (7)$$

Multiplying Eqn(3) by b_0 yields Eqn (8)

$$b_0X_1 + b_0X_2 + b_0X_3 + b_0X_4 + b_0X_5 = b_0 \quad (8)$$

Multiplying Eqn(3) successively by X_1, X_2, X_3, X_4 and X_5 and rearranging the products, gives Eqn(9).

$$\left. \begin{aligned} X_1^2 &= X_1 - X_1X_2 - X_1X_3 - X_1X_4 - X_1X_5 \\ X_2^2 &= X_2 - X_1X_2 - X_2X_3 - X_2X_4 - X_2X_5 \\ X_3^2 &= X_3 - X_1X_3 - X_2X_3 - X_3X_4 - X_3X_5 \\ X_4^2 &= X_4 - X_1X_4 - X_2X_4 - X_3X_4 - X_4X_5 \\ X_5^2 &= X_5 - X_1X_5 - X_2X_5 - X_3X_5 - X_4X_5 \end{aligned} \right\} \quad (9)$$

Substituting Eqns (8) and (9) into Eqn (7) and simplifying the result, gives Eqn (10)

$$Y = \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_{12}X_1X_2 + \beta_{13}X_1X_3 + \beta_{14}X_1X_4 + \beta_{15}X_1X_5 + \beta_{23}X_2X_3 + \beta_{24}X_2X_4 + \beta_{25}X_2X_5 + \beta_{34}X_3X_4 + \beta_{35}X_3X_5 + \beta_{45}X_4X_5 \quad (10)$$

where

β_i and X_i are the coefficient of the response equation and pseudo components of the mix respectively.

The coefficients β_i and β_{ij} are defined as follows:

$$\text{And } \left. \begin{aligned} \beta_i &= b_0 + b_i + b_{ii} \\ \beta_{ij} &= b_{ij} - b_{ii} - b_{jj} \end{aligned} \right\} \quad (11)$$

Eqn(5) can be represented in the form:

$$Y = \sum_{i=1}^5 \beta_i X_i + \sum_{i \leq j \leq 5} \beta_{ij} X_i X_j \quad (12)$$

If the response function is represented by Y, the response function for the pure component, i , and that of binary mixture components, ij , are Y_i and Y_{ij} respectively.

3.1.1 DETERMINATION OF THE COEFFICIENTS OF THE POLYNOMIAL FUNCTION

If the response function is represented by Y, the response function for the pure component, i , and that of binary mixture components, ij , are Y_i and Y_{ij} respectively, then,

$$Y_i = \sum_{i=1}^5 \beta_i X_i \quad (13)$$

And

$$Y_{ij} = \sum_{i=1}^5 \beta_i X_i + \sum_{i \leq j \leq 5} \beta_{ij} X_i X_j \quad (14)$$

The substitution of the values of the pseudo components X_1, X_2, X_3, X_4 and X_5 at the i^{th} poion the lattice into Eqn (13), yields Eqn(15)

$$Y_i = \beta_i \quad (15)$$

And the substitution of the pseudo components X_1, X_2, X_3, X_4 and X_5 at the point ij , into Eqn (14), yields Eqn (16)

$$Y_{ij} = \frac{1}{2}\beta_i + \frac{1}{2}\beta_j + \frac{1}{4}\beta_{ij} \tag{16}$$

Rearrangement of Eqns (15) and (16) gives:

$$\beta_i = Y_i \tag{17}$$

$$\beta_{ij} = 4Y_{ij} - 2Y_i - 2Y_j \tag{18}$$

Let $n_i = Y_i$ and $n_{ij} = Y_{ij}$, hence, Eqns (17) and (18) will be:

$$\beta_i = n_i \tag{19}$$

$$\beta_{ij} = 4n_{ij} - 2n_i - 2n_j \tag{20}$$

Substituting Eqns(19) and (20) into Eqn(10) and simplifying further, gives

$$Y = n_1X_1(2X_1 - 1) + n_2X_2(2X_2 - 1) + n_3X_3(2X_3 - 1) + n_4X_4(2X_4 - 1) + n_5X_5(2X_5 - 1) + 4n_{12}X_1X_2 + 4n_{13}X_1X_3 + 4n_{14}X_1X_4 + 4n_{15}X_1X_5 + 4n_{23}X_2X_3 + 4n_{24}X_2X_4 + 4n_{25}X_2X_5 + 4n_{34}X_3X_4 + 4n_{35}X_3X_5 + 4n_{45}X_4X_5 + 4n_{45}X_4X_5 \tag{21}$$

Eqn(21) is the response function for optimization of river sand-termite soil concrete consisting of five components. The terms n_i and n_{ij} are the responses (i.e. compressive strengths) at the points i and ij . The values of these responses are determined by carrying out laboratory tests.

3.1.2 CONCRETE MIX RATIOS

Five mixed ratios (real and pseudo) that defined the vertices of the four-dimensional simplex lattice used in this study are shown in Table 1

Table 1: Five Mix Ratios (Actual and Pseudo) Obtained From Scheffe’s (5, 2) Factor Space

points	Real Mix ratios					Pseudo Mix ratios				
	Water S ₁	Cement S ₂	R/sand S ₃	T/soil S ₄	Granite S ₅	Water X ₁	Cement X ₂	R/sand X ₃	T/soil X ₄	Granite X ₅
N ₁	0.500	1.0	1.42	0.08	2.50	1.0	0.0	0.0	0.0	0.0
N ₂	0.550	1.0	1.80	0.20	3.00	0.0	1.0	0.0	0.0	0.0
N ₃	0.600	1.0	1.70	0.30	4.00	0.0	0.0	1.0	0.0	0.0
N ₄	0.450	1.0	1.60	0.40	4.25	0.0	0.0	0.0	1.0	0.0
N ₅	0.650	1.0	1.80	0.60	3.50	0.0	0.0	0.0	0.0	1.0

Legend: R/sand= River sand and T/soil = Termite soil

According to Osadebe, et.al (2008) the actual mix ratios relate with pseudo mix ratios in defined by the following equation:
 $\{S\} = [A]\{X\}$ (22)

where S, A and X represent the real mix ratio, coefficient of relation matrix, and pseudo mix ratio respectively. According to Osadebe et.al(2008), matrix A can be taken to be the transpose of the first five real mix ratios shown in table 1, and this resulted to matrix A:

$$[A] = \begin{bmatrix} 0.50 & 0.55 & 0.60 & 0.45 & 0.65 \\ 1 & 1 & 1 & 1 & 1 \\ 1.42 & 1.8 & 1.7 & 1.6 & 1.8 \\ 0.08 & 0.2 & 0.3 & 0.4 & 0.6 \\ 2.5 & 3.0 & 4.0 & 4.25 & 3.5 \end{bmatrix} \tag{23}$$

The five real and pseudo mix ratios in Table 1 corresponds to points of observations, N₁, N₂, N₃, N₄, N₅ located at the five vertices of the four-dimensional simplex lattice. For a (5, 2) simplex design, ten other point observations are needed to add up to the first five to get a total of fifteen observations needed for

the development of the response function. The remaining ten points are located at the mid points of the lines joining the five vertices. On successive substitution of these ten pseudo mix ratios into Eqn(22), the real mix ratios corresponding to the pseudo ones, were obtained. Their values are shown in Table 2.

Table2: Additional Ten Mix Ratios (Real and Pseudo) for formulation of the Optimization Function

points	Real Mix ratios					Pseudo Mix ratios				
	Water S ₁	Cement S ₂	R/sand S ₃	T/soil S ₄	Granite S ₅	Water X ₁	Cement X ₂	R/sand X ₃	T/soil X ₄	Granite X ₅
N ₁₂	0.525	1.0	1.61	0.14	2.75	0.5	0.5	0.0	0.0	0.0
N ₁₃	0.550	1.0	1.56	0.19	3.25	0.5	0.0	0.5	0.0	0.0
N ₁₄	0.475	1.0	1.51	0.24	3.375	0.5	0.0	0.0	0.5	0.0
N ₁₅	0.575	1.0	1.61	0.34	3.00	0.5	0.0	0.0	0.0	0.5
N ₂₃	0.575	1.0	1.75	0.25	3.50	0.0	0.5	0.5	0.0	0.0
N ₂₄	0.500	1.0	1.70	0.30	3.625	0.0	0.5	0.0	0.5	0.0
N ₂₅	0.600	1.0	1.80	0.40	3.25	0.0	0.5	0.0	0.0	0.5
N ₃₄	0.525	1.0	1.65	0.35	4.125	0.0	0.0	0.5	0.5	0.0
N ₃₅	0.625	1.0	1.75	0.45	3.75	0.0	0.0	0.5	0.0	0.5
N ₄₅	0.55	1.0	1.70	0.50	3.875	0.0	0.0	0.0	0.5	0.5

Legend: R/sand= River sand and T/soil = Termite soil

In order to validate the optimization function, extra fifteen points (C₁, C₂, C₃, C₄, C₅, C₆, C₇, C₈, C₉, C₁₀, C₁₁, C₁₂, C₁₃, C₁₄, and C₁₅) of observations were used. These observations provided control mix ratios needed to test the validity of the response function. The mix ratios (actual and pseudo) for the entire work are shown in Table 3.

Table 3: Mix Ratios for Thirty Points Observations (Actual and Pseudo) Obtained From Scheffe’s Factor

Points	Real Mix ratios					Pseudo Mix ratios				
	Water S ₁	Cement S ₂	R/sand S ₃	T/soil S ₄	Granite S ₅	Water X ₁	Cement X ₂	R/sand X ₃	T/soil X ₄	Granite X ₅
N ₁	0.500	1.0	1.42	0.08	2.50	1.0	0.0	0.0	0.0	0.0
N ₂	0.550	1.0	1.80	0.20	3.00	0.0	1.0	0.0	0.0	0.0
N ₃	0.600	1.0	1.70	0.30	4.00	0.0	0.0	1.0	0.0	0.0
N ₄	0.450	1.0	1.60	0.40	4.25	0.0	0.0	0.0	1.0	0.0
N ₅	0.650	1.0	1.80	0.60	3.50	0.0	0.0	0.0	0.0	1.0
N ₁₂	0.525	1.0	1.61	0.14	2.75	0.5	0.5	0.0	0.0	0.0
N ₁₃	0.550	1.0	1.56	0.19	3.25	0.5	0.0	0.5	0.0	0.0
N ₁₄	0.475	1.0	1.51	0.24	3.375	0.5	0.0	0.0	0.5	0.0
N ₁₅	0.575	1.0	1.61	0.34	3.00	0.5	0.0	0.0	0.0	0.5
N ₂₃	0.575	1.0	1.75	0.25	3.50	0.0	0.5	0.5	0.0	0.0
N ₂₄	0.500	1.0	1.70	0.30	3.625	0.0	0.5	0.0	0.5	0.0
N ₂₅	0.600	1.0	1.80	0.40	3.25	0.0	0.5	0.0	0.0	0.5
N ₃₄	0.525	1.0	1.65	0.35	4.125	0.0	0.0	0.5	0.5	0.0
N ₃₅	0.625	1.0	1.75	0.45	3.75	0.0	0.0	0.5	0.0	0.5
N ₄₅	0.55	1.0	1.70	0.50	3.875	0.0	0.0	0.0	0.5	0.5
CONTROL										
C ₁	0.546	0.993	1.828	0.192	3.143	0.333	0.333	0.333	0	0
C ₂	0.513	0.993	1.562	0.258	3.556	0.333	0.00	0.333	0.333	0
C ₃	0.530	0.993	1.595	0.357	3.391	0.333	0.00	0	0.333	0.333
C ₄	0.525	1.0	1.630	0.245	3.438	0.25	0.25	0.25	0.25	0.00
C ₅	0.550	1.0	1.630	0.345	3.563	0.25	0.00	0.25	0.25	0.25
C ₆	0.575	1.0	1.680	0.295	3.250	0.25	0.25	0.25	0.00	0.25
C ₇	0.0538	1.0	1.585	0.165	3.000	0.50	0.25	0.25	0.00	0.00
C ₈	0.600	1.0	1.680	0.395	3.375	0.25	0.00	0.25	0.00	0.50
C ₉	0.520	1.0	1.588	0.212	3.250	0.40	0.20	0.20	0.20	0.00
C ₁₀	0.550	1.0	1.664	0.316	3.450	0.20	0.20	0.20	0.20	0.20
C ₁₁	0.545	1.0	1.626	0.304	3.400	0.30	0.10	0.20	0.20	0.20
C ₁₂	0.545	1.0	1.682	0.348	3.625	0.10	0.20	0.20	0.30	0.20
C ₁₃	0.570	1.0	1.642	0.283	3.200	0.35	0.15	0.25	0.00	0.25
C ₁₄	0.545	1.0	1.650	0.305	3.375	0.25	0.20	0.15	0.20	0.20

C ₁₅	0.538	1.0	1.589	0.306	3.175		0.45	0.05	0.00	0.20	0.30
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3.2 COMPRESSIVE STRENGTH TEST

Compressive strength tests were carried out in order to determine the responses needed to formulate and validate the optimization function. The river sand- termite soil concrete specimen, were concrete cubes measuring 150 x 150x 150 mm in size. A total of ninety cubes were produced from the thirty mix ratios given in T able 3, three cubes from each mix. The first set of 45 cubes made from first set of fifteen mix ratios, were used in

formulating the final optimization functions, while the second set of 45 cubes from the second set of fifteen mix ratios, were used as control test for validating the optimization functions .The concrete cubes were cured in water for 28 days, and tested in compression thereafter. The compression load at failure were recorded and used in Eqn(24) to determine the compressive strength of the river sand-termite soil concrete and presented in Table 4:

$$\text{Compressive strength} = \frac{\text{compressive load of cube at failure (N)}}{\text{cross sectional area of mould (mm}^2\text{)}} \quad (24)$$

III. RESULTS AND ANALYSIS

The results of compressive strength obtained from both in experiment and the optimization function's are given in Table 4

Table 4: Compressive strength (N/mm²) of the 28 day old concrete cubes

Points	Compressive Strength (N/mm ²)			Experiment compressive strength (N/mm ²)	Predicted Compressive Strength of Concrete cubes (N/mm ²)
	Replicate 1	Replicate 2	Replicate 3		
N ₁	25.77	26.22	20.44	24.14	24.14
N ₂	24.44	21.33	27.11	24.29	24.29
N ₃	24.89	26.67	27.78	26.45	26.45
N ₄	24.22	23.33	23.11	23.55	23.55
N ₅	25.11	22.22	23.56	23.63	23.63
N ₁₂	24.89	25.33	23.56	24.59	24.59
N ₁₃	22.67	24.89	23.56	23.71	23.71
N ₁₄	22.22	23.56	25.33	23.70	23.70
N ₁₅	24.00	24.00	22.67	23.56	23.56
N ₂₃	29.11	30.22	31.11	30.15	30.15
N ₂₄	21.78	19.11	19.11	20.00	20.00
N ₂₅	20.89	18.22	18.67	18.96	18.96
N ₃₄	16.89	17.33	17.33	17.19	17.19
N ₃₅	16.89	17.11	16.89	16.96	16.96
N ₄₅	11.56	11.11	11.11	11.26	11.26
C ₁	25.40	25.20	25.30	25.30	26.55
C ₂	19.78	19.56	19.64	19.66	20.47
C ₃	18.98	19.00	19.08	19.02	18.09
C ₄	21.83	22.12	22.20	22.05	22.53
C ₅	21.78	20.00	20.89	20.89	16.87
C ₆	22.91	22.53	22.78	22.74	22.17
C ₇	23.78	25.11	24.22	24.37	25.35
C ₈	20.44	20.02	20.44	20.30	19.86
C ₉	22.54	22.33	22.69	22.52	22.97
C ₁₀	18.24	18.25	18.59	18.36	18.97
C ₁₁	19.98	20.07	20.07	20.04	19.10
C ₁₂	17.33	18.67	17.33	17.78	17.11
C ₁₃	22.35	22.35	22.20	22.30	21.97
C ₁₄	18.63	18.67	18.62	18.64	19.31

C ₁₅	21.00	21.04	21.20	21.08	20.27
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4.1 OPTIMIZATION FUNCTION FOR PREDICTING THE COMPRESSIVE STRENGTH OF THE CONCRETE

The final optimization function is obtained by substituting compressive strength of concrete cubes from the first fifteen points of observations (N₁, N₂, N₃, N₄, N₅, N₆, N₇, N₈, N₉, N₁₀, N₁₁, N₁₂, N₁₃, N₁₄, and N₁₅) into Eqn (21) to obtain:

$$Y = 24.14(2X_1 - 1)X_1 + 24.29(2X_2 - 1)X_2 + 26.45(2X_3 - 1)X_3 + 23.55(2X_4 - 1)X_4 + 23.63(2X_5 - 1)X_5 + 98.36X_1 X_2 + 94.84X_1 X_3 + 94.80X_1 X_4 + 94.24X_1 X_5 + 120.60X_2 X_3 + 80.00X_2 X_4 + 75.84X_2 X_5 + 68.76X_3 X_4 + 67.84X_3 X_5 + 45.04X_4 X_5$$

The Eqn (25) is the final function for the optimization of compressive strength of river sand-termite soil concrete.

TEST OF ADEQUACY OF THE MODEL

The test for adequacy of the optimization function, obtained from the (5,2) simplex design, was done using statistical student's t-test at 95% accuracy level. The compressive strength at the control points

(i.e. C₁, C₂, C₃, C₄, C₅, C₆, C₇, C₈, C₉, C₁₀, C₁₁, C₁₂, C₁₃, C₁₄, C₁₅). Two hypotheses were considered in the test namely:

- a) **Null Hypothesis:** At 95% accuracy level, that there is no significant difference between the laboratory concrete cube strength and the cube strength results obtained from the optimization function.
- b) **Alternative Hypothesis:** At 95% accuracy level, there is a significant difference between the laboratory concrete cube strength and concrete cube strength obtained from the optimization model.

The test is carried out as shown in Table 6

Table 6: Statistical Student's t-test for (5,2) simplex design

Point	Y _E	TWO-TAILED t-TEST			
		Y _M	D _i =Y _E - Y _M	D _A - D _i	(D _A - D _i) ²
C ₁	25.30	26.55	-1.25	1.4627	2.1395
C ₂	19.66	20.47	-0.81	1.0227	1.0459
C ₃	19.02	18.09	0.93	-0.7173	0.5145
C ₄	22.05	22.53	-0.48	0.6927	0.4798
C ₅	20.89	16.87	4.02	-3.8073	14.4955
C ₆	24.74	22.17	0.30	-0.0873	0.0076
C ₇	24.37	25.35	-0.98	1.1927	1.4225
C ₈	20.30	19.86	0.44	-0.2273	0.0517
C ₉	22.52	22.97	-0.45	0.6627	0.4392
C ₁₀	18.36	18.97	-0.61	0.8227	0.6768
C ₁₁	20.04	19.10	0.94	-0.7273	0.5290
C ₁₂	17.78	17.11	0.67	-0.4573	0.2091
C ₁₃	22.30	21.97	0.33	-0.1173	0.0138
C ₁₄	18.64	19.31	-0.67	0.8827	0.7792
C ₁₅	21.08	20.27	0.81	-0.5973	0.568
		Σ D _i =	3.19	Σ(D _A - D _i) ² =	23.1567

Legend: Y_E is the experiment compressive strength and Y_M is the Model compressive strength

Let:
 D_i = The difference of Compressive strength obtained from Experiment, Y_E and the one optimization function, Y_M
 D_A = The mean of D_i = $\frac{\sum D_i}{N}$

The variance of the square of difference of D_A and D_i , $S^2 = \frac{\sum(D_A - D_i)^2}{N-1} =$

$N =$ Number of observation points

The standard deviation of the difference of D_A and D_i , $S = \sqrt{S^2} =$

Therefore,

$$D_i = \frac{\sum D_i}{N} = \frac{3.19}{15} = 0.2127$$

$$S^2 = \frac{\sum(D_A - D_i)^2}{N-1} = \frac{23.1567}{14} = 1.65405$$

$$S = \sqrt{S^2} = \sqrt{1.65405} = 1.2861$$

Actual value of total variation in t-test

For the two-tailed test, the actual value of t is:

$$t_{\text{calculated}} = \frac{D_A N^{0.5}}{S} = \frac{0.2127(15)^{0.5}}{1.2861} = 0.6405$$

Allowable value of total variation in t-test:

Degree of freedom = $N-1 = 15-1 = 14$

At 5 % significance level, for the two-tailed Test = 2.5 %

$100 - 2.5\% = 97.5\% = 0.975$

Allowable total variation in t-test, i.e. $t_{\text{table}} = t_{(0.975,14)} = 2.14$ (Obtained from standard statistical table).

From table 5, the calculated t = 0.6405 which is less than t-value of 2.14 from standard statistical table.

Thus, $t_{\text{table}} > t_{\text{calculated}}$

This implied that difference between the two set of cubes compressive strength is insignificant. Hence the null hypothesis is accepted and alternative hypothesis rejected. Therefore, the optimization function for prediction of compressive strength of river sand-termite soil concrete is adequate.

IV. CONCLUSION

Using simplex design polynomial equation, mix design function for a five component river sand- termite soil concrete cube, was developed. This optimizing function could predict the compressive strength of concrete cube when the mix ratios are known and vice versa. The predictions from this model were tested at 95% accuracy level using statistical student's t-test and found to be adequate. The maximum strength predicted by this model is 30.15 N/mm². This strength is from a mix ratio 0.575:1:1.75:0.25:3.5 (corresponding to the water: cement: river sand: termite soil: granite).

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Prediction and Optimization of Compressive Strength of Sawdust Ash-Cement Concrete Using Scheffe's Simplex Design

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Abstract- Frequent increase in the price of cement and other building materials across Nigeria has reawakened serious need to relate research to production, especially in the use of locally available materials as alternatives for construction of functional but low-cost dwellings in both rural and urban areas in the country. This article aimed at prediction and optimizing compressive strength of concrete when one of its conventional materials, cement is partially or wholly replaced by Sawdust ash. Sawdust ash (SDA) is a non-toxic construction waste material found in abundance in Nigeria. The effective utilization of this material as a component in concrete depends on the mix proportioning of the various component materials. A mathematical model to predict and optimize compressive of Sawdust ash- cement concrete was developed using Scheffe's five component second degree simplex lattices.

The model was used to optimize the compressive strength of concrete made from water, cement, sawdust ash, sand and granites. The results of the response function compared favourably with the corresponding experimental results and the predictions from the response function were tested for adequacy using the statistical student's t-test and found to be adequate at 95% confidence level. The optimum compressive strength of concrete at twenty-eight (28) days was found to be 20.44N/mm². This strength corresponds to a mix ratio of 0.5: 0.95: 0.05: 2.25: 4 (i.e. water: cement: sawdust ash: sand: granites). With the optimization function developed in this work, any desired compressive strength of sawdust ash-cement concrete can be predicted from known mix proportions and vice versa.

Index Terms- sawdust, optimization, scheffes, concrete, prediction, compressive strength

I. INTRODUCTION

One of the basic needs of man is housing. In any developing country like Nigeria, there is a perpetual problem of accommodation and inadequate housing. A recent investigation showed that more than seven million Nigerians have no accommodation (Punch, 2012). It is important to note that majority of housing units in Nigeria are constructed using concrete.

The construction industry relies heavily on conventional materials such as cement, granite and sand for the production of concrete. The high and increasing cost of these materials has

greatly hindered the development of shelter and other infrastructural facilities in Nigeria and other developing countries. There arises the need for engineering consideration of the use of cheaper and locally available materials to meet desired need enhance self efficiency, and lead to an overall reduction in construction cost for sustainable development.

Attempts have equally been made by various researchers to reduce the cost of its constituents and hence total construction cost by investigating and ascertaining the usefulness of materials which could be classified as agricultural or industrial waste. Some of these wastes include sawdust, pulverized fuel ash palm kernel shells, slag, fly ash etc which are produced from milling stations, thermal power station, waste treatment plants etc.

Sawdust is an industrial waste in the timber industry. It is obtained as loose particles or wood chippings from sawing of timber into standard useable sizes. It poses a nuisance to both the health and environment when not properly managed. It has pozzolanic properties and has been shown to react chemically with the calcium hydroxide released from the hydration of Portland cement, to form cement compounds (Elinwa and Mahmood, 2002). Active pozzolans gain their binding properties when they react with calcium hydroxide in lime or cement in presence of water. The advantages of using SDA for concrete production are numerous. It acts as a retarder prolonging the setting times, reduces the heat of hydration, encourages a healthier environment by reducing green gas emission and abundantly available as a waste. SDA has been used as partial replacement in mortar and concrete works (Elinwa and Mahmood, 2002; Elinwa and Ejeh, 2004). It has also been used as a powder material in the production of self compacting concrete (SCC) (Elinwa and Mamuda, 2008) and in combination with metakaolin as a ternary blend with 3 % added to act as an admixture.

In this work, a mathematical model for the prediction and optimization of Compressive Strength of concrete is developed with different percentages of saw dust ash as partial replacement of cement. This involves compression test of concrete from the different mix ratios where cement is partially replaced with sawdust ash. The results were used to develop scheffe's mathematical model. This model would be used to predict the compressive strength of concrete given any mix ratio or predict mix ratios given a particular Compressive Strength of concrete.

II. MATERIALS

The concrete test is a five component composite consisting cement, sawdust ash, fine aggregate, coarse aggregate and water. The cement used in this work is Dangote brand of ordinary Portland cement. It conforms to the requirement of BS 12 (1978). The coarse aggregate consists of crushed granite rock having a maximum size of 20mm. It was obtained from crushed rock industries quarry located in Ishiagu in Ebonyi state, Nigeria. Sand was obtained from Otamiri River was the fine aggregate. The sand was sharp and free from clay, debris and other deleterious materials. The grading of the sand was carried out to BS 812:103 (BS 812: Part 1, 1975). The sand belongs to grading zone C (Neville, A.M., 1996).

Sawdust is a by-product from timber, it is a waste product obtained during sawing of timber into standard sizes. The sawdust was obtained from timber milling market (ogbosisi) Owerri. This material was first dried to remove the natural moisture. The waste was burnt in an enclosure (i.e. open drum) at temperature of about 400-500°C to obtain sawdust ash. The ash was allowed to cool; thereafter the ash was sieved with 150µm sieve aperture to obtain the finest particle of material which approximates to the fineness of that of cement used

III. METHODS

The objective of this work was achieved by employing Scheffe’s experimental mixture equation and experimental results obtained after compression test of the concrete cube of sawdust ash-cement concrete. These methods were used in the formulation of the model for optimization of the compressive strength of sawdust ash-cement concrete. The model developed was tested for adequacy using statistical student’s t-test.

According to Scheffe (1958), a five-component mixture like Sawdust ash-cement concrete, the proportion, X_i of the i^{th} component of the mixture must satisfy the following constraint:

$$X_i \geq 0 \quad (i = 1, 2, 3, 4, 5) \quad (1)$$

And the sum of all proportions of the constituents of the five-component of Sawdust ash-cement concrete must be equal to unity,

i.e.

$$\sum_{i=1}^q X_i = 1 \quad (2)$$

For the five- component sawdust ash-cement concrete,

$$X_1 + X_2 + X_3 + X_4 + X_5 = 1 \quad (3)$$

The response sought for the performance criterion of interest (i.e. compressive strength of the Sawdust ash-cement concrete) is presented using a polynomial function of pseudo components. According to Onwuka et al (2011), the equation of response represented by a polynomial function is given by Eqn(4):

$$Y = b_0 + \sum b_i X_i + \sum b_{ij} X_i X_j + \sum b_{ijk} X_i X_j X_k + \dots + e \quad (4)$$

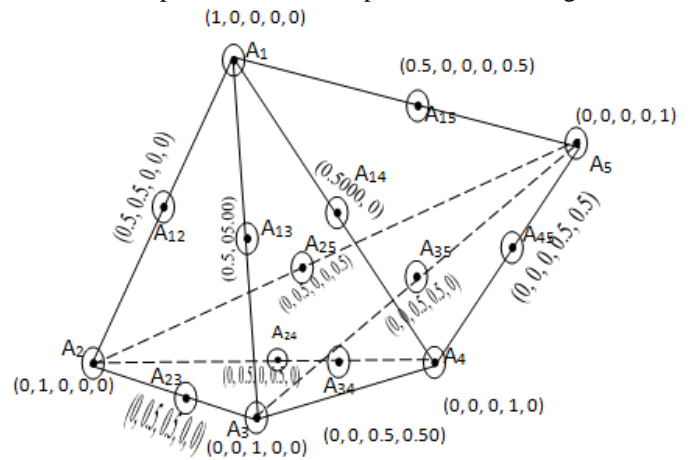
Where;

b_i, b_{ij}, b_{ijk} are constants; X_i, X_j, X_k are pseudo components and e is the random error term which represents the combined effect of all variables not included in the model.

The number of coefficients, k, of the polynomial, is determined using Eqn(5).

3.1 SIMPLEX DESIGN

Simplex is a factor space or a polygon. The simplest simplex is a straight line. A straight line is a one dimensional factor space. Other factor spaces could be two dimensional (a plane), three dimensional (a tetrahedron i.e. solids) or any other imaginary factor space, whose dimension is above three. Scheffe’s factor was considered in this work for formulation of the response function. Scheffe’s method of optimization is applicable to mixtures in which the desired response depends on the proportion of components present in the mixture, rather than on the quality of the mixture (Scheffe, H., 1958). Sawdust – cement concrete is a five-[component mixture consisting of water, cement, sawdust ash, sand and crushed granite rock. This was analyzed using four-dimensional simplex lattice. Four-dimensional simplex lattice factor space is shown in figure 1:



$$k = \frac{(q + m - 1)!}{(q - 1)! * m!} \quad (5)$$

Where q is the number of components of the mixture, and, m is the degree of the polynomial.

For the five pseudo component mixture with two degrees of reaction, the number of coefficients is fifteen. The equation of the response, Y, for the five-pseudo component mixture is given as:

$$Y = b_0 + \sum b_i X_i + \sum b_{ij} X_i X_j + \dots + e \quad (6)$$

Where $0 \leq i \leq j \leq 5$

Expanding Eqn(6) by substituting the values of 'i' and 'j' yields Eqn(7)

$$Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_{12} X_1 X_2 + b_{13} X_1 X_3 + b_{14} X_1 X_4 + b_{15} X_1 X_5 + b_{23} X_2 X_3 + b_{24} X_2 X_4 + b_{25} X_2 X_5 + b_{34} X_3 X_4 + b_{35} X_3 X_5 + b_{45} X_4 X_5 + b_{11} X_1^2 + b_{22} X_2^2 + b_{33} X_3^2 + b_{44} X_4^2 + b_{55} X_5^2 \quad (7)$$

Multiplying Eqn(3) by b_0 yields Eqn (8)

$$b_0 X_1 + b_0 X_2 + b_0 X_3 + b_0 X_4 + b_0 X_5 = b_0 \quad (8)$$

Multiplying Eqn(3) successively by X_1, X_2, X_3, X_4 and X_5 and rearranging the products, gives Eqn(9).

$$\left. \begin{aligned} X_1^2 &= X_1 - X_1 X_2 - X_1 X_3 - X_1 X_4 - X_1 X_5 \\ X_2^2 &= X_2 - X_1 X_2 - X_2 X_3 - X_2 X_4 - X_2 X_5 \\ X_3^2 &= X_3 - X_1 X_3 - X_2 X_3 - X_3 X_4 - X_3 X_5 \\ X_4^2 &= X_4 - X_1 X_4 - X_2 X_4 - X_3 X_4 - X_4 X_5 \\ X_5^2 &= X_5 - X_1 X_5 - X_2 X_5 - X_3 X_5 - X_4 X_5 \end{aligned} \right\} \quad (9)$$

Substituting Eqns (8) and (9) into Eqn (7) and simplifying the result, gives Eqn (10)

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_{12} X_1 X_2 + \beta_{13} X_1 X_3 + \beta_{14} X_1 X_4 + \beta_{15} X_1 X_5 + \beta_{23} X_2 X_3 + \beta_{24} X_2 X_4 + \beta_{25} X_2 X_5 + \beta_{34} X_3 X_4 + \beta_{35} X_3 X_5 + \beta_{45} X_4 X_5 \quad (10)$$

Where β_i and X_i are the coefficient of response equation and pseudo components of the mix respectively.

The coefficients β_i and β_{ij} are defined as follows:

$$\text{And } \left. \begin{aligned} \beta_i &= b_0 + b_i + b_{ii} \\ \beta_{ij} &= b_{ij} - b_{ii} - b_{jj} \end{aligned} \right\} \quad (11)$$

Eqn(5) can be represented in the form:

$$Y = \sum_{i=1}^5 \beta_i X_i + \sum_{i \leq j \leq 5} \beta_{ij} X_i X_j \quad (12)$$

If the response function is represented by Y, the response function for the pure component, Y_i , and that of binary mixture components, Y_{ij} , are Y_i and Y_{ij} respectively.

3.1.1 DETERMINATION OF THE COEFFICIENTS OF THE POLYNOMIAL FUNCTION

If the response function is represented by Y , the response function for the pure component, i , and that of binary mixture components, ij , are Y_i and Y_{ij} respectively, then,

$$Y_i = \sum_{i=1}^5 \beta_i X_i \tag{13}$$

And

$$Y_{ij} = \sum_{i=1}^5 \beta_i X_i + \sum_{i \leq j \leq 5} \beta_{ij} X_i X_j \tag{14}$$

The substitution of the values of the pseudo components X_1, X_2, X_3, X_4 and X_5 at the i^{th} on the lattice into Eqn (13), yields Eqn(15)

$$Y_i = \beta_i \tag{15}$$

And the substitution of the pseudo components X_1, X_2, X_3, X_4 and X_5 at the point ij , into Eqn (14), yields Eqn (16)

$$Y_{ij} = \frac{1}{2} \beta_i + \frac{1}{2} \beta_j + \frac{1}{4} \beta_{ij} \tag{16}$$

Rearrangement of Eqns (15) and (16) gives:

$$\beta_i = Y_i \tag{17}$$

$$\beta_{ij} = 4Y_{ij} - 2Y_i - 2Y_j \tag{18}$$

Let $n_i = Y_i$ and $n_{ij} = Y_{ij}$, hence, Eqns (17) and (18) will be:

$$\beta_i = n_i \tag{19}$$

$$\beta_{ij} = 4n_{ij} - 2n_i - 2n_j \tag{20}$$

Substituting Eqns(19) and (20) into Eqn(10) and simplifying further, gives

$$Y = n_1 X_1 (2X_1 - 1) + n_2 X_2 (2X_2 - 1) + n_3 X_3 (2X_3 - 1) + n_4 X_4 (2X_4 - 1) + n_5 X_5 (2X_5 - 1) + 4n_{12} X_1 X_2 + 4n_{13} X_1 X_3 + 4n_{14} X_1 X_4 + 4n_{15} X_1 X_5 + 4n_{23} X_2 X_3 + 4n_{24} X_2 X_4 + 4n_{25} X_2 X_5 + 4n_{34} X_3 X_4 + 4n_{35} X_3 X_5 + 4n_{45} X_4 X_5 \tag{21}$$

Eqn(21) is the response function for optimization of Sawdust ash-cement concrete consisting of five components. The terms n_i and n_{ij} are the responses (i.e. compressive strengths) at the points i and ij . The values of these responses are determined by carrying out compression tests on cubes obtained using sawdust ash as one of the components of concrete.

3.1.2 CONCRETE MIX RATIOS

Five mixed ratios (real and pseudo) that defined the vertices of the four-dimensional simplex lattice used in this study are shown in Table 1

Table 1: Five Mix Ratios (Actual and Pseudo) Obtained From Scheffe's (5, 2) Factor Space

points	Real Mix ratios					Pseudo Mix ratios				
	Water S_1	Cement S_2	SDA S_3	Sand S_4	Granite S_5	Water X_1	Cement X_2	SDA X_3	Sand X_4	Granite X_5
N_1	0.500	0.95	0.05	2.25	4.00	1.0	0.0	0.0	0.0	0.0
N_2	0.55	0.90	0.10	1.75	3.50	0.0	1.0	0.0	0.0	0.0
N_3	0.60	0.85	0.15	2.25	4.25	0.0	0.0	1.0	0.0	0.0

N ₄	0.45	0.80	0.20	1.50	3.00	0.0	0.0	0.0	1.0	0.0
N ₅	0.65	0.75	0.25	2.50	5.00	0.0	0.0	0.0	0.0	1.0

Legend: SDA= Sawdust Ash

According to Osadebe, et.al (2008) the actual mix ratios relate with pseudo mix ratios in defined by the following equation:

$$\{S\} = [A]\{X\} \tag{22}$$

where S, A and X represent the real mix ratio, coefficient of relation matrix, and pseudo mix ratio respectively. According to Osadebe et.al(2008), matrix A can be taken to be the transpose of the first five real mix ratios shown in Table 1, and this resulted to matrix A:

$$[A] = \begin{bmatrix} 0.50 & 0.55 & 0.60 & 0.45 & 0.65 \\ 0.95 & 0.90 & 0.85 & 0.80 & 0.75 \\ 0.05 & 0.10 & 0.15 & 0.20 & 0.25 \\ 2.25 & 1.75 & 2.25 & 1.50 & 2.50 \\ 4.00 & 3.50 & 4.25 & 3.00 & 5.00 \end{bmatrix} \tag{23}$$

The five real and pseudo mix ratios in Table 1 corresponds to points of observations, N₁, N₂, N₃, N₄, N₅ located at the five vertices of the four-dimensional simplex lattice. For a (5, 2) simplex design, ten other observations are needed to add up to the first five to get a total of fifteen observations needed for the

development of the response function. The remaining ten points are located at the mid points of the lines joining the five vertices. On successive substitution of these ten pseudo mix ratios into Eqn(22), the real mix ratios corresponding to the pseudo ones were obtained. Their values are shown in Table 2.

Table2: Additional Ten Mix Ratios (Real and Pseudo) for formulation of the Optimization Function

points	Real Mix ratios					Pseudo Mix ratios				
	Water S ₁	Cement S ₂	SDA S ₃	Sand S ₄	Granite S ₅	Water X ₁	Cement X ₂	SDA X ₃	Sand X ₄	Granite X ₅
N ₁₂	0.525	0.925	0.075	2	3.75	0.5	0.5	0.0	0.0	0.0
N ₁₃	0.55	0.90	0.10	2.25	4.125	0.5	0.0	0.5	0.0	0.0
N ₁₄	0.475	0.875	0.125	1.875	3.5	0.5	0.0	0.0	0.5	0.0
N ₁₅	0.575	0.85	0.150	2.375	4.5	0.5	0.0	0.0	0.0	0.5
N ₂₃	0.575	0.875	0.125	2	3.875	0.0	0.5	0.5	0.0	0.0
N ₂₄	0.50	0.85	0.150	1.625	3.25	0.0	0.5	0.0	0.5	0.0
N ₂₅	0.60	0.825	0.175	2.125	4.25	0.0	0.5	0.0	0.0	0.5
N ₃₄	0.525	0.825	0.175	1.875	3.625	0.0	0.0	0.5	0.5	0.0
N ₃₅	0.625	0.80	0.20	2.375	4.625	0.0	0.0	0.5	0.0	0.5
N ₄₅	0.55	0.775	0.225	2	4	0.0	0.0	0.0	0.5	0.5

Legend: SDA = Sawdust ash

In order to validate the optimization function, extra fifteen points (C₁, C₂, C₃, C₄, C₅, C₆, C₇, C₈, C₉, C₁₀, C₁₁, C₁₂, C₁₃, C₁₄, and C₁₅) of observations were used. These observations provided control mix ratios needed to test the validity of the response function. The mix ratios (actual and Pseudo) for the entire work are shown in Table 3.

Table 3: Mix Ratios for Thirty Observations (Actual and Pseudo) Obtained From Scheffe’s Factor Space

points	Real Mix ratios					Pseudo Mix ratios				
	Water S ₁	Cement S ₂	SDA S ₃	Sand S ₄	Granite S ₅	Water X ₁	Cement X ₂	SDA X ₃	Sand X ₄	Granite X ₅
N ₁	0.500	0.95	0.05	2.25	4.00	1.0	0.0	0.0	0.0	0.0
N ₂	0.55	0.90	0.10	1.75	3.50	0.0	1.0	0.0	0.0	0.0
N ₃	0.60	0.85	0.15	2.25	4.25	0.0	0.0	1.0	0.0	0.0
N ₄	0.45	0.80	0.20	1.50	3.00	0.0	0.0	0.0	1.0	0.0
N ₅	0.65	0.75	0.25	2.50	5.00	0.0	0.0	0.0	0.0	1.0
N ₁₂	0.525	0.925	0.075	2	3.75	0.5	0.5	0.0	0.0	0.0
N ₁₃	0.55	0.90	0.10	2.25	4.125	0.5	0.0	0.5	0.0	0.0

N ₁₄	0.475	0.875	0.125	1.875	3.5	0.5	0.0	0.0	0.5	0.0
N ₁₅	0.575	0.85	0.150	2.375	4.5	0.5	0.0	0.0	0.0	0.5
N ₂₃	0.575	0.875	0.125	2	3.875	0.0	0.5	0.5	0.0	0.0
N ₂₄	0.50	0.85	0.150	1.625	3.25	0.0	0.5	0.0	0.5	0.0
N ₂₅	0.60	0.825	0.175	2.125	4.25	0.0	0.5	0.0	0.0	0.5
N ₃₄	0.525	0.825	0.175	1.875	3.625	0.0	0.0	0.5	0.5	0.0
N ₃₅	0.625	0.80	0.20	2.375	4.625	0.0	0.0	0.5	0.0	0.5
N ₄₅	0.55	0.775	0.225	2	4	0.0	0.0	0.0	0.5	0.5
CONTROL										
C ₁	0.550	0.900	0.100	2.083	3.92	0.333	0.333	0.333	0	0
C ₂	0.520	0.867	0.133	2.000	3.75	0.333	0.00	0.333	0.333	0
C ₃	0.533	0.833	0.167	2.083	4.00	0.333	0.00	0	0.333	0.333
C ₄	0.525	0.8375	0.125	2.9375	3.688	0.25	0.25	0.25	0.25	0.00
C ₅	0.55	0.8375	0.1625	2.125	4.0625	0.25	0.00	0.25	0.25	0.25
C ₆	0.575	0.8625	0.1375	2.1875	4.1875	0.25	0.25	0.25	0.00	0.25
C ₇	0.05375	0.9125	0.0875	2.125	3.9375	0.50	0.25	0.25	0.00	0.00
C ₈	0.60	0.825	0.175	2.375	4.5625	0.25	0.00	0.25	0.00	0.50
C ₉	0.52	0.890	0.11	2	3.75	0.40	0.20	0.20	0.20	0.00
C ₁₀	0.55	0.85	0.15	2.05	3.95	0.20	0.20	0.20	0.20	0.20
C ₁₁	0.545	0.855	0.145	2.10	4.0	0.30	0.10	0.20	0.20	0.20
C ₁₂	0.545	0.835	0.165	1.975	3.85	0.10	0.20	0.20	0.30	0.20
C ₁₃	0.57	0.8675	0.1325	2.2375	4.2375	0.35	0.15	0.25	0.00	0.25
C ₁₄	0.545	0.855	0.145	2.05	3.9375	0.25	0.20	0.15	0.20	0.20
C ₁₅	0.5375	0.8575	0.1425	2.15	4.075	0.45	0.05	0.00	0.20	0.30

3.2 COMPRESSIVE STRENGTH TEST

Compressive strength tests were carried out in order to determine the responses needed to formulate and validate the optimization function. The sawdust ash-cement concrete specimen, were concrete cubes measuring 150 x 150x 150 mm in size. A total of ninety cubes were produced from the thirty mix ratios given in Table 3, three cubes from each mix. The first set of 45 cubes made from first set of fifteen mix ratios, were used in

formulating the final optimization model, while the second set of 45 cubes from the second set of fifteen mix ratios, were used as control test for validating the optimization model. The concrete cubes were cured in water for 28 days, and tested in compression thereafter. The compression load at failure were recorded and used in Eqn(24) to determine the compressive strength of the river sand-termite soil concrete and presented in Table 4:

$$\text{Compressive strength} = \frac{\text{compressive load of cube at failure (N)}}{\text{cross sectional area of mould (mm}^2\text{)}} \quad (24)$$

IV. RESULTS AND ANALYSIS

The compressive strength of the cubes obtained from the experiment and model are given in Table 4

Table 4: Compressive strength (N/mm²) of the 28 day old concrete cubes

Points	Compressive Strength (N/mm ²)			Mean Experiment compressive strength (N/mm ²)	Predicted Compressive Strength of Concrete cubes (N/mm ²)
	Replicate 1	Replicate 2	Replicate 3		
N ₁	20.69	20.00	20.44	20.34	20.34
N ₂	19.56	19.33	19.11	19.30	19.30
N ₃	18.44	18.22	17.78	18.13	18.13
N ₄	13.33	12.00	15.56	14.45	14.45

N ₅	11.55	9.33	11.11	11.33	11.33
N ₁₂	18.22	20.00	20.66	19.63	19.63
N ₁₃	13.78	13.78	13.33	13.63	13.63
N ₁₄	16.44	10.67	16.89	16.67	16.67
N ₁₅	8.66	9.33	9.33	9.11	9.11
N ₂₃	21.33	15.56	16.00	17.66	17.66
N ₂₄	15.56	16.00	13.30	15.78	15.78
N ₂₅	14.67	16.00	8.89	15.34	15.34
N ₃₄	13.78	15.11	11.58	13.48	13.48
N ₃₅	14.67	14.22	16.44	15.10	15.10
N ₄₅	20.00	18.22	17.78	18.67	18.67
C ₁	17.47	18.08	16.89	17.48	18.42
C ₂	13.55	15.56	15.11	14.74	13.57
C ₃	15.90	15.33	15.51	15.58	14.62
C ₄	16.89	16.11	16.35	16.45	16.44
C ₅	14.34	13.89	14.28	14.17	13.64
C ₆	14.78	14.56	14.67	14.67	15.24
C ₇	17.22	17.11	17.09	17.14	18.87
C ₈	11.604	11.33	11.51	11.48	10.70
C ₉	16.82	16.36	16.00	16.39	17.23
C ₁₀	14.39	14.29	14.22	14.30	15.59
C ₁₁	13.47	13.31	13.72	13.50	14.64
C ₁₂	14.80	14.88	14.72	14.80	15.78
C ₁₃	12.88	13.03	13.24	13.05	14.01
C ₁₄	14.68	14.68	14.38	14.58	15.79
C ₁₅	13.11	13.04	13.18	13.11	14.29

4.1 OPTIMIZATION FUNCTION FOR PREDICTING THE COMPRESSIVE STRENGTH OF THE CONCRETE

The final optimization function is obtained by substituting compressive strength of concrete cubes from the first fifteen points of observations (N₁, N₂, N₃, N₄, N₅, N₆, N₇, N₈, N₉, N₁₀, N₁₁, N₁₂, N₁₃, N₁₄, and N₁₅) into Eqn (21) to obtain:.

$$Y = 20.34X_1 + 19.30X_2 + 18.13X_3 + 4.45X_4 + 11.33X_5 + 19.24X_1X_2 - 22.42X_1X_3 - 2.90X_1X_4 - 26.9X_1X_5 - 4.22X_2X_3 - 4.38X_2X_4 + 0.1X_2X_5 - 11.24X_3X_4 + 1.48X_3X_5 + 23.12X_4X_5 \quad (25)$$

The Eqn (25) is the final function for the optimization of compressive strength of sawdust ash-cement concrete.

Test of Adequacy of the Model

The test for adequacy of second degree polynomial was done using statistical student's t-test at 95% accuracy level. The compressive strength at the control points (i.e. C₁, C₂, C₃, C₄, C₅, C₆, C₇, C₈, C₉, C₁₀, C₁₁, C₁₂, C₁₃, C₁₄, C₁₅) were used for the test. The following two hypotheses were tested using statistical student's t-test.

- c) **Null Hypothesis:** There is no significant difference between the laboratory concrete cube strengths and predicted compressive strength results at 95% accuracy level.
- d) **Alternative Hypothesis:** There is a significant difference between the laboratory concrete cube strengths and predicted strength compressive strength results at 95% accuracy level.

The test is carried out and presented in Table 5 using the following equations:

Let:

Y_E = Responses (compressive strength) from the experiment

Y_M = Responses (compressive strength) from the Second degree polynomial equation

N = Number of observations

D_i = Difference of Y_E and Y_M
 $\sum D_i$

$D_A = \frac{\sum D_i}{N}$ = Mean of difference of Y_E and Y_M

$$S^2 = \frac{\sum(DA - D_i)^2}{N-1} = \text{Variance of difference of } D_i \text{ and } D_A$$

$$t = \frac{S D_i}{S} = \text{Calculated value of } t$$

Table 5: Statistical Student's t-test for the model

TWO-TAILED t-TEST					
OP	Y_E	Y_M	$D_i = Y_E - Y_M$	$D_A - D_i$	$(D_A - D_i)^2$
C ₁	17.48	18.42	-0.94	0.447	0.1998
C ₂	14.74	13.57	1.17	-1.663	2.7656
C ₃	15.58	14.62	0.96	-1.453	2.1112
C ₄	16.45	16.44	0.01	-0.503	0.2530
C ₅	14.17	13.64	0.53	-1.023	1.0465
C ₆	14.67	15.24	-0.57	0.077	0.0059
C ₇	17.14	18.87	-1.73	1.237	1.5302
C ₈	11.48	10.70	0.78	-1.273	1.6205
C ₉	16.39	17.23	-0.84	0.347	0.1204
C ₁₀	14.30	15.59	-1.29	0.797	0.6352
C ₁₁	13.50	14.64	-1.14	0.647	0.4186
C ₁₂	14.80	15.78	-0.98	0.487	0.2372
C ₁₃	13.05	14.01	-0.96	0.467	0.2181
C ₁₄	14.58	15.79	-1.21	0.717	0.5141
C ₁₅	13.11	14.29	-1.18	0.687	0.4720
		S D _i	= -7.39	S (D _A - D _i) ²	= 12.1483

Legend: OP is the observation point

Here,

$$S D_i = -7.39$$

$$N = 15$$

$$D_A = \frac{\sum D_i}{N} = -0.493$$

$$S^2 = \frac{\sum(DA - D_i)^2}{N-1} = 0.8677$$

$$S = \sqrt{S^2} = 0.9315$$

Actual value of total variation in t-test

$$t = \frac{S D_i}{S} = -2.05$$

Allowable total variation in t-test

$$\text{Degree of freedom} = N-1 = 15-1 = 14$$

$$5\% \text{ significance for Two-Tailed Test} = 2.5\%$$

$$1 - 2.5\% = 97.5\% = 0.975$$

Allowable Total Variation in t-test = $t_{(0.975, N-1)} = t_{(0.975, 14)} = 2.14$ (Obtained from statistical table).

From table 5, the calculated $t = 2.05$. Thus, $t_{(table)} > t_{(calculated)}$

This implied that difference between the two set of cubes compressive strength is less than allowable difference. Hence null hypothesis is accepted and alternative hypothesis rejected. Hence, the model is adequate.

V. CONCLUSION

Using scheffe's five component second degree polynomial regression equation, mix design model for a five component saw dust ash-cement concrete cube was developed. This model could predict the compressive strength of concrete cube when the mix ratios are known and vice versa. The predictions from this model were tested at 95% accuracy level using statistical student's t-test and found to be adequate. The maximum strength predicted by this model is 20.44N/mm². This strength is from mix ratio 0.5: 0.95: 0.05: 2.25: 4.0 (corresponding to the water: cement: sawdust ash: sand: granites).

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A Secure and Synchronized Cloud Ecosystem for Students Academics and Professional Records

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Abstract- Cloud computing refers to computing with a focus of virtualized computer networks or resources and application services by improving the utilization of data centre and data resources. In the existing system, it has been analyzed that the risks and availability of student's academic records and information are very likely to be centralized, static in nature and one time use only. The proposed system is based on cloud environment; it communicates as well as synchronized with different academic clouds and provides a way of freedom to students regarding their academics and professional achievements. In this paper we seek cloud computing environment as a new opportunity in deploying cloud based application for keeping academics and professional records of students and figure the academic cloud ecosystem and ensuring security and confidentiality for the data by using Randomized Alphanumeric Cipher (RAC) algorithm. This academic cloud ecosystem is going to define the shape of a new era record keeping place and will be available worldwide.

Index Terms- Cloud ecosystem, data centre, virtualization, RAC security, confidentiality.

I. INTRODUCTION

In today's world where technology has taken over all industries from automobile, food processing and even production houses, how the education system can remain untouched. In the absence of software, there are too many difficulties in keeping records manually. Records may be electronic or hard copy. This paper seeks to handle and keep all the student's academic records in cloud environment thus form academic cloud ecosystem. Hence resulting in better record keeping facility and efficient usage of time. Cloud Computing (CC) is an emerging sound technology with service on demand that is pay and use service in the ICT (Information and Communication Technology). It moves the application software and databases to the large data centers, and offers subscription-based access to infrastructure, platforms, and applications that are popularly known as IaaS (Infrastructure as a Service), PaaS (Platform as a Service), and SaaS (Software as a Service). While these emerging services have increased interoperability and usability and reduced the computation cost, hosting of application, and content storage and delivery by several orders of magnitude, there is significant complexity involved in ensuring that applications and services can scale as needed to achieve consistent and reliable operation under peak loads. Various IT vendors are promising to offer computation, storage, and application hosting services and to provide coverage in several continents with commitments and offering service-

level agreements (SLA) performance and uptime promises for their services. While these clouds are the natural evolution of traditional data centers, they are distinguished by exposing resources computation, data-storage, and applications as standards-based web services and following a utility pricing model where customers are charged based on their utilization of computational resources, storage, and transfer of data commonly known as pay as peruse service. It is a key step in the development and deployment of virtualization of a great number of distributed applications over the computer networks or the internet. It allow us and business body to use cloud applications without installation and access the information at anytime anywhere on any computer with internet access. The CC is a culmination of numerous attempts at large scale computing with seamless access to virtually limitless resources. Entities for cloud services providers such as Amazon, Rackspace, IBM, and Microsoft all offer environments for developing and deploying applications in the cloud. CC comes with aim of distributed data centers' and data resources. Each concerned data centre is composed of physical machines to execute customer's request on virtual machines where applications are provided over the Internet through browser. These services may include compute, network, and storage components. Customers benefit by subscribing to cost-efficient resources on a service provider scale and obtaining increased agility and productivity. Some IaaS benefits includes: Consolidation through virtualization, Infrastructure amortization, Economic efficiencies, Opening of new markets, Differentiation from over-the-top providers. There is vast number of basic technologies, services, and infrastructure that compose cloud computing. In this era of modern society and increased techno trends in the information technology, information is provided to the concerned entities as upon their request. Students earn the academic credits during their academic session and they have the right to get their achievements anytime anywhere. Cloud computing ensures access to remote services with a user's data, software and computation. This paper is organized in this way; Section 1 Abstract and Introduction, Section 2 Related existing system. Section 3 Description of the proposed model along with its architecture description and performance analysis. Section 4 Conclusion and future work.

II. EXISTING SYSTEM

In recent years a variety of systems to facilitate Record Keeping has been developed. Although these systems typically have common goals. They aim at different fields of application and executing them.

Virtualization is one of the most important technologies among them. It is a mechanism of abstracting the hardware and system resources which are located remotely. It has revolutionized center of data technology with the help of a set of techniques and tools that facilitate the providing and management of the dynamic data center's infrastructure. It has become an essential and enabling technology of cloud computing environments. Virtualization can be defined as the abstraction of the four computing resources these are storage, processing power, memory, and network. Virtualization enables high, reliable, and agile deployment mechanisms and management of services, providing on-demand service and live migration services which improve reliability. Accordingly, having an effective management's suite for managing virtual machines infrastructure is critical for any cloud computing infrastructure as a service (IaaS) vendor. Many web sites and web services are available for record keeping for different –different types of information like banking, financial, educational etc.

III. PROPOSED SYSTEM

In this paper, a model is proposed for keeping student's academic records and achievements in secure and synchronized cloud environment which provides the facilities to the students to get their academic information anytime anywhere. As the system is digital and available over the network i.e. internet students don't have to worry about to carry hard copy of their original documents wherever they move, since these documents are their own academic assets they can access these whenever they need it that is service on demand. For a post graduate student he might be pursued his pre secondary, secondary and undergraduate diploma or degree from different board and university and all his records are kept separately to the institutions respectively and considered as different clouds. As cloud computing is achieving increased popularity, concerns are being expressed about the security issues introduced through adoption of new models. The effectiveness and efficiency of traditional protection mechanisms are being reconsidered as the characteristics of this innovative deployment model can differ widely from those of traditional architectures. An alternative perspective on the topic of cloud security is that this is but another, although quite broad, case of applied security and that similar security principles that apply in shared multi-user mainframe security models apply with cloud security. Here cloud made up of computers is extending beyond a single company or an enterprise. The applications and data served by the cloud are available to broad concerned group of users; it crosses enterprise and crossed the platform. Service is accessed via the Internet. Any authorized user can access these docs and apps from any computer over any internet connection. And, to the user, the technology and infrastructure behind the cloud is invisible. It isn't apparent and, in most cases it doesn't matter whether cloud services are based on HTTP, HTML, and XML, JavaScript, PHP or other specific technologies. In the proposed model I want to build a cloud ecosystem in which all the concerned board clouds and the institution clouds will be synchronized and will communicate with each other based on the insolvent of student's identity. We will provide strong authentication and security ID to the student to log into the cloud ecosystem and to get their academic and achievements anytime anywhere.

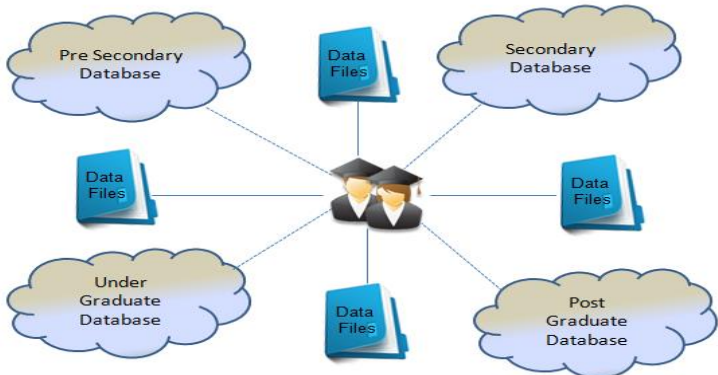


Fig:-1 Existing System for keeping student academic records.

In the existing system students academic records are kept in a hard copy file in the office of the institution which is issued by the authorized party. And same copy is also issued to the students in time only once after completion of his course. From fig:1-The solid lines indicate that a hard copy of student's records has been issued to the respective students whereas the dotted lines show that the academic information is also kept in electronic or digital form into the databases. This copy is used for many purposes like admission in college/university or for job interviews. Now for the job interviews or for the admission candidates move from place to place with original hard copy of the certificates and they have to take care of these wherever they go for counseling and interviews. But in this system disaster like lost of files during travelling, fire etc may happen any time. And to get back the lost file again though the system rules and regulations is very much time consuming even although the concerned institution issue the copy of the file which is equivalent to original files or certificates, it get delay. By going through these system protocols to get back their academic records students can lose the opportunity to enroll in the college/University for higher studies or may be sometimes job.

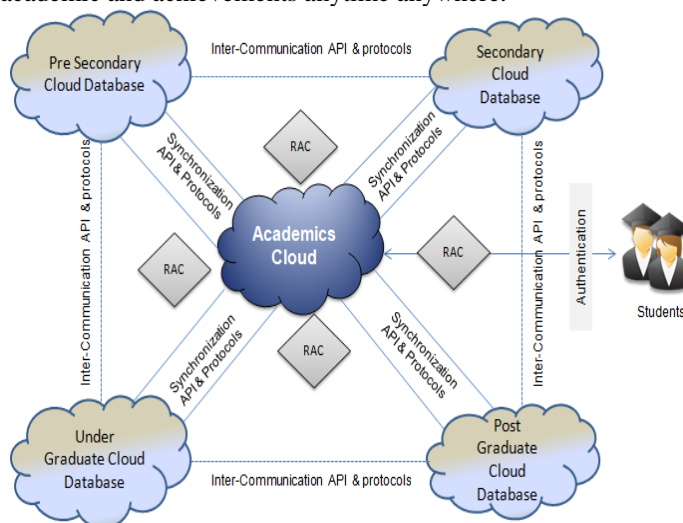


Fig:-2 Proposed Academic Cloud Ecosystem

Students are pursuing their courses during academic session in different intuitions and educational bodies and their academic records are issued to them as upon completion of courses. Here cloud made up of computers is extending beyond a single academic institution. The applications and data served by the cloud are available to broad concerned group of users that is student; Service is accessed via the Internet. Any authorized student can access these docs from any computer over any Internet connection. And, to the user, the technology and infrastructure behind the cloud is invisible. It isn't apparent and, in most cases it doesn't matter whether cloud services are based on HTTP, HTML, and XML, JavaScript, PHP or other specific technologies. In the proposed Academic Cloud Ecosystem the students' academic databases are intercommunicated with the help of proper protocols and APIs (Application Program Interfaces). Usage of the API is via the HTTP protocol. These APIs allows us to write portable code that can interoperate with multiple cloud vendors. The cloud API brings cloud technologies to PHP and the PHPilosophy to the cloud, starting with common interfaces for four cloud application services such as file storage, document storage, simple queues and infrastructure. It is cooperative effort of several major cloud vendors to create a single, simple, interoperable API that works with many cloud services and providers. This works under way to add support for more cloud services and cloud providers. Cloud computing won't

reach its full potential without openness and flexibility. The simple cloud API is an important tool for keeping the cloud open and the applications flexible. For a post graduate student his/her academic records are distributed among different institutions; academic cloud ecosystem is synchronized among pre secondary database, secondary database, under-graduate database and post-graduate database via APIs and protocols. In other words, this cloud application can make use of these academic databases and services with no concern over how the application will be deployed. System is configured to maintain compatibility with services and academic databases; the data source can be chosen through configuration changes alone at the time of deployment. From Fig: 2 It would be visualized that student will be authenticated and get login to the Academic Cloud System with unique ID to view their profiles and academic details on a single click.

Security Concern for Authentication RAC (Randomized Alphanumeric Cipher) Algorithm

We provide authentication and security with the help of Randomized Alphanumeric Cipher (RAC) algorithm. It is based on asymmetric key cryptography and uses random functions with specific way of bit stuffing and stuffing.

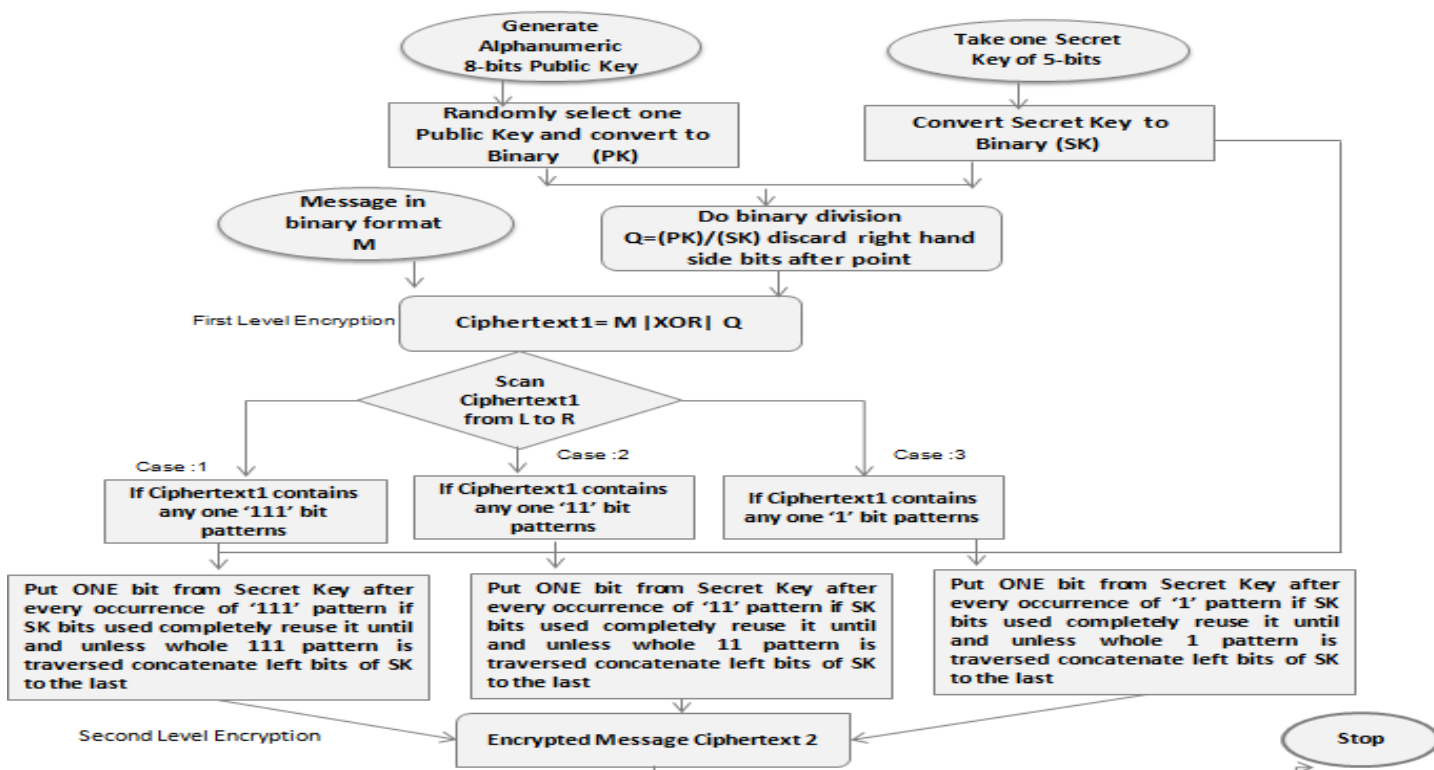


Fig:-3 Flowchart RAC algorithm

Encryption Algorithm

- Randomly generate N number of 8-bit alphanumeric characters.
- Select one public key (PK) of 8-bit and one secret key (SK) of 5-bits.
- Convert Public Key and Private Key to binary format.
- Compute the quotient of binary division where $Q = (PK) / (SK)$.
- Take message (M) and convert into binary format.
- Perform XOR operation with message 'M' and quotient 'Q'. It gives first level encryption $Ciphertext1 = M | XOR | Q$
- Scan the Ciphertext1 from left to right as per cases mentioned in flowchart.
- Perform specific bit stuffing for particular selected case.
- Concatenate the unused bits of SK at last
- It results second level encryption and we get ciphertext2

Decryption Algorithm

- It is just the reverse of Encryption.
- Remove the appended bits from ciphertext2.
- Remove stuffed bits and match it with SK bits. If removed bits equals with SK bits.
- We get ciphertext1. First level decryption over.
- Perform XOR with ciphertext1 and quotient Q.
- This results plain message 'M'. Second level of decryption.

RAC algorithm is used for encryption and decryption of students ID and provides strong authentication to login to academic cloud ecosystem.

Analysis

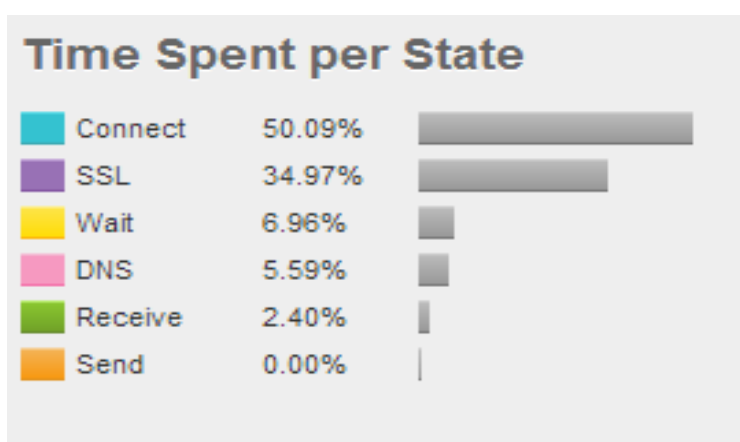


Fig:-4 Time Spent per state

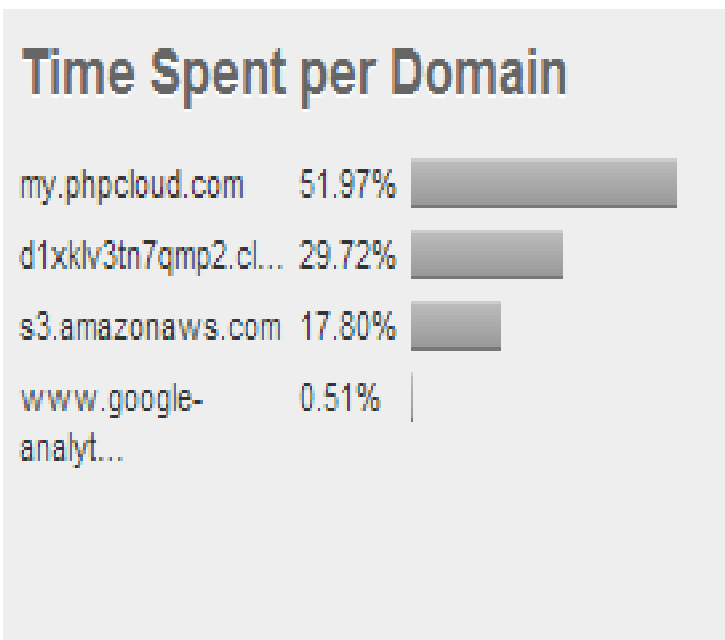


Fig:-5 Time Spent per Domain

Above diagram of fig-4 shows that time spent per state such as connection time, SSL (Secure Socket layer), Waiting time, DNS (Domain Name Server) time, receive time and send time. Fig-5 indicates comparatively time spent per domain like my.phpcloud.com, s3.amazonaws.com, google etc.

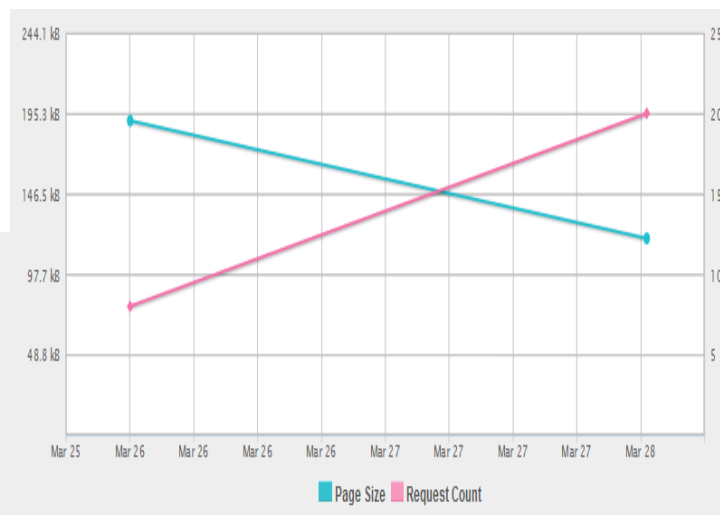


Fig:-6 Page Size and Request Count

Fig -6 shows that page size with respect to request count of that page throughout the user log session in academic cloud ecosystem.

IV. CONCLUSION & FUTURE WORK

In this paper records keeping of 'students academic records and their achievements' problem without the cloud computing has been studied and a modified cloud ecosystem for keeping the academic performance of the students is proposed with authentication and security assurance. The system will be reliable, available, synchronized, and communicatable and completely remove the fear of lose of files and the documents. This system will reduce the risks of lost of files. By using this model in future students can move to any city and any place for job interviews and for counseling for higher studies and his achievements are always with them. As applications software needs to both scale down rapidly as well as scale up, which is a new requirement for keeping the records. Such software also needs a pay-for-use licensing model to match needs of cloud ecosystem. Therefore, we tried to fix up the students record keeping which bring significant impact to their carrier and life. However, in the face of the significant benefits offered by cloud computing, the current technologies are not matured enough to recognize its full potential for record keeping. So many key challenges in this domain including automatic resource provisioning, power management and security management are starting to receive attention from the research community for the real world problems. This holds only as long as there are no appropriate service level agreements with upper boundaries between Cloud operators and users.

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Optimized Resource Allocation in Cloud Environment Based on a Broker Cloud Service Provider

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Abstract- Cloud computing provides on-demand services with high performance in a flexible manner. Fast and easy deployment, scalability and service-oriented architecture are its main features. It promises substantial cost reduction together with flexibility than the traditional IT operations. Service provider's offers substantial amount of services with different performance characteristics. A broker cloud service provider (BCSP) is implemented, which provide its own services and also act as a broker redirecting the request to other cloud service providers. The BCSP gets payment from clients and provides an efficient service to them. In turn BCSP would pay other cloud service providers for using their services. An algorithm is implemented in BCSP based on client requests analysis that provides faster and cost-efficient of allocation resources for clients request. This technique provides an effective request-resource allocation based on various criteria.

Index Terms- pricing and resource allocation, performance attributes, performance and usage measurement, integrity, availability

I. INTRODUCTION

Cloud computing is an emerging field in the Information Technology circle. It is based on parallel computing, distributed computing and grid computing. It offers secure, quick, convenient data storage and net computing service computing [1]-[3]. It delivers three kinds of services.

Infrastructure as a service (IaaS)
Platform as a Service (PaaS)
Software as a Service (SaaS)[4].

These services are available to users in a Pay per-Use-On-Demand model. The main characteristics of cloud computing are virtualization, distribution and dynamic extendibility. Virtualization is the main feature [5]. Many factors such as IT resource, software, hardware, operating system and net storage can be visualized and managed in the cloud-computing platform. Some cloud-computing environments are based on utility computing model that is based on performance and usage measurement, which is similar to traditional utility services are consumed, whereas others bill on a subscription basis. Cloud architecture [6], is comprised of the systems architecture of the software systems involved in the delivery of cloud computing and multiple cloud components communicating with each other

over application programming interfaces. The two components of cloud computing architecture are known as the front end and the back end. The front end is the part seen by the client, i.e. the computer user that includes the client's network (or computer) and the applications used to access the cloud via a user interface. The back end of the cloud computing is the 'cloud' itself, consisting of various computers, servers and data storage devices. Cloud computing is dependent on the service providers and its associated technologies. The advancement in virtualization may result in insufficient resource availability with virtually unlimited amount of computing power and storage capacity readily available on demand. Here we implement a broker cloud service provider (BCSP), which has its own services, more over redirect the user request to other service providers. BCSP based on pricing and resource allocation. The broker service provider gets payment from the clients and provides payment to the service providers for the resources it is using. Approaches have been implemented to find the best service provider for an application and mapping the service provider to that application [10]. Each cloud service providers can be characterized by using quality of services metric (QoS), which include static and dynamic parameters based in the part on web service model [10] [11].

Each cloud service provider (CSP) may offer different resources. The request for resources from client side may be different at different time. Section 2 depicts the overall system architecture and structure of BCSP. At a particular instant more than one CSP is needed to satisfy the client requests. The BCSP analysis the requests from clients for a certain period of time and build a table based on type of resources needed and total resources of each type needed by the clients. This is depicted in section 3. A table based on cloud service providers, the resources they provide, quality of the cloud service providers (CSP) are explained in section 4. An algorithm that find the efficient resource allocation strategy based on client request is depicted in section 5. Section 6 depicts results. Section 7 provides the conclusion and discusses the future work

II. SYSTEM OVERVIEW

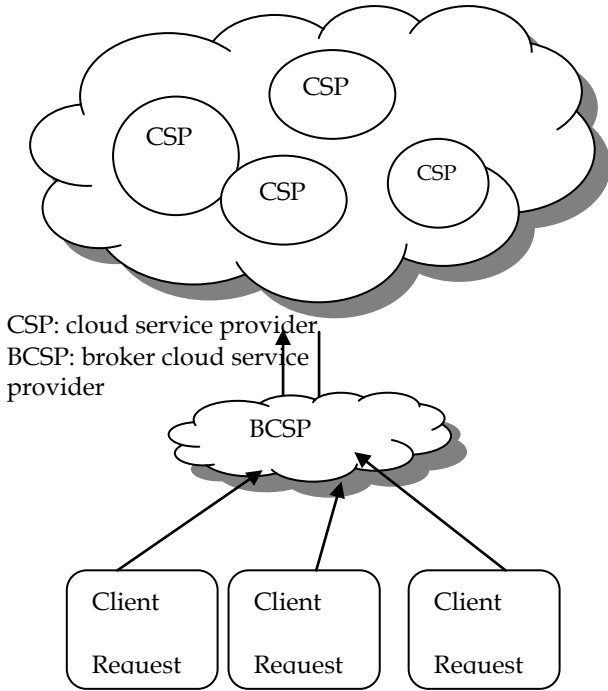


Fig1. System architecture

The clients send request to the broker cloud service provider. If BCSP can provide the resources, it directly satisfies the request. Otherwise it maps its request to other service providers, which in turn allocates the requested resources.

Fig 1 depicts the system structure where the client request is transferred to the BCSP, if the BCSP in turn transfer the request to other CSP's .If the BCSP provide the requested resource then without further forwarding it satisfies the request. Client may have different request for resources at different time. Here the BCSP may provide keep a log of more frequently needed resources. The log is maintained by the evaluation of an algorithm that finds all those resources that are optimal based on the analysis of client requests for a certain period of time. The algorithm is working based on analyzed data and collected data from service provider regarding their quality of service and distance with respect to the broker cloud service provider

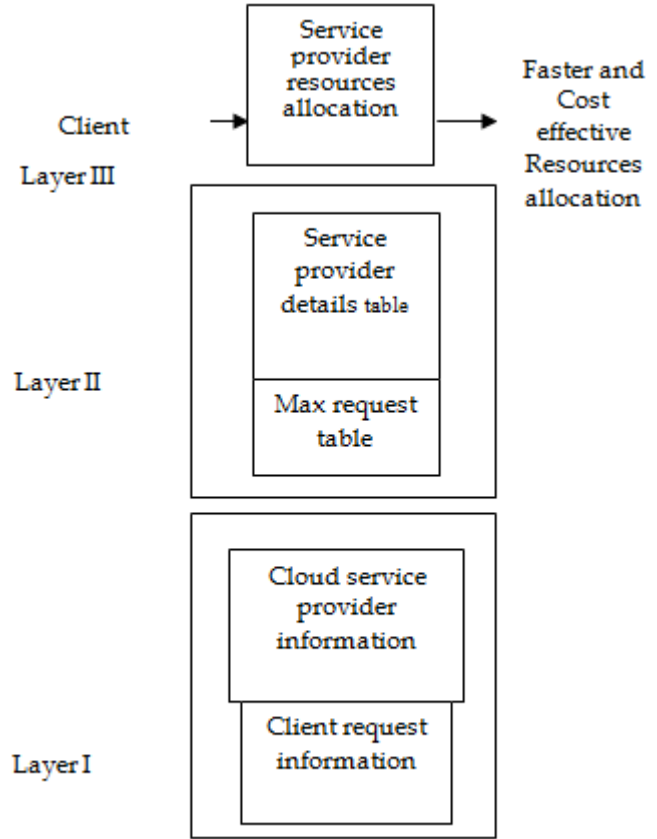


Fig2. Broker component in BCSP

First layer is the information gathering .The broker component of BCSP is depicted in figure2. The broker component is divided into three layers layer, consisting of client request information and service provider information. Second layer is the layer on which the proposed algorithm works. This layer comprises of service provider details table and max request table. The topmost layers consist of the details of fast and cost efficient recourses and service provider allocation. Based on cloud service provider information and client request information service provider request table and service providers details matrix cost i.e. the service providers that provide the request at minimum cost are calculated .The algorithm is implemented in the mentioned tables to find services providers that satisfy the requests at minimum cost .The cost evaluation is based on many factors including the distance of each service provider

III. MAX REQUEST TABLE

The requests for resources are analyzed for a certain period of time and max resource table is constructed. Let R1, R2, R3, R4 are resources requested at a certain period of time say T1

Table1.Request table

Resources	Quantity
R1	100
R2	20
R3	200
R4	300

Let R1, R2, R3, R5 are resources requested at a certain period of time say T2

Table2.Request table

Resources	Quantity
R1	95
R2	20
R3	180
R4	230

Let R1, R2, R3, R4 are resources requested at a certain period of time say T3 .The resources requested at time T4 are given in the next table and it is continued for a certain amount of time.

In this way the resources quantity allocation for a certain period of time is analyzed. Based on the study of the client request maximum request for each resource is found

Table3.Request table

Resources	Quantity
R1	120
R2	25
R3	200
R5	30

Based on the analyzed data max request table is constructed by adding a constant amount to maximum amount of each resources.

Table 4.Max request table

Resources	Quantity	Constant added
R1	120	D1
R2	25	D2
R3	200	D3
R4	300	D4
R5	30	D5

D1, D2, D3.... are constant added to maximum quantity requested. The selection of D1, D2, D3.... is based on the variation in quantity requested. A constant value D1, D2...is added to max request of each type of resources in perception that the total resource request may change up to a certain limit in future. [7]-[11]

IV. SERVICE PROVIDERS DETAILS TABLE

To find the faster and cost effective resource allocation service provider’s details matrix is constructed. The various details that are considered are the quantity of each type of resources owned by the service provider, average distance of each service provider/resource, energy consumption of each service providers, and quality of each of service provider and overall good will and quality of services provided by the service provider. The details regarding the service provider are tabulated and an algorithm is implemented in tabulated data to find the most optimal set of service providers who can provide services at least cost to the client with the lowest risk.

Table5.Service provider details table

Service provider	R1	R2	R3	R4	R5	d	c	q
CSP1	100	20	40	150	30	3	3	2
CSP2	50	10	20	25	15	2	2	2
CSP3	120	26	150	40	25	4	1	1

d- Indicates distance of the service providers, distance are in hundreds of kilometers

c- Depicts utility cost. Cost may in crores. For the ease of evaluation and simulation small values are taken.

q- Depicts quality of services. The quality of services depends upon various criteria [12].

Table6. Performance Attributes list for CSP

A1	Integrity
A2	Security
A3	Average IO response
A4	Availability
A5	CPU utilization
A6	Energy consumption

The Table 6 shows the attributes based on which the quality of the CSP is evaluated

Table 7.Attribute Table

	CSP1	CSP2	CSP3
A1	1	1	5
A2	2	2	4
A3	1	3	4
A4	3	3	3
A5	4	3	3
A6	1	2	3

The table 7 shows the attribute table for the available CSP's. Based on this table Quality factor table is constructed. The maximum value for the each describing attribute is taken as 5. The attribute A6 is evaluated using the formula that is depicted in [11]

Those services providers with average of quality values for all attributes greater than or equal to three are said to be first quality service provider's with $q = 1$ and for those service providers with average between 1 and 2 q is taken as 2 and for those with value between 0 and 1, q is taken as 1 and so on. In this manner the quality factor for each service provider is evaluated. Using the values evaluated the table 8 is constructed. [13]

Table 8. Quality factor table

CSP	Quality factor
CSP1	2
CSP2	2
CSP3	1

In this way quality is assigned for every resource of each service provider. Table 8 shows the quality value assigned to each cloud service provider

V. PROBLEM FORMULATION

Those set of optimal service providers with faster resource allocation are found from the complete the set of service providers based on an algorithm. This algorithm is implemented in Broker cloud service provider and works based on the service provider details table and max request table stored on the BCSP. The final outcome of the algorithm is the set of service providers and resources with minimum cost and faster response.

5.1 Algorithm

Let c_i be the payment cost that should be made to each service provider, q_i be the quality of services provided by the service provider d_i denote the distance of each service provider. R_{ji} be of number resources of type j that taken from i th cloud service provider, C_i is the cost of taking various resources from service provider (i) Let C_k be the cost of taking resources from a particular permutation of service providers

- . If $R_{ji} = 0$ then R_{ji} is taken as 1
- . $T_j = R_{ji} + T_j$
- . If $T_j > R_j$ max then R_{ji} is taken as 1
- . $C_{ik} = \sum_{i=1}^n (\prod_{j=1}^m (R_{ji} / c_j) d_i q_i)$
- . k ranges from 1 to $n!$
- . n denotes the number of CSP's
- . m denotes the number of resources requested
- In this way C_k is calculated for each k^{th} permutation of the $n!$ permutations of n service providers
- . $C_{min} = \min (C_k) \ 1 \leq k \leq n!$

C_{min} is the minimum cost that can be calculated by satisfying the entire clients request and accessing the resources from the service provider at the minimum cost. The permutation

pattern k that gives the minimum cost is taken as the cost efficient and faster method of allocating all the resources. In the way best set of service provider for satisfying the client request is selected.

VI. RESULT

The maximum requests for each type of resources are analyzed for a certain period of time and max request table is constructed. Constant values $D1, D2$ are added to max request of each type of resources in perception that the total resource request may change up to a certain limit in future. The QP table is constructed and based on the table the quality factor of each service provider is analyzed. Using the QP table the quality factor is found for each service provider. Based on Quality factor table and service provider details table cost for each permutation of service provider is found

Table 9. Min cost table

permutation value(k)	Permutation	Cost Cik
1	CSP1,CSP2,CSP3	64x108
2	CSP2,CSP1,CSP3	38x107
3	CSP2,CSP3,CSP1	19x108
4	CSP3,CSP2,CSP1	18x108
5	CSP3,CSP1,CSP2	27x108
6	CSP1,CSP3,CSP2	27x108

The combination CSP2, CSP1,CSP3 gives better result compared to other combinations. The BCSP allocate resources in the order with permutation value k . There may further reduction in cost, since payment is made by BCSP to CSP based on the resources it use. All resources of all CSP's are not taken by the BCSP; therefore payment can be made to only those resources it uses. In this way there will be a considerable reduction in the cost.

From the Table 9, it can found that the minimum cost for resource allocation can be obtained using the permutation with $k=2$. That is for the permutation CSP2, CSP1, CSP3. Figure 3 depicts the plot for table 9. Here permutation is plotted across x-axis and permutation is plotted across y-axis. From this figure it can be inferred that minimum cost is obtained for permutation value $k=2$.

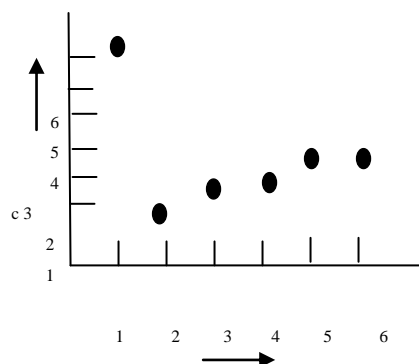


Fig3. Permutation cost graph

VII. CONCLUSION

By using the above algorithm in the BCSP the minimum cost permutation of the available cloud service providers and the resources can be found. Thus BCSP can provide faster as well as cost optimized service to its clients. Initial installation cost of the BCSP may be very larger. But as time proceeds the BCSP may seem to be very cost effective. The BCSP can offer its clients with set of resources at an optimal cost. The payment made by the clients may be monthly or yearly or may be based on utility model. Using this method the BCSP can ignore certain service providers of high cost and low quality services.

The method is not static in nature. The algorithm should be refreshed after a certain interval of time as the number clients as well as Cloud service providers' change. The period for refreshment may be once in a month or twice a month. The period of refreshment is still in consideration.

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A Conceptual Study of Sustainable Development in the Era of Globalization

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Abstract- Since from the beginning, the phenomenon of globalization has captured world attention in various ways. The tremendous change in the countries caused erosion of environmental quality to a large extent. Hence the concept of sustainable development has gained importance since Rio Declaration. The central purpose of it is to create an enabling environment in which all human beings lead secure and creative lives. This paper focuses on the adverse effect of globalization on environment, and the need for sustainable development of environment with the industrial growth.

Index Terms- Globalization, Rio Declaration, Sustainable development, WTO

I. INTRODUCTION

“The world today is economically richer and environmentally poorer than ever,”

-Lester R. Brown

Foreign trade is an engine of growth and innovation. It tends to optimize the use of world resources with every country specializing in the production of the commodity for which it is best suited according to natural and human resource endowment. International trade leads to an increase in productivity and competitiveness and reduction of costs and thereby growth of nations. But the economic expansion in the last century and half had alarming consequences for the global environment. The new economic policies and the structural adjustment programme often predict environmental impact without accuracy because of the complex interplay of various economic, social, political and ecological factors. These are put into effect in an effort to meet India's severe balance of payments crisis (BOP), and to propel its economy into quicker growth and global integration¹³.

This led to depletion of ozone layer, air pollution, loss of forests and bio- diversity, extinction of animal and plant species, loss of marine life, soil and water pollution at an alarming rate. On realizing the importance of the environmental variations, problems created by them and its impact on human settlement the concept of ecology acquired prominence during the 1980's. Hence the concept of sustainable development originated for the first time, with the objective of taking actions in the present to improve the human condition and the earth system in which we live, to be long lasting and benefit future generations, which leads to Sustainable human development.

II. CONCEPT OF SUSTAINABLE DEVELOPMENT-MEANING AND ORIGIN

The concept of sustainable development originated with the Report of the World Commission on Environment and Development (WCED), *Our Common Future* (the Brundtland Report) of 1987 which defined sustainable development as "development which meets the needs of the present generation without compromising the ability of future generations to meet their own needs." The concept of sustainable development was first given prominence at the United Nations Conference on Environment and Development (UNCED) (the "Earth Summit") in Rio in 1992, following which the notion of sustainable development rapidly gained wide currency and encouraged a greater awareness of the major environmental problems and disparities in the world. It marked a decisive stage by recognising the existence of challenges and problems that were common to the entire planet and all humankind, and by seeking to identify cases where joint responsibility could be established. It thereby considerably widened the scope of global problems to include such matters as the environment, health, trade and poverty. It also highlighted the links between globalisation, planet-wide risks and shared responsibilities that created a need for concerted action by the international community.¹⁴

III. OBJECTIVES OF CONCEPT OF SUSTAINABLE DEVELOPMENT

Sustainable development combines the two terms, 'sustainability' and 'development' to indicate a pattern of growth which strengthens both the national capabilities to care for their people in relation to their total relationship with the resources of earth. It focuses upon a relationship between humans and their environment and indicates a warning that human being can not push development which is against nature. Sustainable development has some forward looking and broad based objectives which transcend class, caste, language and regional barriers. These are-

- to maintain the standards of living of the largest number of people with equity and justice, the consideration of

¹⁴ Ayesha Dias, "Human Rights, Environment And Development: With Special Emphasis On Corporate Accountability" - at <http://hdr.undp.org/en/reports/global/hdr2000/papers/ayesha%20dias%20.pdf> last cited on 25.03.13

¹³ <http://www.countercurrents.org/nomani310707.htm>

trans-boundary and cumulative impact in decision making has to be realized.

- to conserve and protect earth's natural resources from misuse and wasteful consumption.
- to innovate new technology and scientific techniques which work in unison with laws of nature and not opposed to it.
- to respect diversity and involve local and indigenous communities for a more grass roots oriented and relevant development policies.
- to plan international institutions which recognize the requirements of poor nations and support them to achieve their growth targets without destroying their natural wealth and environment
- to seek peaceful co- existence of all nations of the world; this demands honoring of treaties and international agreements.

Sustainable development is, thus, a desired direction of change and provides a framework to decide developmental actions by nation's communities and individuals.¹⁵

Conceptually, sustainable development can be conceived of as integrating three 'pillars'; namely- International Environmental Law, International Human Rights Law and International Economic Law. The integrated structure of sustainable development is such that it requires support from each of the pillars.¹⁶ In stating that human beings are at the centre of concern for sustainable development and that they are entitled to a healthy and productive life in harmony and nature, Principle 1 of the Rio Declaration employed language of Human Rights Law. The emergence of sustainable development has coincided with a broadly increasing consensus in International Human Rights. The third pillar of sustainable development is International Economic Law. Concepts of Economic Law have been borrowed as concepts of International Environmental Law.

They are-

- The concept of internalizing the economic costs of pollution and environmental degradation, referred to in environmental law as "full cost pricing";
- The "polluter pays principle" which seeks to make the polluter fully responsible for all costs of pollution, be they economic, human, social or cultural;
- The concept of environmental responsibility and liability based upon a product's "cradle-to grave life-cycle"; and,
- The mechanism of "economic instruments" which provide incentives and disincentives regarding desired environmental performance or behavior.

IV. GLOBALIZATION AS NEW ECONOMIC POLICY

Now major objective of new economic policy in India is globalization. Globalization can be defined as, "a business

philosophy of viewing one's business in a global perspective in terms of global outlook, using globally viable technology, offering the products and services which can better satisfy the customer needs in a global environment, maintaining a quality in adherence to global standards an identity of global citizenship and ultimately fostering a global organizational and business culture".

The core idea of globalization is that more trade is better for all the parties concerned. Any action that interferes with the free flow of capital, goods and services, would produce sub-optimal results. The term globalization means the opening up of the economy for world market by attaining international competitiveness. Globalization is considered as an important element in the reform package and it has four parameters:

- 1 Permitting free flow of goods by reducing or removing trade barriers between the countries;
- 2 Creation of an environment for free flow of capital between the countries;
- 3 Creation of an environment, permitting free flow of technology between the countries; and
- 4 From the point of view of developing country, creation of an environment in which free movement of labour can take place in different countries of the world.¹⁷

In response to trade and foreign investment opportunity resulting from globalization, a large and growing number of developing countries including India have embarked on the liberalization of their trade and foreign investment regimes, as well as the adaptation of their domestic economic structures and straightening of their export capacity.¹⁸

V. EFFECTS OF GLOBALISATION ON ENVIRONMENT

Economic development means very often an increase of pressure on the environment. Starting with the impact on the environment; there is one point of view that since globalization stimulates economic growth, trade, investments etc., will consequently lead to more pollution and environmental degradation. In this point of view, most of the environmental damage is a by-product of the process of socioeconomic development. The impact of globalization on environment needs to be continuously addressed in Indian context which profoundly remains in the transition.

In spite of the potential of globalization to economic convergence it paved for an increase in inequality resulting in increased environmental impacts such as climate change, protection of the ozone layer, biodiversity and desertification. But these international trade arrangements and environmental agreements contain very few provision for harmonizing trade and

¹⁵ Suchinmayee Rachna, "Gender, human rights and Environment", 2008, Nice Printing Press, Delhi. pp.131-132

¹⁶ Ibid.

¹⁷ Ruddar Datt and K.P.M. Sundaram, "Indian Economy", 40th ed, New Delhi: S. Chand and Company Ltd, 1999, p.724.

¹⁸ David Woodward, "Effects of Globalization and Liberalization on Poverty: Concepts and Issues", A Paper presented in an inter-agency seminar on "Globalization and Liberalization: Effects of International Relations on Poverty", Held in Geneva, Switzerland from 15th to 17th April 1996, pp. 68-69.

environment trade and development.¹⁹ Globalisation and its effects have caused anxiety worldwide about the direction that society is taking. Traditionally seen as an economic phenomenon linked with the appearance, development and consolidation of the global market, it has become connected with areas previously regarded as bearing little relevance to economic development.

However, a new body of international economic law is emerging relating to trade and investment, whose impact on environment and human rights is highly questionable. Much recent writings and analysis has focused on the environmental impacts of the World Trade Organization (WTO). This body, along with other objectives aims to imbibe sustainable development of the environment among the member nations.

VI. CONCLUSION

To conclude, although industrialization is seen as a solution to providing economic growth and increasing economic levels, all inevitably produce discharges and wastes that are capable of polluting. Where high population and economic growth demands resources and discharges in the form of pollutants, not many industries have arrived at suitable suggestions on sustainable measures, thus putting pressure on the environment. The phenomenon of globalization has led governments and individuals to realize the international and trans-boundary dimensions of environmental issues, which later led to recognize the concept of sustainable development. The WTO, which is considered as an apex institution in matters of international trade also aims to protect the environment while encouraging the international trade. The Rio Declaration brought together some concepts like polluters pay principle; inter generational equity, etc., to reserve and preserve the environment for future generation with sustainable growth of the industries. But self awareness of protection of environment and preserving it for future generation is the need for the hour.

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¹⁹ Dr. Zafar Mahfooz Nomani, "Environment, Sustainable Development And Globalisation: A Plea To Indian Legislatures", 31 July, 2007, Countercurrents.org

Synthesis, Characterization and Antimicrobial Activity of Metal Complexes of Substituted α -Benzoinoximes

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Abstract- Novel metal benzoinoxime complexes have been synthesized substituted from substituted benzoinoximes. They were characterized by element and spectral analysis. The synthesized complexes were screened for antimicrobial activity at a concentration of 1000 μ g/ml which was serially diluted to determine their MIC value of Furionoxime -Cu(II).

Index Terms- Antimicrobial activity, metal complexes, O-Hydroxybenzoinoxime, 4-Dimethylaminobenzoinoxime.

I. INTRODUCTION

Benzoinoxime are well known for their biological activity. Co-ordination compounds containing ONS as donor atoms are reported to possess antimicrobial activity¹. Complexes of Mn(II) with the tridentate oxime ligand 2,6 diacetylpyridine dioxime by Madan Mohan². It was observed that antimicrobial activity of some drugs increased markedly. When they are applied in the form of metal complexes³. Interstiations on variety of oximes and Schiff bases and their transition metal complexes was carried out by several workers⁴⁻⁵. Benali⁶ reported the extraction of U(VI), W (VI), Mo(IV) and some transition metal of the iron family as the complexes of benzoinoxime. Sulekh Chandra⁷. Reported synthesis. EPR and electronics spectral studies on Cr(III) and Mn(II) complexes of some oxime. Ibrahim Demir⁸ carried out synthesis and characterization on of Ni(II), Cu(II), Co(II), Zn(II), Cd(II) and Hg (II) with iminoxime. Iron(III) complexes of O-vanillinoxime have been synthesized

and characterized by different physicochemical techniques⁹ Mohaptra¹⁰, reported the complexes of divalent ion with benzyl-oxime patil¹¹, studied the antimicrobial effect of Cu(II) complexes containing oxime ligands Attia¹² transition metal complex of substituted benzoinoxime are reported.

II. EXPERIMENTAL

The benzoinoxime were prepared by refluxing substituted benzoinoximes with hydroxylamine hydrochloride in presence of alkaline medium for 3-4 hours, the reaction mixtures were kept overnight. The solid products formed were isolated and washed several times with water alcohol mixture the purity was checked by TLC paper. Their structural details were confirmed on the basis of and spectral analysis. In order to synthesize the complexes the equimolar mixture of each of the ligand (0.01 M) and metal salts was refluxed on a water bath for 6-8 hours in presence of sodium acetate in ethanol / methan, carried out synthesis and characterization of mononuclear and binuclear chromium(III) complexes of α - benzoinoxime. In the present work, novel of the reaction mixture was reflux overnight. The product formed were isolated washed several times with cold water ethanol mixture. The characterization of synthesized complexes was made with elemental analysis, IR and UV- VIS spectra

III. RESULT AND DISCUSSION

IR spectral data of the ligand and its metal complexes (cm^{-1})

Table no.1

Sr.no	Ligand and its complexes	Colours	M.P. ($^{\circ}\text{C}$)	IR Key band (cm^{-1})
1.	4-DMABO	Yellow	145	3423 (O-H), 1660 (C=N)
2.	FURO	Brown	207	3395.4 (O-H), 1651.2 (C=N)
3.	2-HBO	Light Brown	180	3412 (O-H), 1666 (C=N)
1a	4-DMABO-Cu(II)	Red	273	3393 (O-H), 1640 (C=N)
2a	FURO-Cu(II)	Red	278	3380(O-H), 1616 (C=N)
3a	2-HBO-Cu(II)	Brown	282	3386 (O-H), 1610 (C=N)
1b	4-DMABO-Co(II)	Brown	281	3118 (O-H), 1651 (C=N)
2b	FURO-Co(ii)	Black	290	3383 (O-H), 1604 (C=N)
3b	2-HBO-Co(II)	Dark Brown	325	3369 (O-H), 1607 (C=N)
1c	4-DMABO-Mn(II)	Black	276	3412 (O-H), 1605 (C=N)

2c	FURO-Mn(II)	Brown	286	3351(O-H), 1592 (C=N)
3c	2-HBO-Mn(II)	Brown	323	3343(O-H), 1602 (C=N)

The infrared spectra of ligand shows band at 3423 ν (O-H) of oxime. In 4-DMABO complex, which decreases to 3393 cm^{-1} indicating linkage through hydrogen oxygen²². However 1660 (C=N) significantly decreases to 1640 cm^{-1} showing linkage through nitrogen of oximino group²³. In FURO ligand show band at 3395 cm^{-1} ν (O-H) ,in FURO-Cu(II) complexes showed

band at 3380 cm^{-1} However 1651 cm^{-1} ν (C=N) significantly decreases to 1616 cm^{-1} . In 2-HBO ligand show band at 3412 cm^{-1} ν (O-H), in 2-HBO-Cu(II) complexes shows band at decreases to 3386 cm^{-1} showing linkage through nitrogen .However, 1666 cm^{-1} ν (C=N) significantly decreases to 1610 cm^{-1} .

Table No. 2 – Elemental Analysis data of the complexes found / (Calculated) %

Complexes	Elemental analysis data Found / (Calculated) %			
	C	H	N	M
4-DMABO-Cu(II)	62.76 (63.84)	4.57 (5.65)	9.31 (9.31)	9.68 (10.55)
FURO- Cu(II)	57.51 (58.32)	2.94 (3.88)	5.91 (6.80)	14.55 (15.43)
2-HBO-Cu(II)	60.44 (61.36)	3.49 (4.38)	4.23 (5.11)	10.072 (11.59)
4-DMABO-Co(II)	63.44 (64.32)	4.73 (5.69)	9.38 (9.38)	8.4 (9.87)
FURO-Co(II)	58.03 (58.97)	2.98 (3.93)	5.94 (6.88)	13.60 (14.48)
2-HBO-Co(II)	60.93 (61.88)	3.57 (4.42)	4.27 (5.15)	9.93 (10.85)
4-DMABO-Mn(II)	63.48 (64.76)	4.77 (5.73)	9.44 (9.44)	8.53 (9.26)
FURO-Mn(II)	58.64 (59.56)	3.02 (3.97)	6.06 (9.94)	12.73 (13.63)
2-HBO-Mn(II)	57.17 (58.03)	3.29 (4.14)	3.90 (4.83)	8.55 (9.48)

Antimicrobial activity of complexes :-

The compound were assayed for their antimicrobial activities¹³ against four test organisms E.coli, S.aureus, P. aeruginosa, B.subtilis at a concentration of 1000 $\mu\text{g}/\text{ml}$ by agar well technique¹⁴. Further their MIC value against these organisms were determined by serial dilution method using DMF as a solvent. The result obtained are given in table.

MIC values in $\mu\text{g}/\text{ml}$ of compounds

Table No 3 :

Complexes	E.Coli.	S.aureus	P.aeruginosa	B.subtilis
4-DMABO-Cu(II)	125	125	250	250
FURO-Cu(II)	250	250	250	125
2-HBO-Cu(II)	125	125	125	125
4-DMABO-Co(II)	61	125	125	250
FURO-Co(II)	250	125	125	125
2-HBO-Co(II)	125	125	63	63
4-DMABO-Mn(II)	125	125	125	125
FURO-Mn(II)	125	125	125	250
2-HBO-Mn(II)	125	250	125	250

The complex 4-DMABO-Cu(II), FURO-Mn(II) is found to be effective against maximum number of organisms followed by

4-DMABO-Co(II) and 2-HBO-Co(II). They showed antimicrobial activity against E.coli, s.aureus, p.aeruginosa, B.subtilis (Lowest MIC value). The enhanced antimicrobial activity in case of the compound, 2-Hydroxybenzoinoxime-Co(II) may be attributed to the presence of hydroxy group.

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Natural Colours for Terracotta Jewellery

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Abstract- In this paper experiment for development of terra sigillata for terracotta jewellery in different shades of brown, orange, white and grey is presented using clay found in and around Wardha. The terra sigillata thus developed has been used in terracotta jewellery. The technology was successfully implemented by the self help groups and has been effectively commercialised under brand of Wardhani and Kalpak.

Index Terms- terracotta jewellery, terra sigillata, clay, natural colour

I. INTRODUCTION

Terra sigillata is a very smooth, lustrous coating of clay which resembles a glaze and is virtually waterproof. The name means "sealed earth" and has been used to refer to the Classical Greek Attic figures painted in black and red on pottery (Fourts, R., & Belgium, B., 2004). It can be made from any kind of clay, which is found locally and mixed as a thin liquid slip. When it settles down, fine particles are separated out to be used as terra sigillata.

To achieve a glow ranging from a smooth silky lustre to a high gloss, terra sigillata is polished with a soft cloth or brush on the surface of green (unbaked) ware. The primary objective of terra sigillata slip coatings is to get a high satin gloss without a glaze, using simple, time-effective polishing methods. Polishing refers to the process that produces a shine on the clay surface. The particles in the slip decoration are so fine that they partially fuse together during baking; this partial fusion is called sintering. These bodies are smooth and shiny similar to a glaze surface and are also water-proof (Cizer, S 1999).

Indian artisans have developed technologies which are easily available, adaptable, utilitarian and cost effective. In a review of indigenous practices it was found that even today potters are using locally available fine clay to colour their pottery. The pottery artisans are preparing slips based on finest bright clay available in natural deposits in their own locality and by using water from pond or rain.

Potential of Terra Sigillata around Wardha

When different regions, of (periphery of 200 Kilometers) Wardha district were reviewed it was found that the colour of clay was different in each region. Hence the possibility, that a combination of clay from different regions may give a complete colour shade card suitable for jewellery. With the help of local potters from Wardha, a chain was established between the potters of Nagpur, Chandrapur, Gadchiroli, Amravati & Balaghat regions. Fine clay which was locally available and the traditional process for the preparation of terra sigillata/clay colour were collected from different areas, which is as follows-

Vidarbha is the eastern region of Maharashtra. It is made up of Nagpur and Amravati Division. It borders the state of Madhya Pradesh to the north, Chhattisgarh to the east, Andhra Pradesh to the south and the area of Marathwada and Khandesh of Maharashtra to the west. Geographically Vidarbha lies to the north of Deccan Plateau. Unlike the Western Ghats, there is no major hill in this area. The Satpura Range lies to the north of Vidarbha in Madhya Pradesh. Large basaltic rock formation is found throughout Vidarbha, caused by the Deccan lava trap. Wainganga is the largest river in Vidarbha. Other major rivers that drain region of Vidarbha are the Wardha, and Kanhan which are the tributaries of Godavari. Samples no 1 to 6 collected from different region of Vidarbha.



Figure 8, Map of Maharashtra State, India

Madhya Pradesh in Hindi can be translated as Central Province, and is located in the geographical heart of India. The state straddles the Narmada River, which runs east and west between the Vindhya and Satpura ranges; these ranges and the Narmada separates North India from the South. The state of M P borders to the west by Gujarat, to the northwest by Rajasthan, to the northeast by Uttar Pradesh, to the east by Chhattisgarh, and to the south by Maharashtra. The Satpuras (Pansamal), in the Gawilgarh and Mahadeo Hills, also contain a lake, which is to the south, rivers like Indrawati, the Wainganga, the Wardha, the Pench, the Kanhan and Penganga, discharge an enormous volume of water into the Godavari. The Godavari is the lifeline of Andhra Pradesh, but the water which feeds it, is a gift of the Central India watershed. Samples 7 and 8 were collected from district Balaghat, Madhya Pradesh.



Figure 9, Map of Madhya Pradesh State, India

Rajasthan's main geographic features are the Thar Desert and the Aravalli Ranges, which runs through the state from southwest to northeast, almost from one end of state to the other, for more than 850 km. Mount Abu lies to the south-western end of the range, separated from the main range by the West Banas River. The area of Hadoti lies to the southeast, bordering Madhya Pradesh. To the north of Hadoti and Mewar lies the Dhundar region, which is home to the state capital of Jaipur. Dausa is the District of Rajasthan which is about 80 kms from Jaipur. The city of Dausa is the district headquarter. The red soil used for terra sigillata (sample number – 9) was collected from the richest pottery cluster of Dausa Rajasthan, to compare with locally available clay used as a terra sigillata.



Figure 10 Map of Rajasthan State, India

II. DESCRIPTION OF SAMPLES COLLECTED

Total nine samples were collected from three different states. Sample wise details are explained in following paragraphs-

- 1) **Sample no 1** – (Hills near Wardha, district Wardha, Maharashtra) – Wardha is located between $20^{\circ}45'N$ $78^{\circ}36'E$ and $20^{\circ}75'N$ $78^{\circ}60'E$. It has an average elevation of 234 meters. A hill in Wardha is called Hanuman takeri. Soft rocks are found in between the big rocks. Fine black colour particles are obtained on grinding these rocks. The surface of particles produced a shade of brown (RGB 107; 73; 48), when baked.



Figure 4, Site of fine soil, Wardha



Figure 5, Soil sample collected from Wardha



Figure 6, Terra sigillata made with soil sample of Wardha and applied on terracotta beads

- 2) **Sample no 2**– (Village Pawni, Taluka Ramtek, district Nagpur, Maharashtra) -The district of Nagpur is located between 21°09' N, and 79°09' E. Pawni is about 50 kilometres from Nagpur. The clay site is about 15 kilometers from Pawni and situated in the forest of Hivrakheda. Some hundred years ago the potters of this village saw wild animals licking clay with their tongues. Three layers of clay are available here, but the wild animals licked only the black layer which was in the middle in the middle. They brought samples of the clay from middle layer and prepared from this, a few terracotta articles. The surface of articles thus produced had a very smooth finishing with bright brown shade (RGB 93; 64; 42). They then decided to use this clay to give smooth finishing to the terracotta articles.



Figure 7, Map of Nagpur district



Figure 8, Site of fine clay, Pawni



Figure 9, Clay sample collected from Pawni



Figure 10, Terra sigillata made with fine clay of Pawni and applied on terracotta beads

- 3) **Sample no 3**– (Village Khothurna, Taluka Parshivani, district Nagpur, Maharashtra.)- The village Khothurna is about 25 kilometer from village Pawni. The traditional Red murram soil (coarse red soil) site is situated in the forest, which is about 5 kilometer from the village Khothurna. The colour of this murram soil is deep red. Potter's use this murram soil along with the fine clay of Pawni. When murram soil was mixed with the fine clay of Pawni, the resulting colour was brown after baking (RGB 111; 67; 38) and it is very close to semi sweet chocolate (RGB: 107; 66; 38).



Figure 11, Site of murram soil, Khothurna



Figure 12, Sample of red murram soil collected from Khothurna



Figure 13, Terra sigillata made with soil of Khothurna and applied on terracotta beads

- 4) **Sample no 4** – (Village Zadi, district Gadchiroli, Maharashtra) - District of Gadchiroli is situated in the south-eastern corner of Maharashtra. Gadchiroli is located between 20°06'N 80°99'E and °N 80°0'E. It has an average elevation of 217 meters. The main river basin of the district is the Godavari, which flows from west to east and forms the southern boundary of the district. The major tributaries of the Godavari are the Indravati and the Pranhita, which in turn are formed by the confluence of the Wainganga and the Wardha near Chaprala village of Chamorshi Taluka. Mr Sankar Kapat a trader from Nagpur collects the fine clay from Zadi village of Gadchiroli district and sells it to the local potters of Nagpur, Bhandara, Wardha, etc. These potters are using this fine clay to give a natural glaze to their terracotta articles. Orange colour was obtained after baking (RGB: 148; 77; 57) which is a shadelighter than Salmon 4.

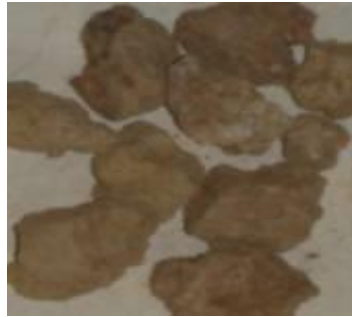


Figure 14, Sample of clay collected from Zadi.



Figure 15, Terra sigillata made with clay collected from Zadi and applied on terracotta

- 5) **Sample no 5**– (Village Rajura, district Chandrapur, Maharashtra.)- Rajura is a city and a municipal council in the district of Chandrapur, Maharashtra. It lies in the heart of the coal and cement producing areas of Maharashtra. Rajura is located between 19°47'N 79°22'E and 19°78' N 79°37'E. It has an average elevation of 181 meters (593 feet). Rajura is located on the banks of River Wardha. Clay was collected from murum bolder mines near the village Virgaon, which is about 10 kilometres from Rajura. There is a layer of white clay, below the murrum bolder. This white clay was used to make terra sigillata which gives white shade (RGB: 193; 168; 159).



Figure 16, Sample of clay collected from Raiura



Figure 17, Terra sigillata made with clay collected from Rajur and applied on

- 6) **Sample no 6** – (Village Bhankhed, district Amravati, Maharashtra) – The district is situated between 20°32' N 76°37' E and 21°46' N 78°27' E. Puma, the largest river of the district, arises from the southern slopes of Gawilgarh hills and flows through Amravati taluka. Fine red clay sample was collected from the hill which is situated in between the village Bhankhed and Chandur in Amravati. The potters of Bhankhed are mixing this clay collected from the hill with clay from paddy field for a better performance during preparation of pottery wares. Clay paint was made with this red clay and after baking it gave shade of orange (RGB 134; 74; 52) which is slightly deeper than Salmon4.



Figure 18, Sample of clay collected from Bhankhed.



Figure 19, Terra sigillata made with clay of Bhankhed and applied on

- 7) **Sample no 7** – (Village Khairlanji, district Balaghat, Madhya Pradesh.) - Balaghat district is located in the southern part of Jabalpur division. It occupies the south eastern portion of the Satpura range and the upper valley of the Wainganga river. The district extends from 21°19' to 22°24' north latitude and 79°31' to 81°3' east longitude. The Wainganga and its tributaries are

the most important rivers in the district. The town of Balaghat is on the Wainganga, which flows to the north and south through the district. The village of Khairlanji, is situated in between Nagpur and Balaghat. It is about 139 kilometers from Nagpur and 46 kilometers from Balaghat which is the district headquarter of Madhya Pradesh. The site of this fine clay is about 3 kilometers from Khairlanji and near to Wainganga river. After baking the colour of this clay becomes orange (RGB: 104; 46; 33).



Figure 20, Site of fine clay, Khairlanji.

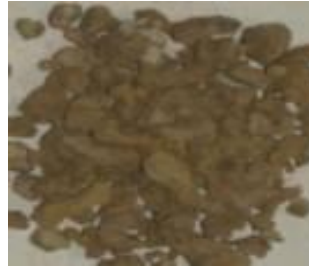


Figure 21, Sample of clay collected from Khairlanji.



Figure 22, Terra sigillata made with clay of Khairlanji and applied on terracotta beads.

- 8) **Sample no 8-** (Village Khamaria, Taluka Katangi, district Balaghat, Madhya Pradesh.)- Katangi is a town and a nagar panchayat in Balaghat district. Katangi is located at 21°47' N 79°47' E and 21°78' N 79°78' E. It has an average elevation of 442 meters (1450 feet). The village of Khamaria is about 60 kilometres from Khairlanji. Fine clay is available here in the fields and this spot is nearly 5 kilometres from village Khamaria. The potters collected the bright black clay from agricultural fields and after baking it turned in shade of deep brown (RGB: 116; 84; 56).



Figure 23, Site of fine clay, Khamaria.



Figure 211, Soil sample collected from Khamaria.



Figure 26, Terra sigillata made with clay of Khamaria and applied on terracotta beads.

- 9) **Sample no 9-** (Village Baswa, district Dausa, Rajasthan) – Soil was collected from the potters of village Baswa, which is in mandal Bandikui, district Dausa, Rajasthan. The district of Baswa is about 11 kilometres from its mandal main town Bandikui. Baswa is 38.5 kilometres far from the city of Dausa. The district is situated in between 26°23' to 27°15' North Latitude and 76°07' to 77°02' East Longitude. Also, the mean sea level height of the district is 333 meters. The Sawa and Ban Ganga rivers run through the district. The potters collect the soil from the nearby hills. Generally this type of red coarse soil is found in-between the big rocks. Potters dig the soil during rainy season when the soil is loose and is easy to collect from the rocks. After baking it gives deep orange colour (RGB: 99; 41; 33).



Figure 26, Soil sample collected from Baswa.



Figure 27, Terra sigillat made with soil of Baswa and applied on terracotta beads

III. STANDARD INDIGENOUS PROCESS TO PREPARE TERRA SIGILLATA

There are many ways to prepare natural colour of clay. Simple local method of the region for the preparation of colour was adopted for experimenting. The process is as follows-

1. Fine clay was mixed with rain water in an earthen pot. Clay particles develop a negative charge when mixed with water and become separate from each other. During this process, positively charged particles float down on the surface of the water while the negatively charged clay particles settle at the bottom of the pot. If the settling is too rapid, it does not allow coarse particles to become separated from the finer ones. It is necessary for the antique slip that the particles are fine enough to be suspended in water. Therefore, the water must not contain positively charged alkaline earth oxides (BeO, MgO, SrO, CaO, BaO) so that the clay particles are not surrounded by positively charged particle deposits (Cizer, S 1999). The proportion is usually one part clay to two parts of water and if the plasticity of clay is more, than the proportion will go up to 1:4.

2. Clay and water were mixed thoroughly in order to break down all lumps coarse particles settle down at the bottom of pots. These were removed and the clay was mixed with hand thoroughly along with water for about 15 minutes every day.

3. After third day the mixture was left undisturbed for about 24 hours. It settled down into two or three clear layers. The top most layer of the solution looks turbid.

4. The thin top most solution is carefully siphoned into another pot. After four or five days, maximum amount of water evaporates from the top. Now a paste of a very fine mixture of clay and water remains at the bottom of the pots. Some mixtures were very thin and percentage of water in it was more due to the percentage of clay, the clay sample must be less in quantity or seepage of water from the bottom of pots may be less. The thin mixture was then heated on gas stove in order to become thick. The mixture was heated up for sometime on low heat stirring continuously all the time with the help of a spoon. If the mixture is not stirred then the terra sigillata at the bottom of the pot will become a solid lump.

5. This thick mixture contains very fine particles of clay, which is called **Terra Sigillata** and it can be used as paint on un-baked and dry-bone clay wares. Application of two or three layers of terra sigillata gives a perfect shine and glaze.

6. This mixture cannot be stored, as it becomes dry quickly. This mixture has to be immersed in water for 24 hours. In this process the particles or terra sigillata gets mixed with water and then it is painted on the surface of beads. (Vince Pitelka, 2007).

7. The first phase is to study the basic colour of terra sigillata which is prepared from a type of clay. Then during the second and third round different types of clays were mixed in equal proportion in order to achieve different shades of colour.

8. The beads were baked in a small up-draft kiln which is designed specially for terracotta beads, maximum temperature necessary for baking process was 750 degree centigrade.

9. For the standardization of terra sigillata combination of different types of clays, colour values of different clay beads and pendants were fixed in accordance with RGB standards with the help of Colours Picker. It is very difficult to maintain the exact shade of colour of beads because colour of beads and pendants is not uniform. Picture of beads and pendants was enlarged and a spot with uniform shade was selected to fix the colour value.

IV. RESULTS

Broadly speaking different shades of colour like brown, orange, gray and white was obtained with the use of clay mentioned above. The following results were obtained during experiment-

Shades of Brown Colours - The different shade of brown colour was achieved with the use of clay from Wardha, Pawni, in Maharashtra and Khamaria in Madhya Pradesh. The colour of clay from Pawni gives smooth silky lustre to a high gloss. The RGB values are in between 93; 64; 42 to 116; 84; 56 (Table-1).

Shades of Orange Colours -. Different shades of orange colour were achieved with the use of clay from the village Baswa, district Dausa, Rajasthan; village Khairlanji, District Balaghat, Madhya Pradesh, village Bhankhed, Dist Amravati, village Zadi, District Gadchiroli, Maharashtra; (Table-1). The colour of soil from Dausa (RGB 99; 41; 33) is very deep as compared to the colours of Khairlanji (RGB 109; 43; 30), Bhankhed (RGB 134; 74; 52) and Zadi (RGB 148; 77; 57). The colour of clay from Bhankhed is quite similar to Salmon-4 (RGB 139, 76, 57).

Shade of White Colour – The colour of terra sigillata achieved from fine clay of Rajur (RGB:193;168;159) is deeper than wheat3 RGB 205;186;150 which is part of white colour shade (Table-1). The terra sigillata of Rajur can be used to prepare tints of different shades.

Mixing of Different Shades of Clay- Different shades of brown colour were obtained by mixing different shades of orange with brown. The colour obtained from the mixture of clay form Pawni and Zadi (RGB 82, 38, 27) is close to Black Brown (RGB 83,37, 16) and clay of Pawni & Khairlanji (RGB 94,43,22) is similar to Beiga Brown (RGB 94, 56, 22). The colour obtained by the mixture of clay from Pawni and Khothurna (RGB 111, 67, 38) is similar to semi sweet chocolate (RGB 107, 66, 38). The mixture of clays from Pawni, Rajura and Wardha (RGB 137, 94, 67) is similar to dark wood (RGB 133, 94, 66) and mixture of Pawni and Rajura (RGB 157, 106, 71) is very close to dark tan (RGB 151, 105, 79). Mixing of two or three type of clay gives an extensive range of brown colour shades with RGB values 82, 38, 27 to 157, 106, 71 (Table-2). Clay from Rajura (RGB 193, 168, 159) is used in different ratio to prepare tints (Table-3) of Khairlanji (RGB 109, 43, 30) which is near to Beiga Brown DK (RGB 109, 66, 39)) (Kevin J. Walsh, 2007).

Usually clay contains calcium carbonate and iron oxide or these can be added. Iron oxide gives the article a fine red colour after baking. Calcium carbonate causes the colour of the article to turn yellow and increases mass expansion so that it adapts along with the thermal expansion of the decoration.

Modification of Process to obtain Black & Grey Colour- To obtain natural grey colour, different experiments were conducted with the locally available indigenous technical know-how. After applying the terra sigillata on the surface of the green-beads, the horn of goat and saw dust was kept inside the closed pots containing beads of clay. On baking at 750 degree centigrade, the beads in both the pots become grey.

This grey colour obtained from saw dust (RGB 21, 21, 21) is very smooth and glossy and it is above the grey -8 (RGB 20, 20, 20). The grey colour obtained with horn (RGB 11, 11, 11) is above the grey-4 (RGB 10, 10, 10) along with this, deposits were observed on the groves of black beads (Table-1).

Terracotta jewellery- Due to non-availability of pottery clay in the region of Wardha it was mutually decided by District Rural Development Agency, Wardha & Mahatma Gandhi Institute for Rural Industrialization (MGIRI), Wardha, to introduce terracotta product which required minimum amount of clay and to get maximum return in terms of profit. The requirement of clay in the production of terracotta jewellery is very less and after proper finishing it will be sold at a good price.

In order to give natural colour to terracotta jewellery, monochromatic colour scheme, analogous colour scheme and complementary colour schemes are found suitable. A monochromatic colour scheme is a scheme which is based on only one colour. This works well specially with a piece of jewellery of light and dark shade with different surface finishing and of different shapes and sizes. Monochromatic colour schemes are derived from a single base colour and further extended by using its shades, tones and tints (that is, a colour modified by the addition of black, grey and white). As a result, the appearance is more subtle and harmonious due to a lack of colour contrast.

The palette has the dark, medium and light values of a single colour. Though it does not have any depth, it provides the contrast of dark, medium and light shade, which is important to achieve a good design.

A range of terracotta with natural colour was designed with monochromatic colour scheme at MGIRI Wardha. Hence the Self Help Groups are commercially producing naturally coloured terracotta jewellery (Figure -28 & 29).

V. CONCLUSION

Composing the terracotta jewellery with shades of brown orange, white and grey gives very conspicuous and natural look. This also increases the commercial value of indigenous technical knowledge of artisans. Mixing of different types of clay gives variation in the shade, which is a positive output for jewellery designing.

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Figure 28, Newly designed terracotta jewellery in two colours and six shapes



Figure 29, Newly designed terracotta jewellery in three colours and seven shapes

**Table – 1 Colours
 clay**

obtained by single





S No	Picture of beads	Location & RGB value	Remarks
Terracotta Beads in Shades of Brown			
1		Fine clay of Pawni RGB : 93; 64; 42	Very Dark Brown RGB : 92;64;51
2		Fine clay of Wardha RGB : 107; 73; 48	Semi-Sweet Chocolate RGB : 107;66;38
3		Fine clay of Khamaria RGB : 116; 84; 56	
Terracotta Beads in Shades of Orange			
5		Red coarse soil from Baswa, Rajasthan RGB : 99; 41; 33	
4		Fine Clay from Khairlanji RGB : 109 ; 43; 30	
6		Fine Clay from Bhankhed RGB : 134; 74; 52	Very near to Salmon4 RBG :139; 76; 57
7		Fine clay from Zadi District Gadchiroli RGB:148; 77; 57	Lighter than Salmon4 RGB : 139; 76; 57
Terracotta Beads in Shades of Grey			
8		Obtained from saw dust RGB : 21; 21; 21	Above to grey 8 RGB: 20; 20; 20
9		Obtained from horn RGB : 11; 11; 11	Above to grey 4 RGB: 10; 10; 10
Terracotta Beads in Shades of White			
10		Fine clay from Rajura RGB:193;168;159	Lighter than wheat3 RGB: 205;186;150

Table-2 Colours obtained by mixtures of clay
















S No	Picture of beads	Location & RBG value	Remarks
1		Pawni + Zadi RGB : 82; 38; 27	Close to Black Brown RGB: 83; 37; 16
2		Pawni + Khairlanji RGB : 94; 43; 22	Close to Beiga Brown RGB: 94; 56; 22
3		Pawni + Khothurna RGB : 111; 67; 38	Very close to semi sweet chocolate RGB 107; 66; 38
4		Pawni + Khothurna + Rajura RGB : 123; 68; 36	Closer to Mocha wood RGB: 113; 71; 42
5		Pawni + Khothurna + Khairlanji RGB :134;85;76	
6		Pawni + Wardha +Rajura RGB : 137; 94; 67	Very close to Dark Wood RGB :133; 94; 66
7		Pawni + Rajasthan RGB :141;91;74	
8		Pawni + Khothurna + Zadi RGB :144;99;84	Very close to tan4 RGB :139; 90; 43
9		Pawni +Rajura RGB 157; 106; 71	Very close to dark tan RGB: 151; 105; 79

Table-3 Tints of Khairlanji fine clay

S No	Picture of beads	Location & RGB value	Ratio of clay	Remarks
1		Khairlanji RGB : 109;43;30	1 : 0	Very close to Beige Brown DK RBG:109, 66, 39
2		Khairlanji +Rajura RGB : 131;69;56	1:1	Close to Beige Brown MD RBG: 128, 85, 30
3		Khairlanji +Rajura RGB : 149;97;84	3:4	
4		Khairlanji +Rajura RGB : 163;121;108	1: 2	
5		Khairlanji +Rajura RGB : 170;135;121	1 : 4	
6		Khairlanji +Rajura RGB : 180;152;141	1: 8	
7		Rajura RGB : 193;168;159	0 : 1	

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Exponential – Half Logistic Additive Failure Rate Model

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Abstract- A combination of exponential and half logistic failure rate model for reliability studies is paid much attention. An attempt is made to present the distributional properties, estimation of parameters , testing of hypothesis and the power of likelihood ratio criterion about the proposed model .

I. INTRODUCTION

It is well-known that in the theory of distributions, normal distribution and exponential distribution are the basic models exemplified in a number of theoretical results. Specifically exponential distribution is an invariable example for a number of theoretical concepts in reliability studies. It is characterized as CFR model also. In case of necessity for an IFR model, the choice falls on Weibull model with shape parameter more than 1 (>1), in particular taken as 2. Similar in shape, with common characteristics of Weibull, we have half logistic distribution as another model. Though not as popular as Weibull for reliability studies, half logistic distribution has its own prominence as a life testing model. A half logistic distribution is an IFR model and it is also a weighted exponential distribution. In this paper, we propose to combine an exponential model (CFR) and a half logistic model (IFR) through their hazard functions to get a two component series system reliability.

Studies related to half logistic distribution can be found in Balakrishnan (1985) introducing half logistic distribution by folding the wellknown logistic distribution at its median. His main contribution in the paper is tabulation of means, variances and covariances of order statistics in samples of size n=1 (1) 15 drawn from half logistic distribution. The modes of all order statistics, percentiles of the extreme order statistics are also given. Balakrishnan and Puthenpura (1986) obtained the coefficients to get the best linear unbiased estimates of location and scale parameters in half logistic distribution. Approximate M.L. estimation of location and scale parameters in half logistic model is considered by Balakrishnan and Wong (1991). Balakrishnan and Chan (1992) considered a scaled half logistic distribution and developed theory of linear estimation for its scale parameter in small and large samples. Kantam and Dharma rao (1993) suggested a modification to estimate the scale parameter of half logistic distribution in ML method of estimation to get simpler and more efficient estimator. Rosaiah et al (1997) studied reliability estimation in half logistic distribution from complete samples. Acceptance sampling plans based on life test data following half logistic model for a given consumer's risk are worked out by Kantam and Rosaiah (1998). Estimation of stress-strength reliability where stress, strength variates are assumed to follow half logistic distribution is discussed by Kantam et al (2000). Rosaiah et al (2003) derived optimum group limits for ML estimation of scale parameter of

half logistic distribution from a grouped data. Ananda et al (2006) viewed half logistic distribution as a folded distribution and discussed its distributional properties and ML estimation of its parameters.

Because such a combination and the related works are not published in the available literature, we made an attempt to consider such a model for our study. In reliability studies, combinations of components forming series, parallel, k out of 'n' systems are quite popular. The survival probabilities of such systems are evaluated either by the system as a whole or through the survival probabilities of the components that define the system. It is well known that in a series system of a finite number of components with independent life time random variables, the system reliability is equal to the product of the component reliabilities. If f(x), F(x), h(x) respectively indicate the failure density, failure probability, failure rate of a component with life time random variable 'X', then we know that

The reliability $R(x) = 1 - F(x)$

$$R(x) = e^{-\int_0^x h(x) dx}$$

If a series system has two components with independent but non-identical life patterns explained by two distinct random variables say X_1, X_2 with respective failure densities, failure probabilities, failure rates as $f_1(x), f_2(x); F_1(x), F_2(x); h_1(x), h_2(x)$ then the system reliability is given by

$$R(x) = e^{-\int_0^x [h_1(x) + h_2(x)] dx} \tag{1.1}$$

From the above expression we can get the failure density and failure rate of the series system whose reliability is given by (1.1).

Specifically we consider a series system of two components with their respective life times modeled by exponential and half logistic distribution.

The hazard functions of the exponential distribution with parameter ' θ ' and a half logistic distribution with parameter ' σ ' .

i.e.
$$h_1(x) = \theta \quad \forall x, x > 0$$

$$h_2(x) = \frac{1}{1 + e^{-\sigma x}}$$

The corresponding reliabilities are

$$e^{-\theta x} \text{ and } \frac{2e^{-\sigma x}}{(1+e^{-\sigma x})}$$

The series system reliability is

$$R(x) = \frac{2^{\frac{1}{\sigma}} e^{-\theta x}}{(1+e^{\sigma x})^{\frac{1}{\sigma}}}, \quad x > 0, \theta, \sigma > 0 \quad (1.2)$$

we consider the failure density corresponding to (1.2) as our exponential half logistic additive failure rate model (EHLAFRM).

The distributional properties, graphical natures for different choices of θ, σ are discussed in section 2. Estimation of parameters from ungrouped and grouped data is presented in section 3 and section 4 respectively. Likelihood ratio criterion and power of likelihood ratio criterion are given in section 5 and section 6 respectively. Summary and conclusions are in section 7.

II. DISTRIBUTIONAL PROPERTIES

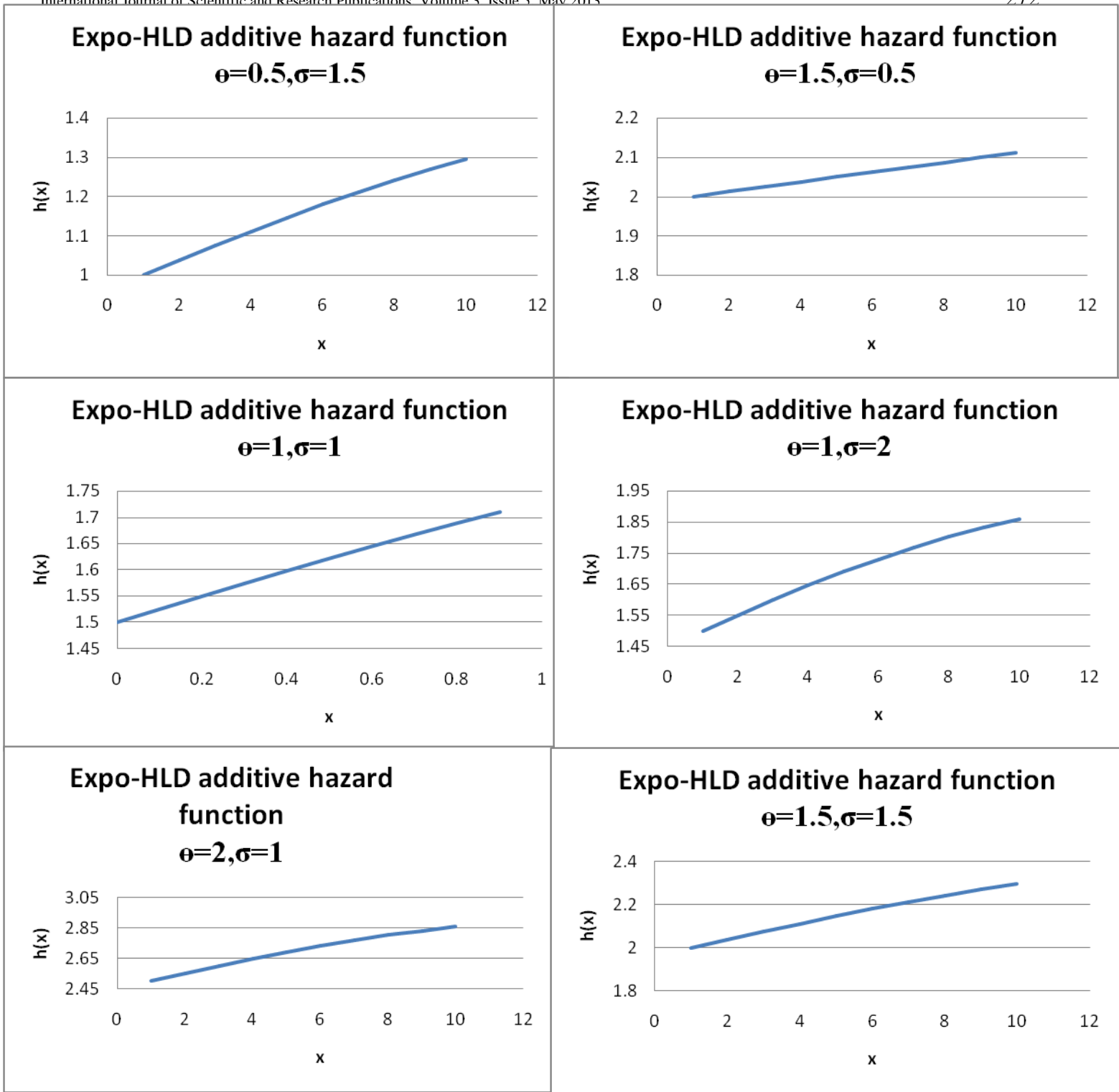
The probability density function, the CDF, failure rate of EHLAFRM are respectively given by

$$f(x) = \frac{2^{\frac{1}{\sigma}} e^{-\theta x}}{(1+e^{\sigma x})^{\frac{1}{\sigma}+1}} [\theta(1+e^{\sigma x}) + e^{\sigma x}], \quad x > 0, \theta, \sigma > 0 \quad (2.1)$$

$$F(x) = 1 - \frac{2^{\frac{1}{\sigma}} e^{-\theta x}}{(1+e^{\sigma x})^{\frac{1}{\sigma}}}, \quad x > 0, \theta, \sigma > 0 \quad (2.2)$$

$$h(x) = \theta + \frac{e^{\sigma x}}{1+e^{\sigma x}}, \quad x > 0; \theta, \sigma > 0 \quad (2.3)$$

The shape of the frequency curve is as shown in the following graphs for various values of $\theta=0.5, 1, 1.5, 2$ and $\sigma=0.5, 1, 1.5, 2$. The probability function appears to be a decreasing function for all the 6 cases given below.



III. MAXIMUM LIKELIHOOD ESTIMATION FROM UNGROUPED DATA

Let x_1, x_2, \dots, x_n be a random sample of size n from a population with density function $f(x, \theta)$, then the likelihood function of the sample values x_1, x_2, \dots, x_n is given by

$$L = \prod_{i=1}^n f(x_i, \theta)$$

where $f(x_i, \theta)$ is the probability density function.

L gives the relative likelihood that the random variable assume a particular set of values x_1, x_2, \dots, x_n for a given sample x_1, x_2, \dots, x_n , L becomes a function of θ , the parameter.

If there exists a function $\hat{\theta} = \hat{\theta}(x_1, x_2, \dots, x_n)$ of the sample values which maximizes L for variations in θ , then $\hat{\theta}$ can be taken as estimator of θ and usually called maximum likelihood estimator (MLE).

Hence $\hat{\theta}$ is the solution of

$$\frac{\partial L}{\partial \theta} = 0 \quad \text{and} \quad \frac{\partial^2 L}{\partial \theta^2} < 0$$

Let x_1, x_2, \dots, x_n is a random sample of size 'n' drawn from the EHLAFRM with pdf $f(x; \theta, \sigma)$ then the likelihood function is given by

$$L = \prod_{i=1}^n f(x_i; \theta, \sigma)$$

$$\Rightarrow L = \prod_{i=1}^n \frac{2^{\frac{1}{\sigma}} e^{-\theta x_i}}{(1 + e^{-\sigma x_i})} [\theta(1 + e^{\sigma x_i}) + e^{\sigma x_i}] \quad (3.1)$$

$$\Rightarrow \log L = \sum_{i=1}^n \log \left\{ \frac{2^{\frac{1}{\sigma}} e^{\theta x_i}}{(1 + e^{\sigma x_i})^{\frac{1}{\sigma} + 1}} [\theta(1 + e^{\sigma x_i}) + e^{\sigma x_i}] \right\} \quad (3.2)$$

The MLEs of θ, σ can be obtained by solving the following likelihood equations

$$\frac{\partial \log L}{\partial \theta} = 0$$

$$\Rightarrow \sum_{i=1}^n \left\{ \frac{(1 + e^{\sigma x_i})(1 - \theta x_i) - x_i e^{\sigma x_i}}{\theta(1 + e^{\sigma x_i}) + e^{\sigma x_i}} \right\} = 0 \quad (3.3)$$

and

$$\frac{\partial \log L}{\partial \sigma} = 0$$

$$\Rightarrow \sum_{i=1}^n \left\{ \frac{\log(1 + e^{\sigma x_i}) - \log 2}{\sigma^2} - \frac{x_i e^{\sigma x_i} (\theta - \sigma)}{\sigma [\theta(1 + e^{\sigma x_i}) + e^{\sigma x_i}]} - \frac{x_i e^{2\sigma x_i} (1 + \sigma)}{\sigma (1 + e^{\sigma x_i}) [\theta(1 + e^{\sigma x_i}) + e^{\sigma x_i}]} \right\} = 0 \quad (3.4)$$

The equations (3.3) and (3.4) have to be solved through iteration only with some well known numerical methods and get the MLEs of θ and σ say θ^* and σ^* respectively.

However, by using a simple successive method, the ML equations (3.3) and (3.4) can be further simplified and get the following estimators (not ML estimators) for θ, σ say $\hat{\theta}, \hat{\sigma}$ are obtained

$$\hat{\theta} = \sum_{i=1}^n \left\{ \frac{1}{x_i} - \frac{e^{\sigma x_i}}{1 + e^{\sigma x_i}} \right\} \quad (3.5)$$

$$\hat{\sigma} = \frac{2 \sum_{i=1}^n x_i}{\sum_{i=1}^n x_i^2} - 1 \quad (3.6)$$

Accordingly the exact variances of the MLEs are not mathematically tractable. However, the asymptotic variance, covariance of the estimates of the parameters are obtained using the following elements of the information matrix :

$$I_{11} = -E\left(\frac{\partial^2 \log L}{\partial \theta^2}\right)$$

$$I_{11} = -E\left[\sum_{i=1}^n \left\{ \frac{(1 + e^{\sigma x_i})^2}{(\theta(1 + e^{\sigma x_i}) + e^{\sigma x_i})^2} \right\}\right] \quad (3.7)$$

$$I_{12} = I_{21} = -E\left(\frac{\partial^2 \log L}{\partial \theta \partial \sigma}\right)$$

$$I_{12} = I_{21} = -E\left[\sum_{i=1}^n \left\{ \frac{x_i e^{\sigma x_i}}{(\theta(1 + e^{\sigma x_i}) + e^{\sigma x_i})^2} \right\}\right] \quad (3.8)$$

$$I_{22} = -E\left(\frac{\partial^2 \log L}{\partial \sigma^2}\right)$$

$$= -E\left[\sum_{i=1}^n \left\{ \frac{(\lambda x_i + 2v x_i)^2 - (\lambda(1 + v x_i) + v^2 x_i) 2x_i}{(\lambda(1 + v x_i) + v^2 x_i)^2} \right\}\right] \quad (3.9)$$

The estimated information matrix elements are

$$\hat{I}_{11} = - \frac{\partial^2 \log L}{\partial \theta^2} \Big|_{\theta=\theta^*}$$

$$\hat{I}_{12} = \hat{I}_{21} = - \frac{\partial^2 \log L}{\partial \theta \partial \sigma} \Big|_{\theta=\theta^*, \sigma=\sigma^*}$$

$$\hat{I}_{22} = - \frac{\partial^2 \log L}{\partial \sigma^2} \Big|_{\sigma=\sigma^*}$$

The estimated asymptotic dispersion matrix of the MLEs is given by the inverse of

$$\begin{bmatrix} \hat{I}_{11} & \hat{I}_{12} \\ \hat{I}_{21} & \hat{I}_{22} \end{bmatrix}$$

IV. MAXIMUM LIKELIHOOD ESTIMATION FROM GROUPED DATA

The probability density function (p.d.f) and the distribution function of EHLAFRM are respectively given by

$$f(x) = \frac{2^{\frac{1}{\sigma}} e^{-\theta x}}{(1 + e^{\sigma x})^{\frac{1}{\sigma} + 1}} \left[\theta(1 + e^{\sigma x}) + e^{\sigma x} \right] \quad x > 0, \theta, \sigma > 0 \quad (4.1)$$

$$F(x) = 1 - \frac{2^{\frac{1}{\sigma}} e^{-\theta x}}{(1 + e^{\sigma x})^{\frac{1}{\sigma}}}, \quad x > 0, \theta, \sigma > 0 \quad (4.2)$$

where θ, σ are the parameters.

Suppose that a raw sample x_1, x_2, \dots, x_n drawn from (4.1) is distributed into $k(\geq 2)$ unequidistant groups $(t_{i-1}, t_i), i = 1, 2, \dots, k$, such that the i -th group (t_{i-1}, t_i) includes ' n_i ' observations. The points t_i 's ($i = 0, 1, 2, \dots, k$) are called group (class) limits. We take t_0 and t_k as '0' and ' ∞ ', respectively. Then we have the data as

Class interval :	$(0 - t_1)$	$(t_1 - t_2)$	\dots	$(t_{i-1} - t_i)$	\dots	$(t_{k-1} - \infty)$
Frequency :	n_1	n_2	\dots	n_i	\dots	n_k

The likelihood function of the grouped sample is given by

$$L = \prod_{i=1}^k [p_i]^{n_i} \tag{4.3}$$

where p_i is the probability of an observation falling in the i -th group, i.e.,

$$p_i = F(t_i) - F(t_{i-1}), \quad i = 1, 2, \dots, k.$$

$F(\cdot)$ is the standard EHLAFRM function given by

$$F(t_i) = 1 - \frac{2^{\frac{1}{\sigma}} e^{-\theta t_i}}{(1 + e^{\sigma t_i})^{\frac{1}{\sigma}}} \quad t > 0, \theta, \sigma > 0$$

The log-likelihood equations, to get ML estimates of the parameters θ and σ , on simplification, are respectively,

$$\sum_{i=1}^k n_i \left[\frac{-A_{i-1}(t_{i-1}) + B_i t_i}{(A_{i-1} - B_i)} \right] = 0 \tag{4.4}$$

and

$$\sum_{i=1}^k n_i \left[\frac{-A_{i-1} \left\{ \frac{\log 2}{\sigma^2} + \frac{t_{i-1} e^{\sigma t_{i-1}}}{\sigma(1 + e^{\sigma t_{i-1}})} - \frac{\log(1 + e^{\sigma t_{i-1}})}{\sigma^2} \right\} + B_i \left\{ \frac{\log 2}{\sigma^2} + \frac{t_i e^{\sigma t_i}}{\sigma(1 + e^{\sigma t_i})} + \frac{\log(1 + e^{\sigma t_i})}{\sigma^2} \right\}}{(A_{i-1} - B_i)} \right] = 0 \tag{4.5}$$

where $A_{i-1} = e^{-\theta t_{i-1}} (1 + e^{\sigma t_{i-1}})^{\frac{1}{\sigma}}$ and $B_i = e^{-\theta t_i} (1 + e^{\sigma t_i})^{\frac{1}{\sigma}}$.

We shall often consider the special but not unusual case when the group limits $0, t_1, t_2, \dots, t_{k-1}$ [except the last group (t_{k-1}, ∞)] are equidistant, i.e., $t_i = i t_1$ for $i = 0, 1, 2, \dots, k-1$. This situation will be referred to as 'equispaced grouping'. Then the log-likelihood equations (4.4) and (4.5) respectively reduce to

$$\sum_{i=1}^k n_i \left[\frac{-A_{i-1}^* (i-1)t_1 + B_i^* i t_1}{(A_{i-1}^* - B_i^*)} \right] = 0 \tag{4.6}$$

$$\sum_{i=1}^k n_i \left[\frac{-A_{i-1}^* \left\{ \frac{\log 2}{2} + \frac{(i-1)t_1 e^{\sigma(i-1)t_1}}{\sigma(1 + e^{\sigma(i-1)t_1})} - \frac{\log(1 + e^{\sigma(i-1)t_1})}{\sigma^2} \right\} + B_i^* \left\{ \frac{\log 2}{\sigma^2} + \frac{i t_1 e^{\sigma i t_1}}{\sigma(1 + e^{\sigma i t_1})} + \frac{\log(1 + e^{\sigma i t_1})}{\sigma^2} \right\}}{(A_{i-1}^* - B_i^*)} \right] = 0$$

and
 (4.7)

where $A_{i-1}^* = e^{-(i-1)\theta t_1} (1 + e^{\sigma i t_1})^{\frac{1}{\sigma}}$ and $B_i^* = e^{-\theta i t_1} (1 + e^{\sigma(i-1)t_1})^{\frac{1}{\sigma}}$.

The ML estimates of the parameters θ and σ say $\hat{\theta}_G$ and $\hat{\sigma}_G$ from unequid spaced and $\hat{\theta}_g$ and $\hat{\sigma}_g$ from equispaced grouped samples are simultaneous iterative solutions of the pairs of equations (4.4), (4.5) and (4.6), (4.7) respectively. In the case of an unequid spaced grouped sample, the elements of information matrix are given by

$$I_{11} = -E[\partial^2 \log L / \partial \theta^2]$$

$$= -E \left\{ \sum_{i=1}^k n_i \frac{[(t_{i-1})^2 A_{i-1} - t_i^2 B_i] (A_{i-1} - B_i) - (B_i t_i - t_{i-1} A_{i-1})^2}{(A_{i-1} - B_i)^2} \right\} \quad (4.8)$$

$$I_{22} = -E[\partial^2 \log L / \partial \sigma^2]$$

$$\frac{\partial^2 \log L}{\partial \sigma^2} =$$

$$-E \left\{ \sum_{i=1}^k n_i \left[-A_{i-1} B_i \left\{ \frac{t_{i-1} e^{\sigma t_{i-1}}}{\sigma(1+e^{\sigma t_{i-1}})} - \frac{\log(1+e^{\sigma t_{i-1}})}{\sigma^2} - \frac{t_i e^{\sigma t_i}}{\sigma(1+e^{\sigma t_i})} + \frac{\log(1+e^{\sigma t_i})}{\sigma^2} \right\} \right. \right.$$

$$\left. \left. \left\{ \frac{t_{i-1} e^{\sigma t_{i-1}}}{\sigma(1+e^{\sigma t_{i-1}})} + \frac{\log(1+e^{\sigma t_{i-1}})}{\sigma^2} + \frac{t_i e^{\sigma t_i}}{\sigma(1+e^{\sigma t_i})} + \frac{\log(1+e^{\sigma t_i})}{\sigma^2} \right\} \right. \right.$$

$$\left. - (A_{i-1}^2 - A_{i-1} B_i) \left[\frac{2 \log 2}{\sigma^3} - t_{i-1} \left\{ \frac{(1+e^{\sigma t_{i-1}})[e^{\sigma t_{i-1}}(\sigma t_{i-1}^{-1})] - \sigma t_{i-1} e^{2\sigma t_{i-1}}}{\sigma^2(1+e^{\sigma t_{i-1}})^2} \right\} + \frac{t_{i-1} e^{\sigma t_{i-1}}}{\sigma^2(1+e^{\sigma t_{i-1}})} - \frac{2 \log(1+e^{\sigma t_{i-1}})}{\sigma^3} \right] \right. \right.$$

$$\left. \left. + (A_{i-1} B_i - B_i^2) \left[\frac{2 \log 2}{\sigma^3} - t_i \left\{ \frac{(1+e^{\sigma t_i})[e^{\sigma t_i}(\sigma t_i^{-1})] - \sigma t_i e^{2\sigma t_i}}{\sigma^2(1+e^{\sigma t_i})^2} \right\} + \frac{t_i e^{\sigma t_i}}{\sigma^2(1+e^{\sigma t_i})} - \frac{2 \log(1+e^{\sigma t_i})}{\sigma^3} \right] \right] \right\} / (A_{i-1} - B_i)^2 \quad (4.9)$$

and

$$I_{12} = I_{21} = -E[\partial^2 \log L / \partial \theta \partial \sigma]$$

$$\frac{\partial^2 \log L}{\partial \theta \partial \sigma} = -E \left\{ \sum_{i=1}^k n_i [(-A_{i-1} B_i t_i) + A_{i-1} t_{i-1} B_i] \right.$$

$$\left. \left[\frac{t_{i-1} e^{\sigma t_{i-1}}}{\sigma(1+e^{\sigma t_{i-1}})} - \frac{\log(1+e^{\sigma t_{i-1}})}{\sigma^2} - \frac{t_i e^{\sigma t_i}}{\sigma(1+e^{\sigma t_i})} - \frac{\log(1+e^{\sigma t_i})}{\sigma^2} \right] \right\} / (A_{i-1} - B_i)^2 \quad (4.10)$$

where $A_{i-1}^* = e^{-\theta(i-1)t_i} (1 + e^{\sigma t_i})^{\frac{1}{\sigma}}$ and $B_i^* = e^{-\theta i t_i} (1 + e^{-\sigma(i-1)t_i})^{\frac{1}{\sigma}}$.

Hence, the estimated asymptotic dispersion matrix of the MLEs $\hat{\lambda}_G, \hat{v}_G$ of λ, v from an unequid spaced grouped sample is

$$D[\hat{\theta}_G, \hat{\sigma}_G] = [I_{11} \ I_{22} - I_{12}^2]^{-1} \begin{bmatrix} I_{22} & -I_{12} \\ -I_{12} & I_{11} \end{bmatrix} \quad (4.11)$$

In the case of an equispaced grouped sample, the elements of information matrix are obtained from (4.8) through (4.10) with $t_i = it_1, i = 1, 2, \dots, k-1$, i.e.,

$$\hat{I}_{11} = -E[\partial^2 \log L / \partial \theta^2]$$

$$= -E \left\{ \sum_{i=1}^k n_i \left[\frac{[(i-1)t_1]^2 A_{i-1}^* - (it_1)^2 B_i^*}{(A_{i-1}^* - B_i^*)^2} (A_{i-1}^* - B_i^*) - [B_i^* it_1 - (i-1)t_1 A_{i-1}^*]^2 \right] \right\} \quad (4.12)$$

$$\hat{I}_{22} = -E[\partial^2 \log L / \partial \sigma^2]$$

$$\begin{aligned} \frac{\partial^2 \log L}{\partial \sigma^2} = & -E \left\{ \sum_{i=1}^k n_i \left[A_{i-1} B_i \left\{ \frac{(i-1)t_1 e^{\sigma(i-1)t_1}}{\sigma(1+e^{\sigma(i-1)t_1})} - \frac{\log(1+e^{\sigma(i-1)t_1})}{\sigma^2} - \frac{it_1 e^{\sigma it_1}}{\sigma(1+e^{\sigma it_1})} + \frac{\log(1+e^{\sigma it_1})}{\sigma^2} \right\} \right. \right. \\ & \left. \left. \left\{ \frac{-(i-1)t_1 e^{\sigma(i-1)t_1}}{\sigma(1+e^{\sigma(i-1)t_1})} + \frac{\log(i+e^{\sigma(i-1)t_1})}{\sigma^2} + \frac{it_1 e^{\sigma it_1}}{\sigma(1+e^{\sigma it_1})} - \frac{\log(i+e^{\sigma it_1})}{\sigma^2} \right\} \right. \right. \\ & + (A_{i-1}^2 - A_{i-1} B_i) \left[\frac{2 \log 2}{\sigma^3} - (i-1)t_1 \left\{ \frac{(1+e^{\sigma(i-1)t_1}) [e^{\sigma(i-1)t_1} (\sigma(i-1)t_{1-1})] - \sigma(i-1)t_1 e^{2\sigma(i-1)t_1}}{\sigma^2 (1+e^{\sigma(i-1)t_1})^2} \right\} \right. \\ & \left. \left. + \frac{(i-1)t_1 e^{\sigma(i-1)t_1}}{\sigma(1+e^{\sigma(i-1)t_1})} - \frac{2 \log(i+e^{\sigma(i-1)t_1})}{\sigma^3} \right] - (A_{i-1} - A_{i-1} B_i)^2 \left[\frac{2 \log 2}{\sigma^3} - it_1 \left\{ \frac{(1+e^{\sigma it_1}) [e^{\sigma it_1} (\sigma it_{1-1})] - \sigma it_1 e^{2\sigma it_1}}{\sigma^2 (1+e^{\sigma it_1})^2} \right\} \right. \right. \\ & \left. \left. + \frac{it_1 e^{\sigma it_1}}{\sigma^2 (1+e^{\sigma it_1})} - \frac{2 \log(1+e^{\sigma it_1})}{\sigma^3} \right] \right] \Big/ (A_{i-1} - B_i) \end{aligned} \quad (4.13)$$

$$I_{12}^* = I_{21}^* = -E[\partial^2 \log L / \partial \theta \partial \sigma]$$

$$\begin{aligned} \frac{\partial^2 \log L}{\partial \theta \partial \sigma} = & -E \left\{ \sum_{i=1}^k n_i \left\{ ((i-1)t_1)^2 (-A_{i-1} (i-1)t_1 B_i + A_{i-1} B_i it_1) \right. \right. \\ & \left. \left. \left\{ \frac{(i-1)t_1 e^{\sigma(i-1)t_1}}{\sigma(1+e^{\sigma(i-1)t_1})} - \frac{\log(1+e^{\sigma(i-1)t_1})}{\sigma} - \frac{it_1 e^{\sigma it_1}}{\sigma(1+e^{\sigma it_1})} + \frac{\log(1+e^{\sigma it_1})}{\sigma^2} \right\} \right\} \Big/ (A_{i-1} - B_i)^2 \end{aligned} \quad (4.14)$$

where $A_{i-1}^* = e^{-\theta(i-1)t_1} (1+e^{\sigma it_1})^{\frac{1}{\sigma}}$ and $B_i^* = e^{-\theta it_1} (1+e^{-\sigma(i-1)t_1})^{\frac{1}{\sigma}}$.

The asymptotic dispersion matrix of the corresponding MLEs - $\hat{\theta}_g, \hat{\sigma}_g$ of θ, σ is

$$\hat{D}[\hat{\theta}_g, \hat{\sigma}_g] = [\hat{I}_{11} \quad \hat{I}_{22} - \hat{I}_{12}]^{-1} \begin{bmatrix} \hat{I}_{22} & -\hat{I}_{12} \\ -\hat{I}_{12} & \hat{I}_{11} \end{bmatrix} \quad (4.15)$$

V. LIKELIHOOD RATIO CRITERION AND CRITICAL VALUES

Let us designate our distribution EHLAFRM as a null population say P_0 . We call exponential distribution as alternate population say P_1 . We propose a null hypothesis H_0 : “ A given sample belongs to the population P_0 ” against an alternative hypothesis H_0 : “ the sample belongs to population P_1 ”.

Let L_1, L_0 respectively stand for the likelihood function of the sample with population P_1 and P_0 . Both L_1 and L_0 contain the respective parameters of the population. The given sample is used to get the parameters of P_1, P_0 , so that for the given sample

the value of $\frac{L_1}{L_0}$ is now estimated. If H_0 is true, $\frac{L_1}{L_0}$ must be small, therefore for accepting H_0 with a given degree of

confidence $\frac{L_1}{L_0}$ is compared with a critical value with the help

of the percentiles in the sampling distribution of $\frac{L_1}{L_0}$. We have seen in section 4 how to get the estimates of parameters.

But the sampling distribution of $\frac{L_1}{L_0}$ is not analytical, we therefore resorted to the empirical sampling distribution through simulation.

We have generated random samples of size 5(1)10, 15, 20, 25, 30 from the population P_0 with various parameter

combinations and got the value of L_1 , L_0 along with the estimates of respective parameters for each sample.

The percentiles of $\frac{L_1}{L_0}$ at various probabilities are computed and are given in Table 5.1.

Table : 5.1
Percentiles of L_1/L_0 for various values of λ and ν

n	$\theta=1, \sigma=1$					
	0.99	0.975	0.95	0.05	0.025	0.01
5	4619176.5	10664.53	300.05	1.493	1.4156	1.3273
6	485274.62	3008.14	467.07	1.6316	1.5641	1.4533
7	85986.66	4144.9	742.15	1.7808	1.6841	1.5473
8	368121.53	6009.11	972.65	1.9544	1.8182	1.6405
9	53868.42	5818.12	1203.75	2.1989	1.9845	1.8557
10	226564.95	13751.23	1513.11	2.3252	2.1098	1.9397
15	371196	23611.12	4502.76	3.8728	3.3998	3.0233
20	260060.65	44157.11	10065.15	6.3438	5.6431	4.9735
25	1605025.37	271543.9	33833.48	10.9535	9.7752	8.5964
30	4192773.25	322768.93	38841.87	18.0275	15.6319	12.8386

VI. POWER OF LIKELIHOOD RATIO CRITERION

In testing of hypothesis we know that the power of a test statistic is the complementary probability of accepting a false hypothesis at a given level of significance. Let us conventionally fix 2.5% and 5% level of significance, so that the percentiles in Table 5.1 under the column 0.975 and 0.95 shall become the critical values. We generate a random sample of sizes 5(1)10,15,20,25, 30 from the population P_1 namely exponential. At this sample we find the estimates of the parameters of P_1 and P_0 using the respective probability models. Accordingly we got the estimates of L_1, L_0 for the sample from P_1 .

Over repeated simulation runs we got the proportion of values of $\frac{L_1}{L_0}$ that fall below the respective critical values of Table 5.1. These proportions would give the value of β , the probability of type II error. If the test statistic has a discriminating power β must be small so that the power $1-\beta$ must be large. Various power values are given in Table 6.1. We see that as 'n' increases β is decreasing and hence $1-\beta$ increases. We conclude that as long as n is less than 10, a given sample can distinguish between the populations P_1 and P_0 only with a probability of 10%. This probability is increasing with sample size 'n'. We therefore conclude that exponential can be a reasonable alternative to our model in small samples

Table: 6.1
Power of Likelihood Ratio Criterion

n	0.975	0.95
5	0.9790	0.9730
6	0.9820	0.9770
7	0.9840	0.9790
8	0.9880	0.9800
9	0.9910	0.9850
10	0.9930	0.9860
15	0.9950	0.9900
20	0.9960	0.9910
25	0.9980	0.9950
30	0.9900	0.9960

VII. SUMMARY AND CONCLUSIONS

Exponential and half logistic failure rate models are combined for the reliability studies and is named as Exponential - half logistic additive failure rate model . The distributional properties, estimation of parameters, testing of hypothesis and the power of likelihood ratio criterion about the proposed model are discussed. This paper can further be used for applying the likelihood ratio criterion with the proposed distribution as null population and the distribution under consideration as an alternative

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Domestic Solid Waste Generation— A Case Study of Semi-Urban Area of Kathua District, Jammu, J & K, India

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Abstract- Solid waste management is a major problem for most of the Indian cities due to growing urban population and per capita waste generation rate, poor public awareness, participation and calamitous financial and organizational capacities of the urban local bodies. This paper deals with the composition of the Domestic Solid Waste (DSW) generation in the semi-urban area of the Kathua District. The various components of the solid waste were categorized into biodegradable, non-biodegradable and inert waste. It is observed that the study area produces around 70.62% of biodegradable material and the rest is contributed by non-biodegradable and inert waste. Moreover, a comparative account of relationship between domestic solid waste generation and education level of the families was also carried out.

Index Terms- Solid waste, Biodegradable waste, Composition, Inert material.

I. INTRODUCTION

Problem of waste generation originated from riotous human activities. The more advanced the society economically is, the more complex becomes the waste generation. In most of the developing countries, solid waste is being dumped on land without adopting any acceptable sanitary land filling practices. Most of the Indian cities are experiencing unplanned urban growth and heavy pressure of population. This results in an enormous production of solid waste (Planning Commission, 1995).

The waste generally contains discarded material like paper, plastic bags, glass, metal, fine earth particles, ash, sewage sludge, dead animals etc. Even the generation of solid waste is not constant and varies from 2.75 to 4.00 Kg per capita per day in the high income countries but it is as low as 0.5 Kg per capita per day in low-income countries. However waste generation increases continuously in proportion with population and increasing land requirements (Indris *et al.*, 2004). The Environmental Protection Act (1986) defines waste as “Any substance or object which the holder discards or intends to discard”. Many of the wastes generated at present are used or reused in uneconomic manner or left completely unutilized, causing a great damage to the human health and environment. Solid waste can be classified into different types depending on their sources viz- Municipal waste, Agricultural waste, Sewage waste, Industrial and mining waste, Hazardous waste, Radioactive waste and Bio-medical waste.

Ecologically, solid waste can be classified as: Biodegradable, Non-biodegradable and Inert waste. Association

of solid waste disposal with outbreaks and various epidemics has been well established. The other negative effects include generation of obnoxious odour, attraction and support of disease vectors, degradation of aesthetic quality of environment etc. Generally, all low and middle income countries have a high percentage of compostable organic matter in the urban waste stream, ranging from 40 to 85 percent of the total (IBRD/The World Bank, 1999).

Incidence: A lot of study has been done on solid waste generation and its composition in various parts of India by various workers e.g. Dutta *et al.* (1999), Garg and Parsad (2003), Bhide (2004), Yousaf and Rehman (2007), but not much attention seem to have been paid to this rapid growing menace of solid waste from this sub tropical belt of the country except some efforts made by Rampal and Kour (2005), Sharma and Gupta (2011) etc.

Objective of the Study: The present study is carried out to estimate the amount of solid waste generated in a semi-urban area of Kathua district, its characterization and to devise the plan of measures to be adopted for proper waste management in the area, thereby protecting the population of the area from its possible hazards.

II. MATERIAL AND METHODS

The study was carried out to estimate qualitative and quantitative composition of domestic solid waste in the study area. The present study is also based upon comparative account of relationship between the domestic solid waste generation and the educational level of the family (Head of the family). So the houses (Families) were categorized into three classes according to the educational level of family. **Class I:** Houses (Families) having educational level up to middle standard. **Class II:** Houses (Families) having educational level from middle to senior secondary level. **Class III:** Houses (Families) having educational level of above Senior secondary level. The sampling was done in 20 houses of each class (60 houses). The primary data was collected for six fortnights.

III. RESULTS AND DISCUSSION

The average total solid waste generated by the three classes was 8562.7g in 24 hours. The biodegradable, non-biodegradable and inert waste contributed 6048.9g (70.62%), 2166 g (25.32%) and 347.7 g (4.06%) respectively (Table 1, Fig. 1). In the biodegradable waste, kitchen waste showed maximum quantity

2366.65 g (27.54%) followed by fruit waste 1566.6 g (18.38%), food waste 1034.1 g (12.08%), paper waste 943.7g (11.02%), plant waste 86.6g (1.01%) and textile waste 50.9 g (0.59%).

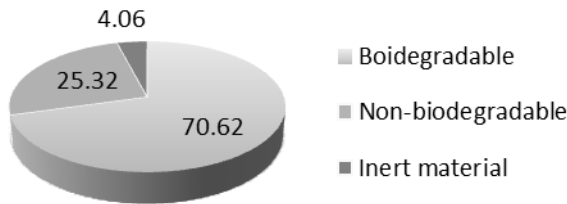


Figure 1: Percentage share of major components of solid waste

In non-biodegradable waste, plastic waste dominated with 1387.9 g (16.24%) followed by glass waste and metal waste i.e. 469.8 g (5.48%) and 308.4 g (3.6%), respectively. Inert material contributed 347.6 g (4.06%) and consisted of dust, hair wax etc. The average solid waste generated per capita per day was 83.91g. The solid waste composition in all three classes was analyzed separately. It varied slightly in classes I, II and III. Class I showed biodegradable content, 67.23%, non-biodegradable, 28.64% and inert, 4.13%. In class II, the solid waste proportion was composed of biodegradable waste (71.55%), non-biodegradable waste (23.95%) and inert material (4.5%). In class III, 72.26%, 24.16% and 3.58% of the waste composition was attributed to biodegradable, non-biodegradable, and inert material, respectively.

But when we look at the quantity of waste generated, we find that in class I (Table 2) it was 351.9g/house/day as compared to 466.8 g/house/day in class II (Table 3) and 465.7g /house/day in class III (Table 4) (Fig. 2). This is due to the fact that the educational status of the people was observed to be quite low and it was somewhat related to the income of the family. So, the houses with less income utilized the resource efficiently and created less waste as compared to the houses of class II and III. Moreover, the per capita waste production also varied greatly. It was 65.16g, 95.26g and 91.31g per day in class I, class II and class III, respectively.

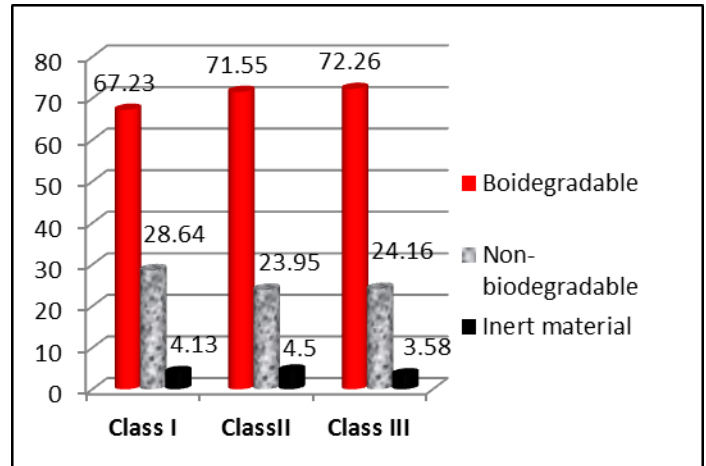


Figure 2: Percentage share of major components of solid in different house classes

IV. CONCLUSION AND RECOMMENDATIONS

People collected solid waste in plastic bags or dustbins and dispersed it in open or in drains. Sweepers were engaged for sweeping the lanes and streets, recyclables were also collected by rag pickers. The most of the waste generated was stored in the vacant plots or along the road side. Open vehicles or tricycles were used to transport solid waste from different places to site of disposal. Nearly 75-80% of the waste was sent to open dumps near the bank of river Ravi where its open burning was carried out. Rag pickers play an important role in segregation of recyclable material. Techniques like sanitary landfill, incineration, composting etc. should be adopted. Dustbins with lid at different locations should be placed. Mechanized and covered vehicles should be used for transportation. Reducing the waste generation at source, segregation of waste into biodegradable and non-biodegradable before its disposal, following the philosophy of four R's (Reduce, Reuse, Refuse, Recycle) and awareness among the masses are some of the measures which can help in combating the problem of solid waste in the study area. In natural systems there is no such thing as waste. Everything flows in a natural cycle of use and reuse. Living organisms consume materials and eventually return them to the environment, usually in a different form, for reuse. Solid waste (or trash) is a human concept. Unfortunately, what is worthless to one person may be of value to someone else. Solid wastes, in real, are really misplaced resources.

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Table 1: Qualitative and quantitative composition of domestic solid waste in the study area (average of all the three classes)

All CLASS ES	Biodegradable waste						Total	Non-biodegradable			Total	Inert waste		Total	Grand Total	Total SW/ /house/ day
	Kitchen waste	Fruit waste	Food waste	Plant waste	Paper waste	Textil e waste		Plasti c waste	Met al waste	Glas s waste		Dust	Hair, wax.etc.			
Total waste	42598.8	2819 8.8	1861 4.4	1564 .8	1698 7.8	918	10888 0.8	2498 2.2	5550 .6	8457 .6	3899 1.6	5401 .2	857.4	6258 .6	15413 1.6	428.6
Average waste generation	2366.6	1566. 6	1034. 1	86.6	943.7	50.9	6048.9	1387. 9	308. 4	469. 8	2166. 1	300	47.6	374. 6	8562.2	
Percent age contrib ution	27.54	18.38	12.08	1.01	11.02	0.59	70.62	16.24	3.6	5.48	25.32	3.5	0.56	4.06	100	

Table 2: Qualitative and quantitative composition of domestic solid waste in class I Houses

CLASS I	Biodegradable waste						Total	Non-biodegradable waste			Total	Inert waste		Total	Grand Total	Total SW/ house/ day
	Kitchen waste	Fruit waste	Food waste	Plant waste	Paper waste	Textile waste		Plastic waste	Meta l waste	Glass waste		Dust	Hair, wax.etc.			
Total waste	11326.8	7062. 6	5164.2	532.2	4175.1	145.5	28406.4	7938.3	1462. 8	2670.9	12072	1446.9	302.4	1749.3	42227.7	351.9
Average Waste generation	1887.8	1177. 1	860.7	88.7	695.8	24.2	4734.5	1323	243.8	445.2	2012	241.1	50.4	291.5	7037.95	
Percentage contribution	26.82	16.72	12.22	1.25	9.88	0.34	67.23	18.81	3.51	6.32	28.64	3.42	0.71	4.13	100	

Table 3. Qualitative and quantitative composition of domestic solid waste in class II Houses

CLASS II	Biodegradable waste						Total	Non-biodegradable			Total	Inert waste		Total	Grand Total	Total SW/ house/day
	Kitchen waste	Fruit waste	Food waste	Plant waste	Paper waste	Textile waste		Plastic waste	Metal waste	Glass waste		Dust	Hair, wax.etc.			
Total waste	15399.3	11738.7	6404.4	575.1	5477.4	489.6	40084.5	8400.3	1108.5	3907.2	13416.9	2091.3	424.2	2515.5	56016	466.8
Average waste generation	2566.6	1956.4	1067.5	95.9	912.9	81.6	6680.7	1400	184.8	651.2	2236.1	348.6	70.7	419.3	9336	
Percentage contribution	27.49	20.95	11.43	1.02	9.77	0.89	71.55	14.99	1.98	6.98	23.95	3.74	0.76	4.5	100	

Table 4: Qualitative and quantitative composition of domestic solid waste in class III Houses

CLASS III	Biodegradable waste						Total	Non-biodegradable			Total	Inert waste		Total	Grand Total	Total SW/house/day
	Kitchen waste	Fruit waste	Food waste	Plant waste	Paper waste	Textile waste		Plastic waste	Metal waste	Glass waste		Dust	Hair, wax.etc.			
Total waste	15873.3	9397.8	7046.1	456.3	7335	0	40391.1	8643.9	2979.3	1879.8	13503	1862.7	131.1	1993.8	55887.9	465.7

Average waste generation	2645.5	1566.3	1174.3	76.05	1222.5	47.12	6731.75	1440.7	496.6	313.3	2250.6	310.5	21.8	332.3	9314.65
Percentage contribution	28.4	16.81	12.6	0.82	13.12	0.51	72.26	15.46	5.34	3.36	24.16	3.34	0.24	3.58	100

IGDSS - Applied Technology at the Grassroots Using Satellite imagery and Mobile GPS at village level for on-site plot level Crop-Mapping

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Abstract- Acquiring trustworthy information on crop type and production is very essential for developing countries like India as agriculture is considered as the backbone of its economy. Comprehensive, reliable and timely information on agricultural resources is very much necessary. Though there are numbers of methods for estimation of crop type and production, each method has its own strength and weaknesses. Apart from crop type, associated information is also equally important to understand the reasons behind farmers' cropping decisions. Though accurate crop data is important for agricultural planning this methodology is may help us in agricultural as well as economic planning. Crop data generated by government agencies used to prepare a catalog of crop information such as Name of crop, area under crop, variety. Traditional methods of crop data collection may not provide reliable information. Use of high resolution satellite images along with geospatial tools and mobile GPS in crop mapping gives a better idea about cropping variation in a particular season along with their spatial distribution. On-site updation of data provides for real-time accuracy.

Index Terms- GIS, Mobile GPS, Satellite image

I. INTRODUCTION

Agriculture surveys are conducted by government in order to gather information and statistics on crops and other related agricultural resources. This data is most important for the taking of effective management decisions. GIS application in agriculture plays a vital role throughout the world by helping farmers to increase production, reduce costs, and manage their land more efficiently. Mapping individual crops, and their associated information at plot level plays an important and significant role in understanding cropping pattern of the area. Adopting such a kind of technology in agricultural survey helps in building definite databases on seasonal cropping patterns. Efficiency in agriculture can thus be augmented by using Remote Sensing and GIS.

II. OBJECTIVE

1. To develop a methodology aimed at obtaining seasonwise plot level crop data using High resolution satellite image and mobile GPS.
2. To arrive at realistic spatial distribution information and area estimation of crops in a village.

III. DATA AND SOFTWARE USED

This method involves pre-field work database generation. To map plot level data, high resolution satellite images was needed. For this survey, cartosat stereo images were used. To identify plot data on ground ArcPAD software was used with Garmin M10 asus mobile GPS. For database generation, processing and analysis purpose ArcGIS 10 software was used.

IV. METHODOLOGY OF ON-SITE CROP MAPPING IN THE FIELD

Step1: Toposheet of selected area is georeferenced. Using this georeferenced toposheet, cadastral map of village is rectified. At the time of rectification, google earth is used for reference to maintain better accuracy. Then *gat* (survey) numbers are digitized from georeferenced cadastral map.

Step2: Cartosat image is georeferenced using selected ground control points (GCP's) from the village. These points were major drainage lines, intersection of roads, waterbodies etc.

Step3: The village map is then overlaid on cartosat image to get the actual village area. The village area is then extracted from satellite image using clip tool of ArcGIS software.



Figure 1: Clipped Cartosat image for village Kauthe Khurd.

Step4:-To map plots, shapefile is created with name "Village plots". Then plots were digitized from satellite image. Here, major farm bund was taken as plot. All such farm bunds in village are digitized.

*Note: - Plots are different from *gat* numbers. One *gat* can have more than one plot.

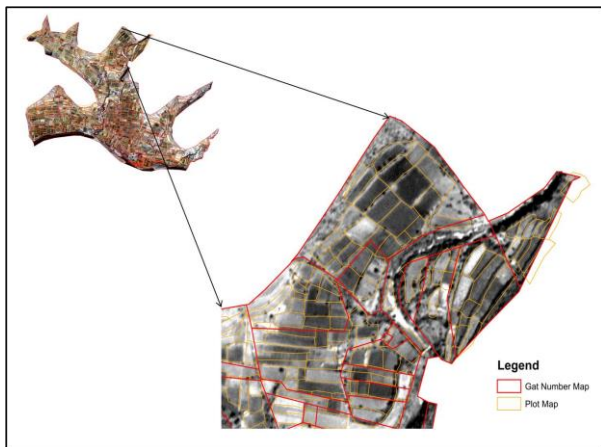


Figure 2: Plots demarcated from Satellite image and plots in gats.

Step5: After digitizing all the plots, a unique plot ID is assigned to each plot. Shapefiles of village gat, village boundary and village plots are then transferred on mobile GPS. Care has should be taken that all shapefiles should be in the same projection i.e. UTM.

Step6: The field investigator with the help of mobile GPS starts locating plots in the field. The investigator clicks on the GPS pointer fixed on the screen to get plot ID and notes it down in data down.

Step7: To get information of plots, field investigator needs the help of a local resource person from the village. This resource person accompanies the field investigator throughout the survey and helps in coordinating the interaction between the investigator and the farmer whenever required.

Step8: During this survey, investigator collects plotwise information on various parameters like plot owner, crop name, crop variety, whether plot is irrigated or rainfed, source of irrigation, method of irrigation, group or individual irrigation, fertilizers used, approximate production, rationale for crop selection, market places, and proposed crop planning.

Step9: It may so happen that the whole plot is not cultivated. i.e. plot may not be equal to cropped area. If the actual the cropped area is less than the plot area, then the investigator records cropped area and fallow area separately.

Step10: Information is thus collected for all plots in a village. This information is then transferred into a geodatabase format to bring the database onto the GIS platform. Using basic tools in ArcGIS, geodatabase is linked to each plot of shape file using "Plot ID" as primary key.

Step11: This database linkage is temporary. To make it permanent the shapefile has to be exported into a new shapefile again.

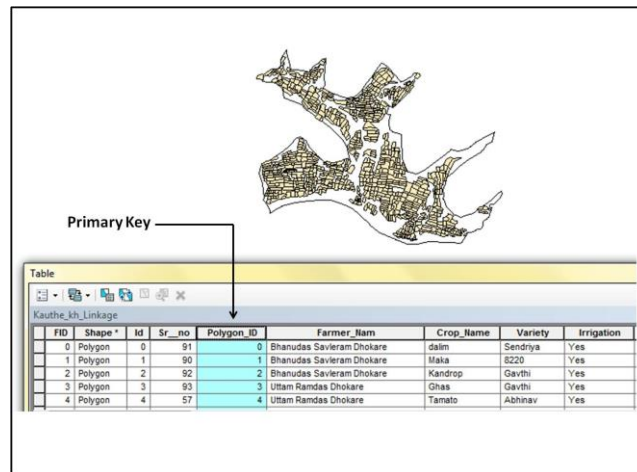


Figure 3: Geodatabase linked to Plot shapefile keeping polygon ID as a Primary Key.

Using this shapefile various thematic maps can be generated based on different attributes.

Spatial Analysis based on linked plot data

The process of examining the locations, attributes, and relationships of features in spatial data through various analytical techniques in order to address a question or gain useful knowledge is known as Spatial Analysis. It extracts or creates new information from spatial data. (ArcGIS 10, help)

Spatial analysis plays crucial role getting information on spatial distribution of various parameters from plot data. New information can be created using spatial query set. (Fig.4 shows the distribution of plots owned by farmer "Shantaram Dhokare").

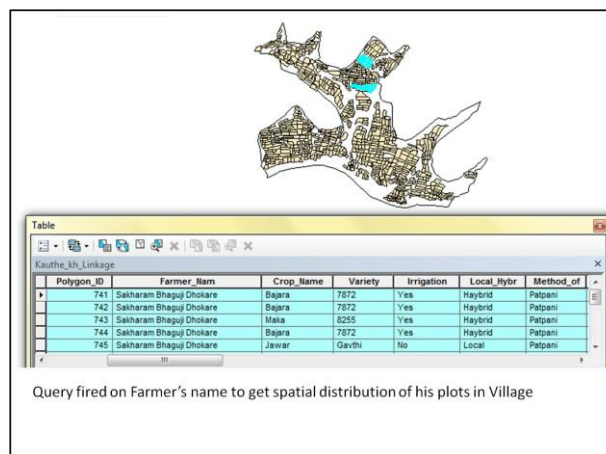


Figure 4: Highlighted plot shows the result of the query asked to linked plot data.

A definite, layered, attributed database can thus be generated.

V. ADVANTAGE OF THE METHODOLOGY/SURVEY

1. As plot mapping is done from satellite image before field work, investigator does not need to walk around the plot for mapping. If topography is undulated and investigator is not able to walk around the plot then he/she can simply click on the pre-

defined plots on Mobile GPS to get plot ID. This saves much time in the field.

2. Large amounts of data can be efficiently and accurately collected and processed in a very short time (eg. 200 plots/day). This reduces cost and brings down the overall budget of survey.

*Note: - Labor cost includes per day charges of resource person and field investigators

3. If some trouble occurs in GPS in the field, there are no chances of data losses, as the Plots are already saved in shapefile format.

4. As this is on-site mapping and field investigator physically verifies each plot so there are very less chances of data duplication.

5. Plot generation from satellite image is a **one time activity**. Same plot shapefile can be used to map crops of different seasons over the years.

VI. VALIDATION OF THE SURVEY

This survey is totally field based, depends on local resource persons and field investigators. So, to validate crop survey, 20% sample plots with well spatial distribution in village were selected and those plots were verified in the field using mobile GPS. It was found that there were no gaps in collected data.

VII. LIMITATIONS

1. Duration of crop survey for particular season is not fixed, as that may vary due to delay in rainfall and late sowing of crop which may result in missing of data.

2. Image rectification has to be very correct, shift in image leads to shifting in plots. On ground investigator may not get exact plot.

3. One plot may have inter cropping or mix cropping pattern, which needs separate entry. So at the time of data display, there are chances of skipping of inter cropping or mix cropping pattern crop data.

4. GPS battery backup is short, so need to have extra batteries and other accessories to save time and data in the field.

5. This survey is limited to only agricultural plots so data on common property land resources (CPLR) is not included.

VIII. POTENTIAL APPLICATION AREAS

As this survey is related to crop mapping it has many applications. Major applications areas are as follows:

1. Watershed Development

In watershed development, crop monitoring can be done using this method. If this survey is conducted regularly at appropriate point from implementation to completion of a project, plot wise changes can be observed in cropping pattern. These changes can be plotted against treatments undertaken. Thus it can be very effective survey in monitoring and impact assessment.

2. Water Budgeting

Water Budgeting includes calculating water balance of the watershed area and to budget the available water for the planning of monsoon, winter and summer crops. Plot level data of the crops helps us to understand the cropping pattern of the village and can be used to calculate water remaining after each season. Also this data helps us to do crop planning based on previous year cropping pattern and current water availability. This enables the community to plan their village/watershed water resources.

3. Agriculture

It is useful to study the production level of particular crop season wise, also it will be helpful to identify and track the specific variety grown. As soil properties are linked to each plot, assigning hydrological soil groups is possible. Agro-advisories can be then shown spatially.

IX. AREAS OF USAGE

This methodology can meet the needs and requirements of a variety of stakeholders in various types of projects.

1. For Farmers

- i. Planning suitable crops
- ii. Integrated Nutrient Management
- iii. Integrated Water Management
- iv. Integrated Pest Management

2. For Government Agencies

- i. Identify farmers impacted by crop damage
- ii. Total irrigation requirement and water conservation needs in Projects
- iii. Estimating crop production
- iv. Estimating capacity of storage godowns needed
- v. Tentative estimations of revenue collection
- vi. Planning location of the markets and *mandis*

3. For Insurance Sector

- i. Monitor growth of insured crop
- ii. Assess actual crop Insurance
- iii. Monitor timely payments of compensations

4. For Agricultural inputs to companies

- i. Estimating distribution and supply of seeds to areas to be covered under specific crop
- ii. Identifying suitable varieties as per soil and weather data

5. Fertilizer companies

- i. Estimating demand and supply of fertilizers
- ii. Ensuring timely availability of fertilizers to the farmers

Taking it Forward...

To develop, establish and implement any field based methodology, participation of local people or farmers is very important. As this survey is related to crop and ownership

mapping, there has to be full participation of land owner. The following methodology has been proposed to increase the active participation of farmers in this survey.

1. Demonstration of survey to Farmers

Complete digitized plot map will be prepared using satellite image. From village cadastral map, we will take *gat* numbers. These maps will be shown to farmers. As the farmers know their *gat* numbers they will come to know which plots falling in their *gat* numbers. To identify plot accurately physical feature map will also be provided to farmers so they will get an idea regarding location of their plots for site association. Once the farmer identifies his/her plot, s/he can provide detailed information about crops in that plots.

2. Data collection from Farmers

With the help of demonstration of survey, farmer will know the spatial distribution of the plots in village. As each plot will be having unique ID, farmer will send the information PlotID wise to field investigator or field investigator will collect the information from farmer. It may happen that farmer is big land holder and may have many plots. In this case if farmer is not able to identify plots then s/he will be taken to the plots and using mobile GPS, plots can be identified. This information will be collected for each season of particular year, so comprehensive database will be generated on cropping system.

3. Validation of Survey

As mentioned earlier, sample plots will be selected to verify the collected data in every season.

X. BENEFITS OF FARMERS PARTICIPATION

1. As the farmer is key person in this survey, he will be aware of what kind of activities are going on in his field. So this can be called as grass-root participative techno survey.

2. There are very less chances of data duplication and along with spatial data, accurate attribute data also will be collected which will improve the data quality and can be used in various domains.

3. It will be cost effective.

XI. CONCLUSION

Looking at the need of reliable data on crop and their applicability in various sectors there is continuous technological updation is going on. In this case, use of GIS, Remote Sensing and mobile GPS can be an efficient solution. Use of these tools will become mandatory in coming years in agricultural domain as these technologies have been proved most efficient and accurate compare to traditional methods. Use of advanced technology with grass root or local knowledge is always advantageous to get better results and generate trustworthy information. Generating, managing and updating such a kind of database can be utilized for development of Decision Support Systems which will further support Spatial Decision Support System (SDSS) on Crop management.

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Image Texture Feature Extraction Using GLCM Approach

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Abstract- Feature Extraction is a method of capturing visual content of images for indexing & retrieval. Primitive or low level image features can be either general features, such as extraction of color, texture and shape or domain specific features. This paper presents an application of gray level co-occurrence matrix (GLCM) to extract second order statistical texture features for motion estimation of images. The Four features namely, Angular Second Moment, Correlation, Inverse Difference Moment, and Entropy are computed using Xilinx FPGA. The results show that these texture features have high discrimination accuracy, requires less computation time and hence efficiently used for real time Pattern recognition applications.

Index Terms- Texture, Pattern recognition, Features, Frames.

I. INTRODUCTION

Feature extraction involves simplifying the amount of resources required to describe a large set of data accurately. When performing analysis of complex data one of the major problems stems from the number of variables involved. Analysis with a large number of variables generally requires a large amount of memory and computation power or a classification algorithm which over fits the training sample and generalizes poorly to new samples. Feature extraction is a general term for methods of constructing combinations of the variables to get around these problems while still describing the data with sufficient accuracy. Texture tactile or visual characteristic of a surface. Texture analysis aims in finding a unique way of representing the underlying characteristics of textures and represent them in some simpler but unique form, so that they can be used for robust, accurate classification and segmentation of objects. Though texture plays a significant role in image analysis and pattern recognition, only a few architectures implement on-board textural feature extraction. In this paper, Gray level co-occurrence matrix is formulated to obtain statistical texture features. A number of texture features may be extracted from the GLCM. Only four second order features namely angular second moment, correlation, inverse difference moment, and entropy are computed. These four measures provide high discrimination accuracy required for motion picture estimation. These features are calculated and implemented using Xilinx ISE 13.4.

II. EXTRACTION OF GLCM

In statistical texture analysis, texture features are computed from the statistical distribution of observed combinations of intensities at specified positions relative to each other in the image. According to the number of intensity points (pixels) in each combination, statistics are classified into first-order, second-order and higher-order statistics. The Gray

Level Cooccurrence Matrix (GLCM) method is a way of extracting second order statistical texture features.

The approach has been used in a number of applications, Third and higher order textures consider the relationships among three or more pixels. These are theoretically possible but not commonly implemented due to calculation time and interpretation difficulty.

A GLCM is a matrix where the number of rows and columns is equal to the number of gray levels, G , in the image. The matrix element $P(i, j | \Delta x, \Delta y)$ is the relative frequency with which two pixels, separated by a pixel distance $(\Delta x, \Delta y)$, occur within a given neighborhood, one with intensity 'i' and the other with intensity 'j'. The matrix element $P(i, j | d, \theta)$ contains the second order statistical probability values for changes between gray levels 'i' and 'j' at a particular displacement distance d and at a particular angle (θ) . Using a large number of intensity levels G implies storing a lot of temporary data, i.e. a $G \times G$ matrix for each combination of $(\Delta x, \Delta y)$ or (d, θ) . Due to their large dimensionality, the GLCM's are very sensitive to the size of the texture samples on which they are estimated. Thus, the number of gray levels is often reduced. GLCM matrix formulation can be explained with the example illustrated in fig 2.1 for four different gray levels. Here one pixel offset is used (a reference pixel and its immediate neighbour). If the window is large enough, using a larger offset is possible. The top left cell will be filled with the number of times the combination 0,0 occurs, i.e. how many time within the image area a pixel with grey level 0 (neighbour pixel) falls to the right of another pixel with grey level 0(reference pixel).

neighbour pixel value ---> ref pixel value:	0	1	2	3
0	0,0	0,1	0,2	0,3
1	1,0	1,1	1,2	1,3
2	2,0	2,1	2,2	2,3
3	3,0	3,1	3,2	3,3

Fig 2.1. GLCM calculation

The MATLAB code used for the GLCM is

```
q1 = imread('Jerry.jpg');
w1 = rgb2gray(q1);
e1 = imresize(w1, [128 128]);
r1 = graycomatrix(e1);
disp(r1);
t1 = imhist(e1);
figure, imshow(e1), title('transformed gray Jerry .jpg in gray');
```

The output will be an 8*8matrix which is a GLCM of input image.

III. EXTRACTION OF TEXTURE FEATURES OF IMAGE

Gray Level Co-Occurrence Matrix (GLCM) has proved to be a popular statistical method of extracting textural feature from images. According to co-occurrence matrix, Haralick defines fourteen textural features measured from the probability matrix to extract the characteristics of texture statistics of remote sensing images. In this paper four important features, Angular Second Moment (energy), (inertia moment), Correlation, Entropy, and the Inverse Difference Moment are selected for implementation using Xilinx ISE 13.4.

3.1. Angular Second Moment

Angular Second Moment is also known as Uniformity or Energy. It is the sum of squares of entries in the GLCM. Angular Second Moment measures the image homogeneity. Angular Second Moment is high when image has very good homogeneity or when pixels are very similar

$$ASM = \sum_{i=0}^{Ng-1} \sum_{j=0}^{Ng-1} P_{ij}^2 \quad \dots 1$$

Where i, j are the spatial coordinates of the function p (i, j), Ng is gray tone.

3.2 Inverse Difference Moment

Inverse Difference Moment (IDM) is the local homogeneity. It is high when local gray level is uniform and inverse GLCM is high.

$$IDM = \frac{\sum_{i=0}^{Ng-1} \sum_{j=0}^{Ng-1} P_{ij}}{1 + (i - j)^2} \quad \dots 2$$

IDM weight value is the inverse of the Contrast weight.

3.3. Entropy

Entropy shows the amount of information of the image that is needed for the image compression. Entropy measures the loss of information or message in a transmitted signal and also measures the image information.

$$ENTROPY = \sum_{i=0}^{Ng-1} \sum_{j=0}^{Ng-1} -P_{ij} * \log P_{ij} \quad \dots 3$$

3.4. Correlation

Correlation measures the linear dependency of grey levels of neighboring pixels. Digital Image Correlation is an optical method that employs tracking & image registration techniques for accurate 2D and 3D measurements of changes in images. This is often used to measure deformation, displacement, strain and optical flow, but it is widely applied in many areas of science and engineering. One very common application is for measuring the motion of an optical mouse.

$$Correlation = \frac{\sum_{i=0}^{Ng-1} \sum_{j=0}^{Ng-1} (i, j) p(i, j) - \mu_x \mu_y}{\sigma_x \sigma_y} \quad \dots 4$$

The formulation and extraction of the four given image features are extracted using matlab for calculating GLCM as image cannot be directly given as input to implement using FPGA. Image feature extraction method used in this paper is given in fig 3.1. All the texture features are real numbers. Real numbers cannot be displayed using waveforms which show only bits as outputs.

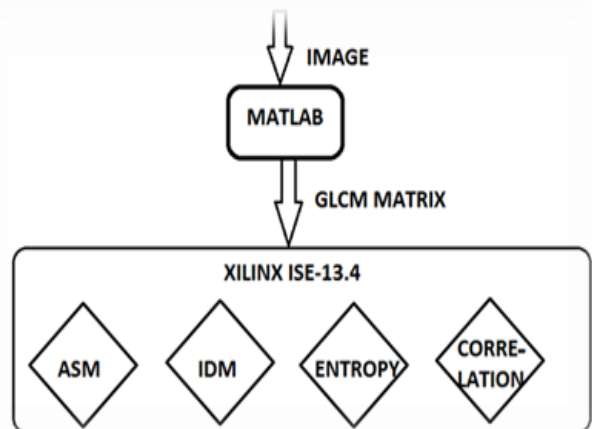


Fig 3.1. Extraction of image features.

So bits are converted to real numbers using “\$bitstoreal” command. Hence the real number output will be displayed in the console window. As the delay given is 10ns, till 10ns the 64 inputs are –nan and after 10ns the inputs will be assigned. The last one is the output which is the texture feature.

IV. RESULTS



RGB to Grey Converted

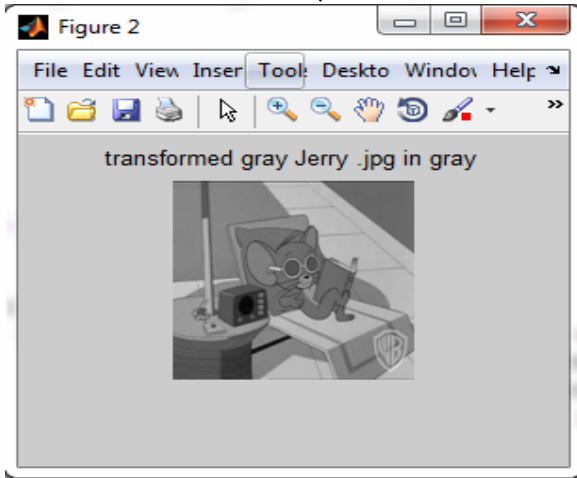
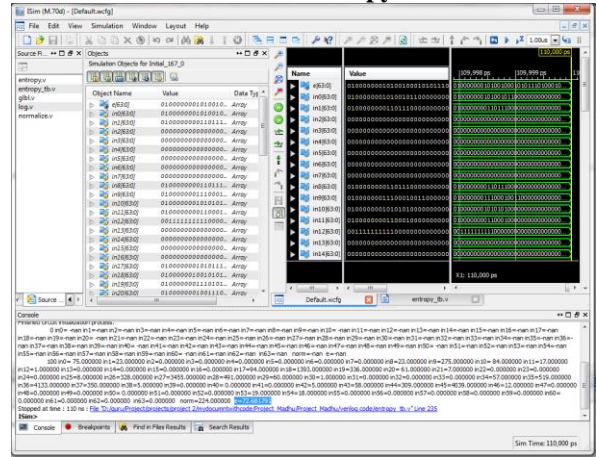


Fig 4.1. Input image & Converted output sample Image of a video

4.2. Grey Level Co-occurrence Matrix

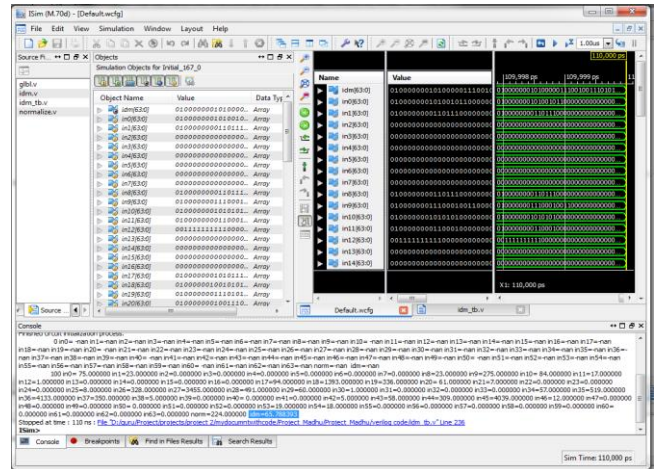
75	23	0	0	0	0	0	0
23	275	84	17	1	0	0	0
0	94	1393	336	61	7	0	0
0	8	328	3455	491	60	1	0
0	0	57	519	4133	350	5	0
0	0	5	58	309	4039	12	0
0	0	0	0	0	19	18	0
0	0	0	0	0	0	0	0

4.2.1. Entropy



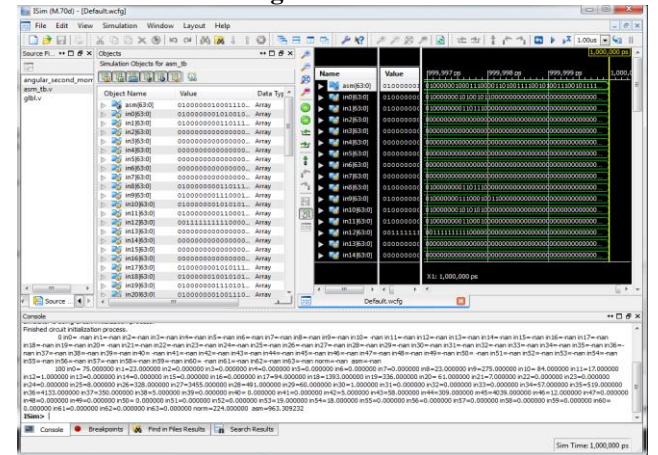
Entropy =72.68175

4.2.2. Inverse Difference Moment



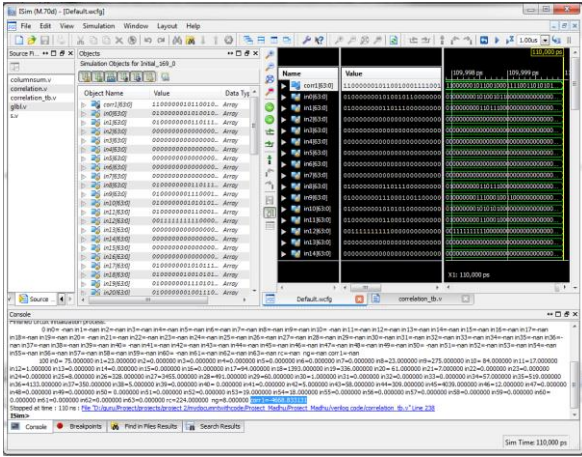
IDM=65.738

4.2.3. Angular Second Moment



Asm=963.309

4.2.3. Correlation



Correlation=-4668.833

Texture Features Extraction for Cartoon Image

Features	Image Size		
	64 x 64	128 x 128	256 x 256
ASM	54.8659	963.309232	17059.1454
Entropy	5.0947	64.164512	436.382
Correlation	-108951.191	-4668.83318	-161.7655
IDM	15.8964	65.788393	271.589

As the size of the image for which Texture features are extracted increases the values of all the features are also increased proportionally. So the optimum size to be used for extraction is 128x128 for better resolution and minimum loss of information.

V. CONCLUSION

The Gray Level Co-occurrence Matrix (GLCM) method is used for extracting four Statistical Texture Parameters i.e., Entropy, Inverse Difference Moment, Angular Second Moment and Correlation. By extracting the features of an image by GLCM approach, the image compression time can be greatly reduced in the process of converting RGB to Gray level image when compared to other DWT Techniques, but however DWT is versatile method of compressing video as a whole. These features are useful in motion estimation of videos and in real time pattern recognition applications like Military & Medical Applications.

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An Efficient Method for Easy Computation by Using θ - Matrix by Considering the Integer Values for Solving Integer Linear Fractional Programming Problems

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Abstract- To minimize the computational effort needed in solving a Linear Fractional programming problem a new approach has been proposed. Here we use θ matrix for finding the solution of the integer linear fractional programming problems.

Index Terms- Integer Linear Fractional Programming Problems, θ matrix and Promising variables.

approach has been proposed. In this method, among the decision variables, the variables which can enter into the basis are identified and ordered based on the maximum contribution to the objective function. The ordered decision variables one by one are allowed to enter into the basis by checking whether it is still giving an improved solution.

I. INTRODUCTION

To solve Integer Linear Fractional Programming Problems with reduced computational effort, a new method of

II. GENERAL INTEGER LINEAR FRACTIONAL PROGRAMMING PROBLEMS IN MATRIX FORM

The general Integer Linear Fractional Programming Problems is given by

$$\begin{aligned} \text{Extremize } Z &= \frac{C^T X + c_0}{D^T X + d_0} \\ \text{Subject to} \\ AX &(\leq = \geq) P^0 \\ X &\geq 0 \text{ and are integer} \end{aligned}$$

$$\text{Where } A^{m \times n} = \begin{bmatrix} a_{11} & a_{12} & a_{13} & \cdot & \cdot & \cdot & a_{1n} \\ a_{21} & a_{22} & a_{23} & \cdot & \cdot & \cdot & a_{2n} \\ a_{31} & a_{32} & a_{33} & \cdot & \cdot & \cdot & a_{3n} \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot & \cdot & \cdot & \cdot \\ a_{m1} & a_{m2} & a_{m3} & \cdot & \cdot & \cdot & a_{mn} \end{bmatrix} \quad X^{n \times 1} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ \cdot \\ \cdot \\ \cdot \\ x_n \end{bmatrix} \quad P^0 = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \\ \cdot \\ \cdot \\ \cdot \\ b_m \end{bmatrix}$$

Let the columns corresponding to the matrix A be denoted by $P^1, P^2, P^3, \dots, P^n$ where

$$P_1 = \begin{bmatrix} a_{11} \\ a_{21} \\ a_{31} \\ \vdots \\ a_{m1} \end{bmatrix} \quad P_2 = \begin{bmatrix} a_{12} \\ a_{22} \\ a_{32} \\ \vdots \\ a_{m2} \end{bmatrix} \quad P_3 = \begin{bmatrix} a_{13} \\ a_{23} \\ a_{33} \\ \vdots \\ a_{m3} \end{bmatrix} \quad \dots \quad P_n = \begin{bmatrix} a_{1n} \\ a_{2n} \\ a_{3n} \\ \vdots \\ a_{mn} \end{bmatrix}$$

$$C^T = (c^1, c^2, c^3, \dots, c^n), \quad D^T = (d^1, d^2, d^3, \dots, d^n) \text{ and } c^0, d^0 \text{ are scalars.}$$

III. APPROACH

In this new approach to solve Integer Linear Fractional Programming Problems, three phases are included and those phases are given below.

Phase I:

Promising decision variables are identified to enter in the basis and those promising variables are ordered based on the contribution to the objection function.

Phase II:

The arranged promising variables are allowed to enter into the basis in the arranged order after checking whether the newly entering variables will improve the objective function of the problem, keeping the feasibility.

Phase III:

Finding the improved solution vector.

The expanded form of θ matrix is

$$\begin{array}{c}
 \\
 \\
 x_1 \\
 \\
 x_2 \\
 \\
 \\
 x_j \\
 \\
 \\
 x_n
 \end{array}
 \begin{bmatrix}
 S^1 & S^2 & \dots & S^i & \dots & S^m \\
 \frac{b_1}{a_{11}} & \frac{b_2}{a_{21}} & \dots & \frac{b_i}{a_{i1}} & \dots & \frac{b_m}{a_{m1}} \\
 \frac{b_1}{a_{12}} & \frac{b_2}{a_{22}} & \dots & \frac{b_i}{a_{i2}} & \dots & \frac{b_m}{a_{m2}} \\
 \vdots & \vdots & \dots & \vdots & \dots & \vdots \\
 \frac{b_1}{a_{1j}} & \frac{b_2}{a_{2j}} & \dots & \frac{b_i}{a_{ij}} & \dots & \frac{b_m}{a_{mj}} \\
 \vdots & \vdots & \dots & \vdots & \dots & \vdots \\
 \frac{b_1}{a_{1n}} & \frac{b_2}{a_{2n}} & \dots & \frac{b_i}{a_{in}} & \dots & \frac{b_m}{a_{mn}}
 \end{bmatrix}$$

Each row of the θ matrix consists of m number of intercepts of the decision variable along their respective axes and each column consists of intercepts formed by the decision number of promising variables in each of the m constraints.

The above three phases are repeated till the optimum solution reached. In this method, the promising variables are identified and arranged based on the maximum contribution to the objective function by considering the **integer values** of the θ matrix entries. The step by step procedure is as given below.

- Step 1:** Let iteration = 0
- Step 2:** Perform phase I
- Step 3:** Perform phase II
- Step 4:** If the set J is empty then, Perform phase III
- Step 5:** stop.

Phase I - Ordering of Promising variables

Step 1. Using the intercepts of the decision variables along the respective axes with respect to the chosen basis a matrix is called θ matrix is to be constructed. A typical intercept for the

$$j^{th} \text{ variable, } x^j \text{ due to the } i^{th} \text{ the resource, } b^i \text{ is } \left\{ \frac{b_i}{a_{ij}} \right\} \quad a^{ij} > 0$$

Step 2. The minimum integer intercepts and its position in each row of θ matrix is found out. If there are more one minimum integer intercept then one of them is selected arbitrarily. Multiply the minimum intercept of the variable

corresponding to a row with the corresponding contribution coefficient in the objective function both in the numerator and

denominator and the objective function value $\left(\frac{c_j x_j + c_0}{d_j x_j + d_0} \right)$ is calculated.

Step 3. Let $\lambda = 0$. J is a set consisting of the subscript of the promising variables.

Step 4. Select the variable whose $\left(\frac{c_j x_j + c_0}{d_j x_j + d_0} \right)$ value is

the largest integer. If the same largest integer value occurs, for more than one variable then the variable that has maximum contribution including the fractional value is taken as the promising variable. If that is also same then select any one arbitrarily.

Step 5. Let it be x_R . Then x_R is selected as the promising variable.

Step 6. Increment λ by 1. The subscript of the variable x_R is stored as the l^{th} element in set J.

Step 7. The row corresponding to the variable x_R as well as the other rows whose minimum occurs in the column at which the minimum for x_R occurs are deleted.

Step 8. Step 4 to 7 is repeated till either all the rows or all the columns are deleted.

Step 9. The set of variables collected in Steps 4 to 7 are the ordered promising variables.

Let $J = \{\text{Subscripts of the promising variables arranged in the descending}$

$$\text{order} \left(\frac{c_j x_j + c_0}{d_j x_j + d_0} \right) \text{ value} \}.$$

Let λ be the total number of elements in the set J.

Phase II – Arranged variables are allowed to enter into the basis

The arranged promising variables are allowed to enter into the basis one by one based on the entering criteria. The step by step procedure is given below.

Step 1. Let $k = 1$, X^B is the solution vector and flag (=0) is the flag vector

$$\text{flag} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ \cdot \\ \cdot \\ \cdot \\ 0 \end{bmatrix}_{n \times 1} ; \quad P^{0-old} = P^0$$

Step 2. Iteration is incremented by 1.

Step 3. The k^{th} element in the set J is selected and let it be j. Then the entering variable is x_j .

Step 4. Computation of x_j value.

The value with which x_j can enter into the basis is computed by using the following formula,

$$\theta_k = \min \left\{ \text{int} \left\{ \frac{(P_{0-old})_i}{(P_j)_i} \right\} ; (P_j)^i > 0 \right\} \quad i = 1, 2, 3, \dots, m$$

Step 5. If $\theta_k = 1$ and $k=1$ then the value of $\alpha = 1$ else the value of α is chosen between 0 to 1 (Let $\alpha = 0.5$)

$$\text{Compute } S = \text{int} (\alpha \theta_k)$$

$$\varepsilon_k = \text{int} (1 - \alpha) \theta_k$$

Step 6. S is added to the j^{th} element of the vector X^B and 1 is added to flag^j

Step 7. P^0 vector is modified using the relation

$$(P^{0-new})^i = (P^{0-old})^i - (P_j)^i S \quad i = 1, 2, \dots, m$$

Step 8. (P^{0-old}) is replaced by (P^{0-new})

If $k=1$ or $S \leq 1$ go to step 16

Step 9. Check whether k^{th} element is still promising among the remaining list of $(\lambda - k)$ promising variables in set J using the following steps.

Step 10. Let $r = 1$

Step 11. Select the $(k + r)^{th}$ element in this set J. Let it be q. Then the variable corresponding position x^q .

Step 12. Find θ_q using the formula

$$\theta_q = \min \left\{ \text{int} \left\{ \frac{(P_{0-old})_i}{(P_j)_i} \right\} ; (P_j)^i > 0 \right\}$$

$$\varepsilon_q = \left(\frac{c_q \theta_q + c_0}{d_q \theta_q + d_0} \right)$$

Step 13. If $\varepsilon^k < \varepsilon_q$ goto step 15

Step 14. Increment r by one

If $r \leq (\lambda - k)$ then goto step 11. Else goto step 16.

Step 15. k is replaced by k + r and ε^k is replaced by ε_q

If $k < \lambda$ goto step 10

Step 16. If $\text{flag}^k \leq 1$ goto step 3.
Else goto Perform Phase I.

Phase III – Determination of new (improved) solution vector to the Integer Linear Fractional Programming Problems

Except for the most promising variable in the solution set obtained in phase II the values of remaining variables are set to zero. Taking this as starting solution, phase I and II are performed until improved solution is obtained. If there is no improvement the next promising variable value along with the most promising variable also is retained and the remaining basic variables made to zero. Phase III is repeated until the basic variables list exhausted.

IV. ALGORITHM

Stage I. The basic variables are arranged according to the descending order of their contribution to the objective function

Step 1. $\lambda = 0, k = 0, n^1$ is the number of basic variables having nonzero values in the solution

Step 2. X is the solution vector obtained in phase II.

Step 3. If λ^{th} element in X, ie $X^\lambda > 0$, then

Multiply $\left(\frac{c_\lambda x_\lambda + c_0}{d_\lambda x_\lambda + d_0} \right)$, let it be stored as k^{th} row 0^{th} column element of array W and λ is stored as k^{th} row 1^{th} column element of array W. k is incremented by one.

Step 4. λ is incremented by one

Step 5. If $\lambda < n^1$ then goto step 3.

Step 6. The array W is sorted in the descending order based on the 0^{th} column values of W

Where $x_1, x_2, x_3, x_4, x_5, x_6 \geq 0$ and all are integers

Solution

$$A = \begin{pmatrix} 4 & 2 & 5 & 7 & 7 & 7 \\ 4 & 2 & 4 & 9 & 9 & 1 \\ 9 & 3 & 1 & 4 & 7 & 9 \\ 5 & 3 & 1 & 2 & 4 & 6 \end{pmatrix}, P_0 = \begin{pmatrix} 325 \\ 400 \\ 425 \\ 425 \end{pmatrix}, P_1 = \begin{pmatrix} 4 \\ 4 \\ 9 \\ 5 \end{pmatrix}, P_2 = \begin{pmatrix} 2 \\ 2 \\ 3 \\ 3 \end{pmatrix}, P_3 = \begin{pmatrix} 5 \\ 4 \\ 1 \\ 1 \end{pmatrix}$$

Stage II. Finding the solution by assigning all the variable values except one in the basis to zero level.

Step 7. $k = 0$

Step 8. $\lambda = 0$

Step 9. $i = 0$

Step 10. If $i \neq k$ then

$$J = W^{i1}$$

$$X^j = 0$$

Step 11. i is incremented by one

Step 12. If $i < n^1$ then goto step 10

Step 13. Now P^c is the current resource vector or (RHS) and corresponding objective function value Z^1 is calculated.

Stage III. Find the new solution

Step 14. Use phase I and phase II and find the new solution X which is stored as $Y(\lambda)$ and the corresponding objective function value Z^2 is stored as $V(\lambda)$.

Step 15. λ is incremented by one

Step 16. If $\lambda < n^1$ then goto step 9

Step 17. Find the largest of $V(\lambda)$ and its position pos,

where $(0 \leq \lambda < n^1)$, Let it be stored in Z^3 **Step 18.** If $Z^3 > Z$, then Replace X by Y (pos)

goto step 7. else if $k < n^1$ then increment k by 1.
goto step 8.

V. NUMERICAL EXAMPLES

Solve the following Integer linear fractional Programming Problem.

Maximize

$$Z = \frac{4x_1 + 17x_2 + 24x_3 + 23x_4 + 19x_5 + 13x_6 + 2}{2x_1 + 3x_2 + 4x_3 + 6x_4 + 3x_5 + 3x_6 + 50}$$

Subject to the constraints

$$4x_1 + 2x_2 + 5x_3 + 7x_4 + 7x_5 + 7x_6 \leq 325$$

$$4x_1 + 2x_2 + 4x_3 + 9x_4 + 9x_5 + x_6 \leq 400$$

$$9x_1 + 3x_2 + x_3 + 4x_4 + 7x_5 + 9x_6 \leq 425$$

$$5x_1 + 3x_2 + x_3 + 2x_4 + 4x_5 + 6x_6 \leq 425$$

$$X = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \end{pmatrix}, P_4 = \begin{pmatrix} 7 \\ 9 \\ 4 \\ 2 \end{pmatrix}, P_5 = \begin{pmatrix} 7 \\ 9 \\ 7 \\ 4 \end{pmatrix}, P_6 = \begin{pmatrix} 7 \\ 1 \\ 9 \\ 6 \end{pmatrix}$$

$$C^T = (4, 17, 24, 23, 19, 13), D^T = (2, 3, 4, 6, 3, 5, 50), C_0 = 2, D_0 = 50.$$

Phase - I

To find θ Matrix

d_j	c_j	x_j	$\frac{c_j x_j + 2}{d_j x_j + 50}$
2	4	x_1	
3	17	x_2	
4	24	x_3	
6	23	x_4	
3	19	x_5	
$\theta = 3$	13	x_6	

				81	100	47	85	1.319
				162	200	141	141	5.072
				65	100	425	425	5.039
				46	44	106	212	3.229
				46	44	60	106	4.604
				46	400	47	70	3.191

Arrangement of promising variables
 $J = \{2, 3, 5\}$

Phase - II

$X_2 \rightarrow$ promising variable

$$\theta = \text{minimum} \left\{ \text{int} \left(\frac{325}{2}, \frac{425}{3} \right) \right\} = \text{minimum} (162, 200, 141, 141) = 141$$

$\therefore S = 70$

$$Z = \frac{1190 + 2 \cdot 1192}{210 + 50} = \frac{260}{260} = 4.585$$

$$(P_0 - \text{new})_1 = 325 - 70 \times 2 = 185$$

$$(P_0 - \text{new})_2 = 400 - 70 \times 2 = 260$$

$$(P_0 - \text{new})_3 = 425 - 70 \times 3 = 215$$

$$(P_0 - \text{new})_4 = 425 - 70 \times 3 = 215$$

$X_2 \rightarrow$ promising variable

$$\theta = \text{minimum} \left\{ \text{int} \left(\frac{185}{2}, \frac{215}{3} \right) \right\} = \text{minimum} (92, 130, 71, 71) = 71$$

$\therefore S = 35$

$$Z = \frac{17 \times 35 + 1192}{3 \times 35 + 260} = \frac{595 + 1192}{105 + 260} = \frac{1787}{365} = 4.896$$

$$(P_0 - \text{new})_1 = 115, (P_0 - \text{new})_2 = 190, (P_0 - \text{new})_3 = 110, (P_0 - \text{new})_4 = 110$$

Repeating this procedures Phase I and Phase II we get the solution as

The current solution is $x_2 = 130, x_3 = 13$

$$\text{Maximum } Z = \frac{130 \times 17 + 24 \times 13 + 2}{3 \times 130 + 4 \times 13 + 50} = \frac{2524}{492} = 5.130$$

Phase - III

x_2 is retained 130 and remaining variables are set to zero ,that is $x_3 = 0$.

$$\text{Now } P_0 = \begin{pmatrix} 65 \\ 140 \\ 35 \\ 35 \end{pmatrix}$$

Following similarly we get the final solution

The OptimaPhase - I

To find θ Matrix

d_j	c_j	x_j							
									$\frac{c_j x_j + 2}{d_j x_j + 50}$
2	4	x_1	16	35	3	7			0.25
3	17	x_2	32	70	11	11			2.28
4	24	x_3	13	35	35	35			3.08
6	23	x_4	9	15	8	17			2.01
3	19	x_5	9	15	5	8			1.49
$\theta = 3$	13	x_6	9	140	3	5			0.69

Arrangement of promising variables

$$J = \{ 3, 2 \}$$

Phase - II

$X_3 \rightarrow$ promising variable

$$\theta = \text{minimum} \left\{ \text{int} \left(\frac{65}{5}, \frac{35}{1} \right) \right\} = \text{minimum} (13, 35, 35, 35) = 13$$

$\therefore S = 6$

$$Z = \frac{6 \times 24 + 17 \times 130 + 2}{6 \times 4 + 3 \times 130 + 50} = \frac{144 + 2212}{24 + 440} = \frac{2356}{464} = 5.08$$

$(P_0 - \text{new})_1 = 35, (P_0 - \text{new})_2 = 116, (P_0 - \text{new})_3 = 29, (P_0 - \text{new})_4 = 29$

Following similarly we get

$X_3 \rightarrow$ promising variable

$$\theta = \text{minimum} \left\{ \text{int} \left(\frac{5}{5}, \frac{23}{1} \right) \right\} = \text{minimum} (1, 23, 23, 23) = 1$$

$\therefore S = 1$

$$Z = \frac{1 \times 24 + 2500}{1 \times 4 + 488} = \frac{2524}{492} = 5.13$$

$(P_0 - \text{new})_1 = 0, (P_0 - \text{new})_2 = 88, (P_0 - \text{new})_3 = 22, (P_0 - \text{new})_4 = 22$

Phase - I

To find θ Matrix

d_j	c_j	x_j							
									$\frac{c_j x_j + 2524}{d_j x_j + 492}$

$$\theta = \begin{matrix} 2 & 4 & x_1 \\ 3 & 17 & x_2 \\ 4 & 24 & x_3 \\ 6 & 23 & x_4 \\ 3 & 19 & x_5 \\ 3 & 13 & x_6 \end{matrix} \begin{bmatrix} 0 & 22 & 2 & 4 \\ 0 & 44 & 7 & 7 \\ 0 & 22 & 22 & 22 \\ 0 & 9 & 5 & 11 \\ 0 & 9 & 3 & 5 \\ 0 & 88 & 2 & 3 \end{bmatrix} \begin{matrix} - \\ - \\ - \\ - \\ - \\ - \end{matrix}$$

Arrangement of promising variables
 $J = \{ \}$

Here the Phase – III will not improve the solution so, the optimal solution is
 $x_2 = 130, x_3 = 13$

$$\text{Maximize } Z = \frac{130 \times 17 + 24 \times 13 + 2}{3 \times 130 + 4 \times 13 + 50} = \frac{2524}{492} = 5.13$$

VI. CONCLUSION

In this a new approach to solve Integer Linear Fractional Programming problem has been discussed. The above algorithm rendered best optimal solution. In Future this method can be applied in Mixed Integer Linear Fractional programming problem to get a better optimal solution.

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Short Term Optimal Generation Scheduling of Fixed Head Hydrothermal System Using Genetic Algorithm and Constriction Factor Based Particle Swarm Optimization Technique

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Abstract- In this paper, a genetic algorithm (GA) and constriction factor based particle swarm optimization technique are proposed for solving the short term fixed head hydrothermal scheduling problem with transmission line losses. The performance efficiency of the proposed techniques is demonstrated on hydrothermal test system comprising of three thermal units and one hydro power plant. A wide range of thermal and hydraulic constraints such as real power balance constraint, minimum and maximum limits of thermal and hydro units, water availability limit and discharge rate limits are taken into account. The simulation results obtained from the constriction factor based particle swarm optimization technique are compared with the outcomes obtained from the genetic algorithm to reveal the validity and verify the feasibility of the proposed methods. The test results show that the constriction factor based particle swarm optimization approach give the same solution as obtained by genetic algorithm but the computation time of the constriction factor based particle swarm optimization method is less than genetic algorithm.

Index Terms- Hydrothermal Generation Scheduling, Genetic Algorithm (GA), Particle Swarm Optimization (PSO), Constriction Factor (CF)

I. INTRODUCTION

THE hydrothermal generation scheduling plays an important role in the operation and planning of a power system. Since the operating cost of thermal power plant is very high compared to the operating cost of hydro power plant, the integrated operation of the hydro and thermal plants in the same grid has become the more economical [1]. The main objective of the short term hydro thermal scheduling problem is to determine the optimal generation schedule of the thermal and hydro units to minimize the total

production cost over the scheduling time horizon (typically one day or one week) subjected to a variety of thermal and hydraulic constraints. The hydrothermal generation scheduling is mainly concerned with both hydro unit scheduling and thermal unit dispatching. The hydrothermal generation scheduling problem is more difficult than the scheduling of thermal power systems. Since there is no fuel cost associated with the hydro power generation, the problem of minimizing the total production cost of hydrothermal scheduling problem is achieved by minimizing the fuel cost of thermal power plants under the constraints of water available for the hydro power generation in a given period of time [2]. In short term hydrothermal scheduling problem, the generating unit limits and the load demand over the scheduling interval are known. Several mathematical optimization techniques have been used to solve short term hydrothermal scheduling problems [3]. In the past, hydrothermal scheduling problem is solved using classical mathematical optimization methods such as dynamic programming method [4-5], lagrangian relaxation method [6-7], mixed integer programming [8], interior point method [9], gradient search method and Newton raphson method [2]. In these conventional methods simplifying assumptions are made in order to make the optimization problem more tractable. Thus, most of conventional optimization techniques are unable to produce optimal or near optimal solution of this kind of problems. The computational time of these methods increases with the increase of the dimensionality of the problem. The most common optimization techniques based upon artificial intelligence concepts such as evolutionary programming [10-11], simulated annealing [12-14],

differential evolution [15], artificial neural network [16-18], genetic algorithm [19 -22] and particle swarm optimization [23-27] have been given attention by many researchers due to their ability to find an almost global or near global optimal solution for short term hydrothermal scheduling problems with operating constraints. Major problem associated with these techniques is that appropriate control parameters are required. Sometimes these techniques take large computational time due to improper selection of the control parameters.

The PSO is a population based optimization technique first proposed by Kennedy and Eberhart in 1995. In PSO, each particle is a candidate solution to the problem. Each particle in PSO makes its decision based on its own experience together with other particles experiences. Particles approach to the optimum solution through its present velocity, previous experience and the best experience of its neighbors [28]. Compared to other evolutionary computation techniques, PSO can solve the problems quickly with high quality solution and stable convergence characteristic, whereas it is easily implemented.

The genetic algorithm (GA) is a stochastic global search and optimization method that mimics the metaphor of natural biological evolution such as selection, crossover and mutation. GA is started with a set of candidate solutions called population (represented by chromosomes). At each generation, pairs of chromosomes of the current population are selected to mate with each other to produce the children for the next generation. The chromosomes which are selected to form the new offspring are selected according to their fitness. In general, the chromosomes with higher fitness values have higher probability to reproduce and survive to the next generation. While the chromosomes with lower fitness values tend to be discarded. This process is repeated until a termination condition is reached (for example maximum number of generations). Most of the GA parameters are set after considerable experimentation and the major drawback of this method is the lack of a solid theoretical basis for their setting.

II. PROBLEM FORMULATION

The main objective of short term hydro thermal scheduling problem is to minimize the total fuel cost of thermal power plants over the optimization period

while satisfying all thermal and hydraulic constraints. The objective function to be minimized can be represented as follows:

$$FT = \sum_{t=1}^T \sum_{i=1}^N ntFit(P_{git}) \quad (1)$$

In general, the fuel cost function of thermal generating unit i at time interval t can be expressed as a quadratic function of real power generation as follows:

$$Fit(P_{git}) = a_i P_{git}^2 + b_i P_{git} + c_i \quad (2)$$

Where P_{git} is the real output power of thermal generating unit i at time interval t in (MW), $Fit(P_{git})$ is the operating fuel cost of thermal unit i in (\$/hr), FT is the total fuel cost of the system in (\$), T is the total number of time intervals for the scheduling horizon, nt is the numbers of hours in scheduling time interval t , N is the total number of thermal generating units, a_i, b_i and c_i are the fuel cost coefficients of thermal generating unit i .

The minimization of the objective function of short term hydrothermal scheduling problem is subject to a number of thermal and hydraulic constraints. These constraints include the following:

1) Real Power Balance Constraint:

For power balance, an equality constraint should be satisfied. The total active power generation from the hydro and thermal plants must equal to the total load demand plus transmission line losses at each time interval over the scheduling period.

$$\sum_{i=1}^N P_{git} + \sum_{j=1}^M P_{hjt} = P_{Dt} + P_{Lt} \quad (3)$$

Where, P_{Dt} is the total load demand during the time interval t in (MW), P_{hjt} is the power generation of hydro unit j at time interval t in (MW), P_{git} is the power generation of thermal generating unit i at time interval t in (MW) and P_{Lt} represents the total transmission line losses during the time interval t in (MW).

The total transmission line loss is assumed as a quadratic function of output powers of the generator units [29] that can be approximated in the form:

$$PL_k = \sum_{i=1}^{N+M} \sum_{j=1}^{N+M} P_{it} B_{ij} P_{jt} \quad (4)$$

Where B_{ij} is the transmission loss coefficient matrix, P_{it} and P_{jt} are the power generation of hydro or thermal plants and M is the number of hydro power plants.

2) Thermal Generator Limit Constraint:

The output power generation of thermal power plant must lie in between its minimum and maximum limits. The inequality constraint for each thermal generator can be expressed as:

$$P_{gi}^{\min} \leq P_{git} \leq P_{gi}^{\max} \quad (5)$$

Where P_{gi}^{\min} and P_{gi}^{\max} are the minimum and maximum power outputs of thermal unit i in (MW), respectively. The maximum output power of thermal generator i is limited by thermal consideration and minimum power generation is limited by the flame instability of a boiler.

3) Hydro Generator Limit Constraint:

The output power generation hydro power plant must lie in between its minimum and maximum bounds. The inequality constraint for each hydro generator can be defined as:

$$P_{hj}^{\min} \leq P_{hjt} \leq P_{hj}^{\max} \quad (6)$$

Where P_{hj}^{\min} is the minimum power generation of hydro generating unit j in (MW) and P_{hj}^{\max} is the maximum power generation of hydro generating unit j in (MW).

4) Water Discharge Rate Limit Constraint:

The water Discharge rate of hydro turbine must lie in between its minimum and maximum operating limits.

$$q_{hj}^{\min} \leq q_{hjt} \leq q_{hj}^{\max} \quad (7)$$

Where q_{hj}^{\min} and q_{hj}^{\max} are the minimum and maximum water discharge rate of reservoir j , respectively

5) Water Availability Limit:

For the scheduling time period, each hydro generating plant is restricted by the amount of water available in the reservoir as follows:

$$\sum_{t=1}^T n t q_{hjt} = V_{hj} \quad (8)$$

Where q_{hjt} is the water discharge rate of hydro unit j during the time interval t and V_{hj} is the volume of water stored in hydro reservoir j .

III. PERFORMANCE MODEL OF HYDRO POWER PLANT

The output power of each hydro electric power plant varies with the effective head of reservoir and the water discharge rate through the turbines. According to Glimm Kirchmayer model, the water discharge rate is a function of output power generation and the net hydraulic head and can be represented as follows:

$$q_{hjt} = k \psi(h_j) \phi(P_{hjt}) \quad (9)$$

Where q_{hjt} is the water discharge rate of the reservoir j , k is the constant of proportionality; h_j is the effective head of reservoir j and P_{hjt} is the output power of hydro generating unit j at time interval t .

Where ψ and ϕ are quadratic functions and are given by:

$$\psi(h_j) = \alpha h_j^2 + \beta h_j + \gamma \quad (10)$$

$$\phi(P_{hjt}) = x P_{hjt}^2 + y P_{hjt} + z \quad (11)$$

Where x , y and z are the water discharge coefficients α , β and γ are positive coefficients.

For large reservoir capacity the effective head is assumed to be constant over the optimization period. Thus, for fixed head reservoir, the output power of each hydro unit is function only of water discharge

rate. Thus the function $\psi(h_j)$ is constant and hence, equation (9) can be rewritten as:

$$q_{hjt} = k_1 \varphi(P_{hjt}) \quad (12)$$

The characteristic equation of the water discharge rate of the j^{th} hydro generating unit at time interval t can be represented by the quadratic equation as follows:

$$q_{hjt} = x_j P_{hjt}^2 + y_j P_{hjt} + z_j \quad (13)$$

Where: x_j , y_j and z_j are the water discharge coefficients of hydro unit j .

IV. OVERVIEW OF GENETIC ALGORITHM (GA)

The GA is a method for solving optimization problems that is based on natural selection, the process that drives biological evolution. The general scheme of GA is initialized with a population of candidate solutions (called chromosomes). Each chromosome is evaluated and given a value which corresponds to a fitness level in problem domain. At each generation, the GA selects chromosomes from the current population based on their fitness level to produce offspring. The chromosomes with higher fitness levels have higher probability to become parents for the next generation, while the chromosomes with lower fitness levels to be discarded. After the selection process, the crossover operator is applied to parent chromosomes to produce new offspring chromosomes that inherit information from both sides of parents by combining partial sets of genes from them. The chromosomes or children resulting from the crossover operator will now be subjected to the mutation operator in final step to form the new generation. Over successive generations, the population evolves toward an optimal solution. A schematic outline of simple genetic algorithm is illustrated in figure 1.

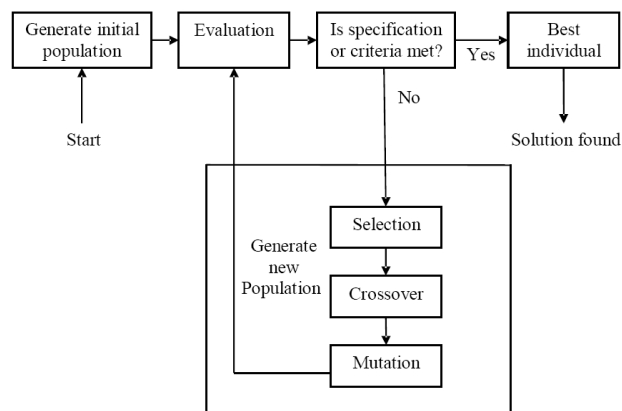


Fig.1. Schematic outline of simple genetic algorithm

The features of GA are different from other traditional methods of optimization in the following respects [30]:

- GA does not require derivative information or other auxiliary knowledge.
- GA work with a coding of parameters instead of the parameters themselves. For simplicity, binary coded is used in this paper.
- GA search from a population of points in parallel, not a single point.
- GA use probabilistic transition rules, not deterministic rules.

A. Genetic Algorithm Operators

At each generation, GA uses three operators to create the new population from the previous population:

1) Selection or Reproduction

Selection operator is usually the first operator applied on the population. The chromosomes are selected based on the Darwin's evolution theory of survival of the fittest. The chromosomes are selected from the population to produce offspring based on their fitness values. The chromosomes with higher fitness values are more likely to contributing offspring and are simply copied on into the next population. The commonly used reproduction operator is the proportionate reproduction operator. The i^{th} string in the population is selected with a probability proportional to F_i where, F_i is the fitness value for that string. The probability of selecting the i^{th} string is:

$$P_i = \frac{F_i}{\sum_{j=1}^n F_j} \quad (14)$$

Where n is the population size, the commonly used selection operator is the roulette-wheel selection method. Since the circumference of the wheel is marked according to the string fitness, the roulette-wheel mechanism is expected to make F_i/F_{avg} copies of the i^{th} string in the mating pool. The average fitness of the population is:

$$F_{avg} = \frac{\sum_{i=1}^n F_i}{n} \quad (15)$$

2) Crossover or Recombination

The basic operator for producing new chromosomes in the GA is that of crossover. The crossover produce new chromosomes have some parts of both parent chromosomes. The simplest form of crossover is that of single point crossover. In single point crossover, two chromosomes strings are selected randomly from the mating pool. Next, the crossover site is selected randomly along the string length and the binary digits are swapped between the two strings at crossover site.

3) Mutation

The mutation is the last operator in GA. It prevents the premature stopping of the algorithm in a local solution. The mutation operator enhances the ability of the genetic algorithm to find a near optimal solution to a given problem by maintaining a sufficient level of genetic variety in the population. This operator randomly flips or alters one or more bits at randomly selected locations in a chromosome from 0 to 1 or vice versa.

4) Parameters of Genetic Algorithm (GA)

The performance of GA depends on choice of GA parameters such as:

i. Population size (N_p): The population size affects the efficiency and performance of the algorithm. Higher population size increases its diversity and reduces the chances of premature converge to a local optimum, but the time for the population to converge to the optimal regions in the search space will also increase. On the other hand, small population size

may result in a poor performance from the algorithm. This is due to the process not covering the entire problem space. A good population size is about 20-30, however sometimes sizes 50-100 are reported as best.

ii. Crossover rate: The crossover rate is the parameter that affect the rate at which the process of cross over is applied. This rate generally should be high, about 80-95%.

iii. Mutation rate: It is a secondary search operator which increases the diversity of the population. Low mutation rate helps to prevent any bit position from getting trapped at a single value, whereas high mutation rate can result in essentially random search. This rate should be very low.

5) Termination of the GA

The generational process is repeated until a termination condition has been satisfied. The common terminating conditions are:

- The algorithm reaches the specified number of generations.
- The algorithm runs for a specified amount of time.
- The best fitness value in the current population is less than or equal to the specified value.
- The best solution is not changed after a set number of generations.
- The algorithm runs for a specified amount of time with no improvement in the fitness function.

V. GA APPLIED TO SHORT TERM HYDROTHERMAL SCHEDULING

In genetic algorithm, the water discharge through the turbines during each optimization interval is used as the main control variable. In binary genetic algorithm representation, the water discharge rates for each reservoir at each time interval are represented by a given number of binary strings. In GA binary representation, the water discharge rate is used rather than the output power generation of hydro units because the encoded parameter is more beneficial for dealing with water balance constraints. The binary representation of hydro thermal coordination problem is illustrated in figure 2.

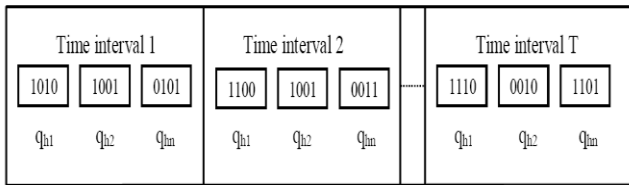


Fig.2. Binary representation of hydro thermal scheduling problem

The generated string can be converted in the feasible range by using the following equation:

$$q_{hj} = q_{hj}^{\min} + \left(\frac{q_{hj}^{\max} - q_{hj}^{\min}}{2^L - 1} \right) \times d_i \quad (16)$$

Where q_{hj}^{\min} is the minimum value of discharge rate through hydro turbine j, q_{hj}^{\max} is the maximum value of discharge rate through hydro turbine j, L is the String length (number of bits used for encoding water discharge rate of each hydro unit) and d_i is the binary coded value of the string (decimal value of string).

By knowing the water discharge rate of each hydro power plant the output power of hydro power plant can be determined. The total power generations of all hydro power plants are subtracted from the total system load demand for each hour. The remaining load must be satisfied by running thermal units for each hour. An economic load dispatch problem is achieved and the fuel cost for each thermal unit over the scheduling period is calculated.

VI. ALGORITHM FOR SHORT TERM HYDROTHERMAL SCHEDULING PROBLEM USING GA METHOD

The sequential steps of solving short term hydro thermal scheduling problem by using genetic algorithm are explained as follows:

Step 1: Read the system input data, namely fuel cost curve coefficients, power generation limits of hydro and thermal units, number of thermal units, number of hydro units, power demands, water discharge rate coefficients, amount of water available in hydro reservoir, transmission loss coefficients matrix, water discharge rate limits.

Step 2: Select genetic algorithm parameters such as population size, length of string, probability of crossover, probability of mutation and maximum number of generations to be performed.

Step 3: Generate the initial population randomly in the binary form. The initial population must be feasible candidate solutions that satisfy the practical operation constraints of all thermal and hydro units.

Step 4: Calculate the discharge rate of each hydro unit from the decoded population by using equation (16).

Step 5: Check the inequality constraint of the water discharge rate for each hydro unit from the following equation:

$$q_{hjt} = \begin{cases} q_{hjt} & \text{if } q_{hj}^{\min} \leq q_{hjt} \leq q_{hj}^{\max} \\ q_{hj}^{\min} & \text{if } q_{hjt} \leq q_{hj}^{\min} \\ q_{hj}^{\max} & \text{if } q_{hjt} \geq q_{hj}^{\max} \end{cases} \quad (17)$$

Step 6: Calculate the hydro power generation of each hydro unit.

Step 7: Check the inequality constraint of hydro power generation according to the following equation:

$$P_{hjt} = \begin{cases} P_{hjt} & \text{if } P_{hj}^{\min} \leq P_{hjt} \leq P_{hj}^{\max} \\ P_{hj}^{\min} & \text{if } P_{hjt} \leq P_{hj}^{\min} \\ P_{hj}^{\max} & \text{if } P_{hjt} \geq P_{hj}^{\max} \end{cases} \quad (18)$$

Step 8: Calculate the thermal demand by subtracting the generation of hydro units from the total load demand. The thermal demand (total load – hydro generation) must be covered by the thermal units. The thermal generations are calculated from the power balance equation given in (4).

Step 9: Calculate the output power of each thermal unit by solving economic load dispatch problem.

Step 10: Check the inequality constraint of thermal power generation for each thermal unit according to the following equation:

$$P_{git} = \begin{cases} P_{git} & \text{if } P_{gi}^{\min} \leq P_{git} \leq P_{gi}^{\max} \\ P_{gi}^{\min} & \text{if } P_{git} \leq P_{gi}^{\min} \\ P_{gi}^{\max} & \text{if } P_{git} \geq P_{gi}^{\max} \end{cases} \quad (19)$$

Step 11: Evaluate the fitness value for each string in the population by using the objective function stated in equation (1).

Step 12: The chromosomes with lower cost function are selected to become parents for the next generation.

Step 13: Perform the crossover operator to parent chromosomes to create new offspring chromosomes.

Step 14: The mutation operator is applied to the new offspring resulting from the crossover operation to form the new generation.

Step 15: Update the population.

Step 16: If the number of iterations reached the maximum, then go to step 17. Otherwise go to step 4.

Step 17: The string that generates the minimum total fuel cost of the thermal power plants is the optimal solution of the problem.

Step 18: Print the outputs of hydrothermal scheduling and stop.

VII. CONSTRICTION FACTOR BASED PARTICLE SWARM OPTIMIZATION TECHNIQUE

A. Overview of Particle Swarm Optimization

Particle swarm optimization (PSO) is a population based stochastic optimization technique, inspired by social behavior of bird flocking or fish schooling. It is one of the most modern heuristic algorithms, which can be used to solve non linear and non continuous optimization problems. PSO shares many similarities with evolutionary computation techniques such as genetic algorithm (GA). The system is initialized with a population of random solutions and searches for optima by updating generations. However, unlike GA, PSO has no evolution operators such as mutation and crossover. The PSO algorithm searches in parallel using a group of random particles. Each particle in a swarm corresponds to a candidate solution to the problem. Particles in a swarm approach to the optimum solution through its present velocity, its previous experience and the experience of its neighbors. In every generation, each particle in a swarm is updated by two best values. The first one is the best solution (best fitness) it has achieved so far. This value is called Pbest. Another best value that is tracked by the particle swarm optimizer is the best value, obtained so far by any particle in the population. This best value is a global best and called gbest. Each particle moves its position in the search space and updates its velocity according to its own flying experience and neighbor's flying experience. After finding the two best values, the particle update its velocity according to equation (20).

$$V_i^{k+1} = \omega \times V_i^k + c_1 \times r_1 \times (Pbest_i^k - X_i^k) + c_2 \times r_2 \times (gbest^k - X_i^k) \quad (20)$$

Where V_i^k is the velocity of particle i at iteration k , X_i^k is the position of particle i at iteration k , ω is the inertia weight factor, c_1 and c_2 are the acceleration coefficients, r_1 and r_2 are positive random numbers between 0 and 1, $Pbest_i^k$ is the best position of particle i at iteration k and $gbest^k$ is the best position of the group at iteration k .

In the velocity updating process, the acceleration constants c_1 , c_2 and the inertia weight factor are predefined and the random numbers r_1 and r_2 are uniformly distributed in the range of [0,1]. Suitable selection of inertia weight in equation (20) provides a balance between local and global searches, thus requiring less iteration on average to find a sufficiently optimal solution. A low value of inertia weight implies a local search, while a high value leads to global search. As originally developed, the inertia weight factor often is decreased linearly from about 0.9 to 0.4 during a run. It was proposed in [31]. In general, the inertia weight ω is set according to the following equation:

$$\omega = \omega_{max} - \frac{\omega_{max} - \omega_{min}}{Iter_{max}} \times Iter \quad (21)$$

Where ω_{min} and ω_{max} are the minimum and maximum value of inertia weight factor, $Iter_{max}$ corresponds to the maximum iteration number and $Iter$ is the current iteration number.

The current position (searching point in the solution space) can be modified by using the following equation:

$$X_i^{k+1} = X_i^k + V_i^{k+1} \quad (22)$$

The velocity of particle i at iteration k must lie in the range:

$$V_{i \min} \leq V_i^k \leq V_{i \max} \quad (23)$$

The parameter V_{max} determines the resolution or fitness, with which regions are to be searched between the present position and the target position. If V_{max} is too high, the PSO facilitates a global search and particles may fly past good solutions. Conversely, if V_{max} is too small, the PSO facilitates a local search and particles may not explore sufficiently beyond locally good solutions. In many experiences with

PSO, V_{max} was often set at 10-20% of the dynamic range on each dimension.

The constants c_1 and c_2 in equation (20) pull each particle towards Pbest and gbest positions. Thus, adjustment of these constants changes the amount of tension in the system. Low values allow particles to roam far from target regions, while high values result in abrupt movement toward target regions. Figure 3 shows the search mechanism of particle swarm optimization technique using the modified velocity, best position of particle i and best position of the group.

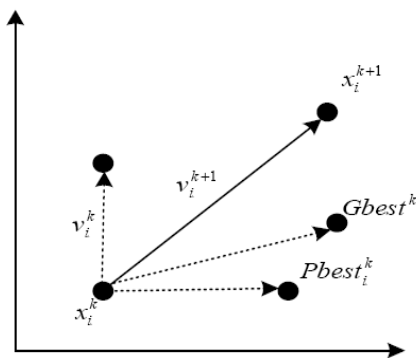


Fig.3. Updating the position mechanism of PSO technique

B. Constriction Factor Approach

After the original particle swarm proposed by Kennedy and Eberhart, a lot of improved particle swarms were introduced. The particle swarm with constriction factor is very typical. Recent work done by Clerc [32] indicates that the use of a constriction factor may be necessary to insure convergence of the particle swarm optimization algorithm. In order to insure convergence of the particle swarm optimization algorithm, the velocity of the constriction factor approach can be represented as follows:

$$V_i^{k+1} = K \times [\omega \times V_i^k + c_1 \times r_1 \times (Pbest_i^k - X_i^k) + c_2 \times r_2 \times (gbest^k - X_i^k)] \quad (24)$$

Where K is the constriction factor and given by:

$$K = \frac{2}{2 - \varphi + \sqrt{\varphi^2 - 4\varphi}} \quad (25)$$

Where: $\varphi = c_1 + c_2$, $\varphi > 4$

The convergence characteristic of the particle swarm optimization technique can be controlled by φ . In the constriction factor approach, φ must be greater than 4.0 to guarantee the stability of the PSO algorithm. However, as φ increases the constriction factor decreases and diversification is reduced, yielding slower response. Typically, when the constriction factor is used, φ is set to 4.1 (i.e. $c_1 = c_2 = 2.05$) and the constant multiplier k is 0.729. The constriction factor approach can generate higher quality solutions than the basic PSO technique.

VIII. ALGORITHM FOR SHORT TERM HYDROTHERMAL SCHEDULING PROBLEM USING CFPSO TECHNIQUE

The sequential steps of solving short term hydro thermal scheduling problem by using genetic algorithm are explained as follows:

Step 1: Read the system input data, namely fuel cost curve coefficients, power generation limits of hydro and thermal units, number of thermal units, number of hydro units, power demands, water discharge rate coefficients, amount of water available in hydro reservoir, transmission loss coefficients matrix, water discharge rate limits.

Step 2: Select the parameters of PSO such as population size (N_p), acceleration constants (c_1 and c_2), initial and final value of inertia weight factor (ω_{min} and ω_{max}).

Step 3: Initialize a population of particles with random positions according to the minimum and maximum operating limits of each unit (upper and lower bounds of power output of thermal generating units and upper and lower bounds of water discharge rate of hydro units). These initial particles must be feasible candidate solutions that satisfy the practical operation constraints of all thermal and hydro units.

Step 4: Initialize the velocity of particles in the range between $[-V_i^{max}, +V_i^{max}]$.

Step 5: Calculate the power generation of each hydro unit.

Step 6: Calculate the thermal demand by subtracting the generation of hydro units from the total load demand. The thermal demand (total load – hydro generation) must be covered by the thermal units. The thermal generations are calculated from the power balance equation given in (4).

Step 7: Check the inequality constraint of thermal power generated using equation (19).

Step 8: Evaluate the fitness value of each particle in the population using the objective function given in equation (1).

Step 9: If the evaluation value of each particle is better than the previous Pbest, then set Pbest equal to the current value.

Step 10: Select the particle with the best fitness value of all the particles in the population as the gbest.

Step 11: Update the velocity of each particle according to equation (24).

Step 12: Check the velocity of each particle according to the following equation:

$$V_i^{k+1} = \begin{cases} V_i^{k+1} & \text{if } V_i^{\min} \leq V_i^{k+1} \leq V_i^{\max} \\ V_i^{\min} & \text{if } V_i^{k+1} \leq V_i^{\min} \\ V_i^{\max} & \text{if } V_i^{k+1} \geq V_i^{\max} \end{cases} \quad (26)$$

Step 12: The position of each particle is modified according to equation (22).

Step 13: Check the inequality constraints of the modified position.

Step 14: If the stopping criterion is reached (i.e. usually maximum number of iterations) go to step 15, otherwise go to step 5.

Step 15: The particle that generates the latest gbest is the optimal generation power of each unit with minimum total fuel cost of the thermal power plants.

Step 16: Print the outputs of hydrothermal scheduling and stop.

IX. CASE STUDY AND SIMULATION RESULTS

To verify the feasibility and effectiveness of the proposed algorithms, a hydrothermal power system consists of one hydro power plant and three thermal generating units were tested.. The data of test system are taken from [2]. The fuel cost data and the minimum and maximum limits of the thermal generating units are given in table I. In this case study, the water discharge rate is represented according to Glimn Kirchmayer model. The water discharge rate coefficients and the lower and upper limits of hydro power plant are given in table II. The scheduling time period is one day with 24 intervals of one hour each. The load demand for 24 hours is given in table III. The B-matrix of the transmission line loss coefficients is given in equation (27). The proposed algorithms has been implemented in MATLAB language and executed on an Intel Core i3, 2.27 GHz personal

computer with a 3.0 GB of RAM. The optimal control parameters used in genetic algorithm are listed in table IV. The CFPSO control parameters selected for the solution are given in table V. The program is run 50 times for each algorithm and the best among the 50 runs are taken as the final solutions. The resultant optimal power schedule of thermal and hydro power plants that meets the required load demand and the total transmission line losses obtained from the CFPSO algorithm is shown in table VI while table VII shows the hourly fuel cost of each thermal unit, total fuel cost of the system and the water discharge rate of hydro power plant obtained from CFPSO technique. Table VIII presents the optimal hydrothermal generation schedule along with demand for 24 hour including the transmission line losses obtained from the genetic algorithm and table IX gives the hourly fuel cost of each thermal unit, total fuel cost of the system and water discharge rate of hydro power plant obtained from the genetic algorithm. Table X shows the comparison of total fuel cost and computation time between the two proposed methods. From table X, it is observed that the constriction factor based PSO algorithm give the same solution as obtained by genetic algorithm. Figure 4 shows the optimal power generation schedule of hydrothermal test system using CFPSO algorithm. The hourly hydro plant discharge trajectory by using CFPSO method is given in figure 5. Figure 6 gives the optimal power generation schedule during day hours by using genetic algorithm and figure 7 shows the hourly hydro plant discharge trajectory by using genetic algorithm.

TABLE I: FUEL COST DATA OF THERMAL GENERATING POWER PLANTS

Plant	a_i (\$/MW ² hr)	b_i (\$/MWhr)	c_i (\$/hr)	P_{gi}^{\min} (MW)	P_{gi}^{\max} (MW)
1	0.01	0.1	100	50	200
2	0.02	0.1	120	40	170
3	0.01	0.2	150	30	215

TABLE II: DISCHARGE RATE COEFFICIENTS AND POWER LIMITS OF HYDRO UNIT

Plant	x_j	y_j	z_j	Water volume (m ³)	P_{hj}^{\min} (MW)	P_{hj}^{\max} (MW)
1	0.01	0.10	100	25000	50	200

TABLE III: LOAD DEMAND FOR 24 HOUR

Hour	P _D (MW)	Hour	P _D (MW)	Hour	P _D (MW)	Hour	P _D (MW)
1	175	7	390	13	565	19	375
2	190	8	410	14	540	20	340
3	220	9	440	15	500	21	300
4	280	10	475	16	450	22	250
5	320	11	525	17	425	23	200
6	360	12	550	18	400	24	180

TABLE IV: CONTROL PARAMETERS OF GENETIC ALGORITHM

Genetic algorithm parameters	Value
Population size	50
Maximum number of generations	300
Crossover probability	0.8
Mutation probability	0.05

TABLE V: CONTROL PARAMETERS OF PARTICLE SWARM OPTIMIZATION

CFPSO technique parameters	Value
Population size	50
Maximum number of generations	300
Acceleration coefficients(C ₁ /C ₂)	2.05
Minimum inertia weight (ω _{min})	0.4
Minimum inertia weight (ω _{max})	0.9
Constriction factor (k)	0.729

$$B_{ij} = 10^{-3} \times \begin{bmatrix} 0.50 & 0.05 & 0.20 & 0.03 \\ 0.05 & 0.04 & 0.18 & -0.11 \\ 0.20 & 0.18 & 0.50 & -0.12 \\ 0.03 & -0.11 & -0.12 & 0.23 \end{bmatrix} \text{ MW}^{-1} \quad (27)$$

TABLE VI: HOURLY HYDROTHERMAL GENERATION SCHEDULE AND POWER LOSS OBTAINED FROM CFPSO TECHNIQUE

Hour	Thermal generation			Hydro generation	Loss (MW)
	P _{g1} (MW)	P _{g2} (MW)	P _{g3} (MW)	P _{h1} (MW)	

1	68.1356	40.0000	64.0655	10.0000	7.2007
2	77.1462	41.6310	70.0654	10.0000	8.8426
3	88.9214	50.2145	83.0333	10.0000	12.1691
4	114.2141	67.3381	109.2003	10.0000	20.7527
5	131.7539	78.4389	127.8284	10.0741	28.0956
6	146.5142	88.5791	141.4943	17.8482	34.4359
7	154.6471	94.8724	148.4014	29.9173	37.8385
8	160.5308	98.7054	153.0133	38.0547	40.3041
9	165.1055	106.2091	162.3226	50.2454	43.8825
10	175.8352	113.1778	169.6516	64.9265	48.5912
11	188.4399	123.3503	183.0102	86.1154	55.9155
12	194.9369	129.0775	189.3461	96.4565	59.8173
13	200.0000	134.1211	193.8283	100.0000	62.9491
14	191.6835	127.1509	186.4970	92.6519	57.9831
15	182.4302	118.2798	176.3102	75.2374	52.2576
16	167.5452	108.4111	164.5151	54.6059	45.0773
17	162.1553	102.7916	158.2515	43.8912	42.0896
18	157.9871	96.6312	150.7118	33.8157	39.1457
19	149.6308	92.4476	144.9175	23.9481	35.9440
20	141.1155	85.3907	135.2588	10.2154	31.9807
21	123.4245	72.6379	118.2341	10.0000	24.2965
22	101.6896	57.8784	96.6686	10.0000	16.2363
23	80.5810	44.9917	74.2655	10.0000	9.8386
24	71.7041	40.0000	66.0655	10.0000	7.7696

TABLE VII: HOURLY FUEL COST OF EACH THERMAL UNIT, TOTAL FUEL COST AND WATER DISCHARGE RATE OF HYDRO PLANT OBTAINED FROM CFPSO METHOD

Hour	F1 (\$/hr)	F2 (\$/hr)	F3 (\$/hr)	Ft (\$/hr)	q _{h1} (m ³ /hr)
1	153.2382	156.0000	203.8570	513.0952	346.0000
2	167.2299	158.8259	213.1048	539.1608	346.0000
3	187.9623	175.4514	235.5519	598.9655	346.0000
4	241.8700	217.4222	291.0872	750.3794	346.0000
5	286.7662	250.8972	338.9666	876.6301	347.5712
6	329.3155	285.7832	378.5053	993.6038	516.0775
7	354.6219	309.5029	399.9101	1064.035	792.0487
8	373.7544	324.7256	414.7333	1113.214	987.9836
9	389.1088	356.2285	445.9508	1191.287	1296.384
10	426.7638	387.5019	471.7471	1286.013	1691.457
11	473.9399	436.6409	521.5294	1432.110	2307.260
12	499.4977	466.1279	546.3887	1512.014	2627.361
13	520.0000	493.1817	564.4598	1577.641	2740.000
14	486.5941	456.0622	535.1106	1477.767	2508.101
15	451.0509	411.6302	496.1148	1358.796	1984.388
16	397.4685	365.9007	453.5553	1216.924	1411.026
17	379.1589	341.6012	432.0856	1152.846	1133.410
18	365.3979	316.4148	407.2829	1089.096	884.9241
19	338.8569	300.1758	388.9942	1028.027	653.3727
20	313.2474	274.3705	360.0013	947.6193	350.5693
21	264.6784	232.7892	313.4398	810.9074	346.0000
22	213.5766	192.7861	262.7819	669.1446	346.0000
23	172.9911	164.9841	220.0067	557.9820	346.0000
24	158.5851	156.0000	206.8596	521.4447	346.0000

TABLE VIII: HOURLY HYDROTHERMAL GENERATION SCHEDULE AND POWER LOSS OBTAINED FROM GENETIC ALGORITHM

Hour	Thermal generation			Hydro generation	Loss (MW)
	P _{g1} (MW)	P _{g2} (MW)	P _{g3} (MW)	P _{h1} (MW)	
1	68.9424	40.0000	63.2542	10.0000	7.1966
2	77.7136	41.6691	69.4542	10.0000	8.8371
3	90.2901	49.8742	82.0324	10.0000	12.1967
4	116.1462	66.2480	108.4961	10.0000	20.8903
5	133.3731	78.1412	126.5703	10.0451	28.1294
6	148.6410	88.3040	139.7042	17.8171	34.4660
7	156.6274	94.2452	147.1962	29.8885	37.9577
8	162.0485	98.5113	152.1114	37.7646	40.4357
9	167.9657	105.3961	160.7127	50.0459	44.1204
10	177.3897	112.5981	168.7198	64.9960	48.7035
11	189.9430	122.8326	182.3191	86.0092	56.1041
12	196.3250	128.3683	188.5426	96.6920	59.9279
13	200.0000	134.0858	193.8870	99.9916	62.9640
14	192.4916	126.6513	186.0227	92.8697	58.0354
15	183.7948	117.6525	175.3296	75.5273	52.3044
16	170.6785	107.4372	162.4406	54.6934	45.2504
17	163.7986	102.2441	157.3157	43.8523	42.2109
18	159.3076	96.4384	149.6248	33.8046	39.1756
19	153.0155	91.2666	143.1632	23.7604	36.2052
20	143.6989	84.4822	133.9327	10.0511	32.1649
21	125.3484	72.0078	117.0156	10.0000	24.3719
22	102.5453	58.2131	95.4262	10.0000	16.1848
23	81.9909	43.8815	74.0655	10.0000	9.9379
24	72.0141	40.0000	65.7542	10.0000	7.7682

TABLE IX: HOURLY FUEL COST OF EACH THERMAL UNIT, TOTAL FUEL COST AND WATER DISCHARGE RATE OF HYDRO PLANT OBTAINED FROM GENETIC ALGORITHM

Hour	F1 (\$/hr)	F2 (\$/hr)	F3 (\$/hr)	Ft (\$/hr)	Q _{h1} (m ³ /hr)
1	154.4248	156.0000	202.6618	513.0866	346.0000
2	168.1654	158.8932	212.1297	539.1884	346.0000
3	190.5520	174.7361	233.6997	598.9878	346.0000
4	246.5140	214.4009	289.4132	750.3281	346.0000
5	291.2211	249.9352	335.5144	876.6707	346.9562
6	335.8056	284.7822	373.1136	993.7014	515.3889
7	360.9842	307.0677	396.1066	1064.158	791.3693
8	378.8019	323.9406	411.8010	1114.544	980.8619
9	398.9214	352.7062	440.4282	1192.056	1291.194
10	432.4101	384.8266	468.4077	1285.644	1693.388
11	479.7777	434.0401	518.8665	1432.684	2304.039
12	505.0676	462.4052	543.1918	1510.664	2634.801
13	520.0000	492.9885	564.6989	1577.688	2739.731
14	489.7793	453.4759	533.2488	1476.504	2514.881
15	456.1848	408.6074	492.4707	1357.263	1992.808
16	408.3793	361.5985	446.3577	1216.336	1413.350
17	384.6798	339.3016	428.9456	1152.927	1132.427
18	369.7198	315.6511	403.8008	1089.172	884.6571
19	349.4389	295.7186	383.5896	1028.747	649.0814

20	320.8636	271.1930	356.1661	948.2227	347.0835
21	269.6571	230.9032	310.3296	810.8899	346.0000
22	215.4099	193.5966	260.1468	669.1534	346.0000
23	175.4242	162.8999	219.6701	557.9942	346.0000
24	159.0616	156.0000	206.3870	521.4487	346.0000

TABLE X: COMPARISON OF TOTAL FUEL COST AND COMPUTATION TIME BETWEEN GA AND CFPSO TECHNIQUES

Method	Total fuel cost (\$)	CPU Time (Sec)
CFPSO	24278.7028	10.23
GA	24278.0589	18.14

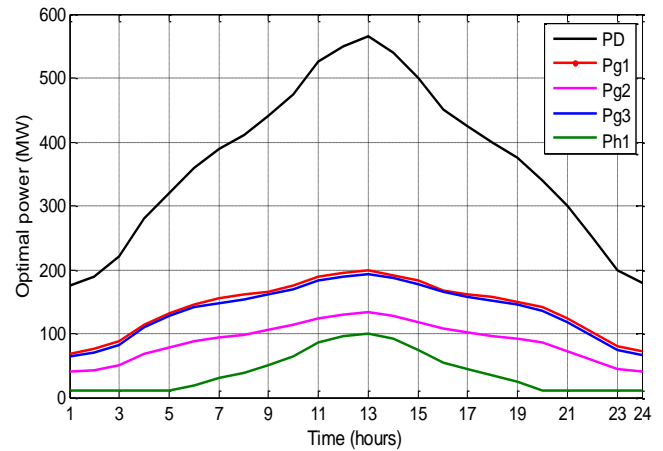


Fig.4. Optimal power generation schedule using CFPSO technique

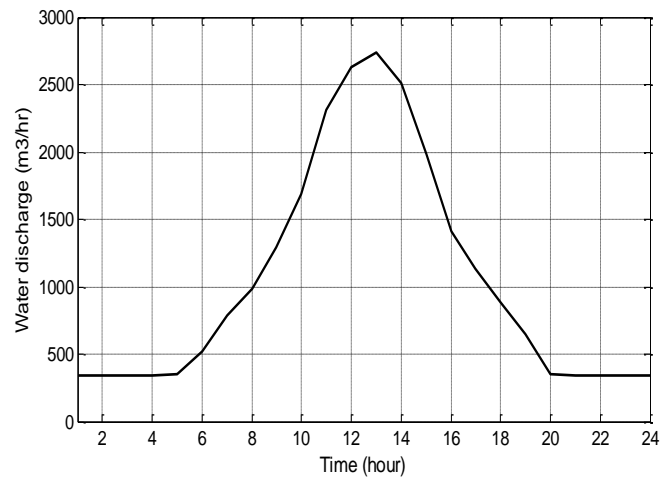


Fig.5. Hydro plant discharge trajectory using CFPSO technique

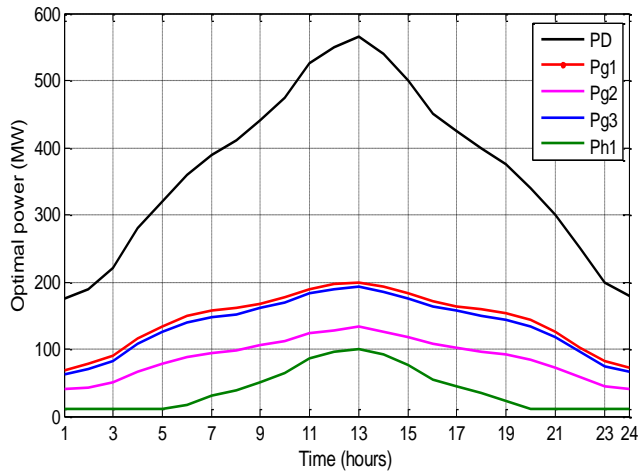


Fig.6. Optimal power generation schedule using GA method

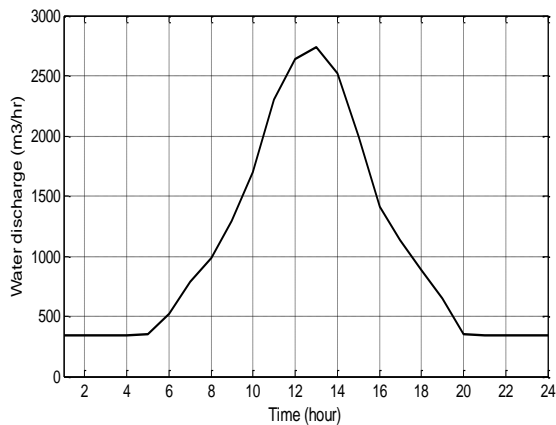


Fig.7. Hydro plant discharge trajectory using GA method

X. CONCLUSIONS

In this paper, particle swarm optimization technique with constriction factor (CFPSO) and genetic algorithm (GA) are proposed for solving short term fixed head hydrothermal scheduling problem. To demonstrate the performance efficiency of the proposed algorithms, they has been applied on hydrothermal system consists of three thermal units and one hydro power plant. In this paper, the transmission line losses are taken into account. The results obtained from the CFPSO technique are compared with the simulation results obtained from the GA to verify the feasibility of the proposed methods. The numerical results show that the CFPSO algorithm gives the same results as obtained by the GA. From the tabulated results, it is clear that the GA require more computation time than the CFPSO technique. Thus, the CFPSO approach can converge to the minimum fuel cost faster than the GA. From the

simulation results, it can be seen that, the CFPSO method performs better than GA in terms of the power loss.

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The relationship between seed polymorphism and germination of *Acacia mellifera*(Vahl)Benth. Seeds

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Abstract- *Acacia mellifera* is a widespread species, very common in many area, adaptable to sand and clay soil and tolerate extreme drought .It has many uses ,it uses as fodder, honey plant, fuel wood., living hedge or fence, edible gum producer and as a medicine for stomach pains and treat colds, eye inflammation, diarrhoea and bleeding. This study was carried to investigate the seed color polymorphism of *Acacia mellifera* in relation to germination percentage .The result showed that the percentage of the brown greenish seeds almost about half of the bulk, the brown and green almost share the same percentage. The viability of the three colors almost had the same percentage, which means that the color of the seeds was not associated with seed viability further studies were need for demonstrating if this polymorphism associated with seedling performance or with seed storability.

Index Terms- *Acacia mellifera*, germination, seed, polymorphism

I. INTRODUCTION

In plants showing seed polymorphism, two or more sharply defined distribution patterns are seen (Harper, 1977). Attributes such as seed size, shape, dormancy, or internal structures are some of the forms in which polymorphism may be manifested (Van Staden et al 1989). Seed coat color changes are often associated with the onset of impermeability during seed maturation and there is evidence that seed coat color is controlled by a single gene . (Egley 1989).

Acacia mellifera which Known as hook thorn is usually a multi-stemmed, much branched, obconical shrub up to about 2m tall. The canopy is widest at the top like an upside-down cone (Coates Palgrave 2002) and is dense and tangled with dark, rigid branches and twigs (Grant & Thomas 2000). The tree is usually branches low down and the crown has a substantial horizontal spread that often exceeds its height (Smit 1999) The fruit are pods , thin to almost papery, flat and oval shaped, narrowing at both ends (Smit 1999) .The seeds are 7-10 x 6-8mm in size, subcircular-lenticular, compressed with a small central areole which is indented and horseshoe shaped, they are olive green to brown in color (Ross 1975) . It is a very adaptable species occurring in dry bushveld where it is found in sand, clayey soils and on rocky substrates. (Schmidt et al. 2002) and this species can tolerate extreme drought (Roodt 1998). The pods, leaves, young twigs and flowers are nutritious and are eaten by cattle, goats and sheep. The fallen leaves are a valuable source of fodder, particularly for the smaller antelope species (van der

Walt 2000) . Extracts of the roots and leaves are used to treat colds, eye inflammation, diarrhoea and bleeding (Grant & Thomas 2000) The wood is used extensively for fuel, It is a hardwood, slow and hot burning, producing ideal cooking coals and used for making charcoal(Dharani2002).

Form field observations *Acacia mellifera* seeds have seed color polymorphism within and among populations and with regard to poor germination percentage of this species, this study was carried to investigate the seed color polymorphism of *Acacia mellifera* in relation to germination percentage

II. MATERIALS AND METHODS

The seed collected in 2009. The seeds were sorting according to its color; green, brown and brown greenish seeds. The percentage of its present in the seed lot was counted. For each seed shape 100 seeds were used. These were divided into 4 replicates of 25 seeds each. Seeds were sown immediately in round aluminium dishes filled with moist sand. Dishes were watered daily with a fine shower . Germination was carried out in a controlled germination room at the National Tree Seed Centre – Soba 30oc, light for 12 hours from fluorescent lamps. Germination counts were done at 7 days interval and for a period of 6 for each seed shape. For cutting test Two hundred fruits were taken at random from the composite working samples taken from 10 trees of each species. Fruits were divided into 2 replicates of 100 fruits .Fruits were cut transversely one by one with the aid of a pruning shear. Cut fruits were visualized by naked eye and a hand lens to identify:

- i-Sound fruits (normal, firm, fresh and full size).
 - ii- Empty fruits (Empty fruit coats, with no seeds).
 - iii- Dead fruits (fragile, dark, coloured and decayed or abortive).
- The CRD (Complete Randomize Design) with four replicates was selected and the statistical analysis was done by JMP package (Programme improved form SAS Package) for analysis of variance, means were compared using Tucky - Kramer.

III. RESULTS AND DISCUSSION

The result showed that the percentage of the brown greenish seeds almost about half of the bulk, the brown and green almost share the same percentage. The viability of the three colors almost hade the same percentage, which means that the color of the seeds was not associated with seed viability. There were no significant differences in germination percentages between the three color this results is in agree with Traveset et al,(2009) who

showed that the Seeds of the two morphs of *Myrtus communis* had the same germinability (final percentage germination) as well as similar rates of germination under controlled conditions (in growth chambered greenhouse). Outdoors, seeds from blue berries tended to germinate slightly faster (which might give them an early advantage) but differences between morphs disappeared after several weeks of growth. On the other hand studies of two wild, fleshy-fruited species of wheat have

demonstrated differences in seed germination rates among color morphs (Willson and O'Dowd, 1989). further studies were need for demonstrating if this polymorphism associated with seedling performance or with seed storability. May be it is a somatic polymorphism or it result from a cross pollination with species in same family and this was recoded by Ahmed (1982) who stated that there were cross pollination happened between *A. mellifera* and *A. Senegal*.

(Table 1) the percentage of the different color in 100 seeds

Green seeds	Brown seeds	Brown greenish seeds
25%	20%	55%

(Table 2) Effect of *A. melifera* seeds polymorphism viability using cutting test

	Green seeds%	Brown seeds%	Brown greenish seeds%
Healthy seeds	93	94	92
Empty seeds	0	0	0
Damaged seeds	7	6	8

(Table 3) The germination percentage of the different colored seeds

	Mean %	Rank
control	73.3	a
Green seeds	63.6	a
Brown seeds	65.7	a
Brown greenish seeds	66.2	a

$p \geq 0.21$ SE \pm 4.6

IV. RECOMMENDATION

Studies on seed polymorphism associate with seedling performance or with seed storability..

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Area and Power Efficient Router Design for Network on Chip

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Abstract-As network on chip (NoC) systems become more prevalent in today's industry. Routers and interconnection networks are the main components of NoC. Therefore, there is a need to obtain low area and power models for these components so that we can better understand the area and power tradeoffs. In this paper a low- area and power efficient NoC architecture is proposed by eliminating the virtual channels. Buffers are replaced by elastic buffer. In order to get the advantage of both buffered and buffer less the cross bar is split in to two parts. Implementation is done in Micro wind 3.5 the proposed router area is reduced by 47.89% and power is reduced by 11.2% compared to base line router accordingly.

Index Terms- Virtual channel, NoC, Elastic buffer

I. INTRODUCTION

To solve the problem of the traditional bus in the area interconnect scaling and power consumption, etc., a new on-chip communication structure Network-on-Chip has been proposed[1].NoC provides high performance communication is at the cost of an increase in the structure complexity. An interconnection network dissipates a significant fraction of power and complexity increases the area. So power consumption and area has become important parameters in the NoC design. Routers are the most important communication components in NoC, whose power and area model is the focus of the relevant research [2]. The input buffers of router increase the power budget and chip area. Eliminating input buffers is a natural approach to design low-power NoCs or reducing the number of input buffers overhead degrades the network performance

II. PREVIOUS WORK

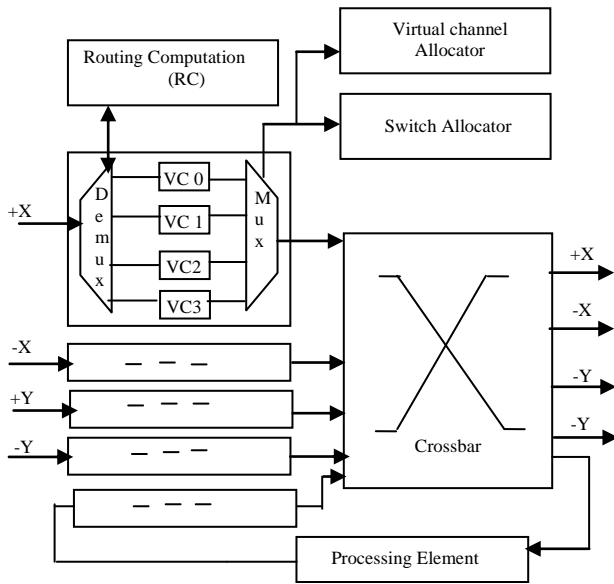
Different techniques have been proposed to reduce or eliminate the size of input buffers. Initially iDEAL, a low-power area-efficient NoC is achieved by reducing the number of buffers within the router [3]. To overcome the performance degradation caused by the reduced buffer size, adaptive dual-function links is used which is capable of data transmission as well as data storage when required. Other designs targeting power saving with router

design have different approaches. A dynamic buffering resources allocation design named ViChaR (Virtual Channel Regulator) focuses on efficiently allocating buffers to all virtual channels, by deploying a unified buffering unit instead of a series of separated buffers, and minimizing the required size [4]. Another approach utilizing channel buffering is the Elastic Channel Buffers (ECB), which replaces the repeaters with flip-flops, and eliminates the router buffers altogether [5]. Other bufferless networks such as FlitBLESS [6, 7] and SCARAB [11] adopt either deflecting or dropping conflicting packets, thereby reducing the latency and power, while sustaining throughput at low network loads while at higher network loads, these networks suffer deflection/dropping leading to an increase in power consumption. In NoC, a router sends packets from a source to a destination router through several intermediate nodes. If the head of packet is blocked during data transmission, the router cannot transfer the packet any more. In order to remove the blocking problem, wormhole routing method is proposed in [8]. The wormhole router splits the packet into several flits which can be transferred in a single transmission. Buffer allocation and flit control are performed at a flit level in wormhole routing since wormhole routing does not allocate available buffer to whole packet [9]. Therefore, the wormhole routing is a method which can minimize overall latency and may decrease buffer size compared to others. In addition, VCs are used to avoid deadlock problem and thus increase throughput. The main purpose of VCs is to decouple the allocation of buffer space to allow a flit to use a single physical channel and competing with other flits.

III. NOC BASELINE ROUTER ARCHITECTURE

A NoC router is implemented using wormhole technique it consists of buffers, switches, and control units which are required to store and forward flits from the input ports to the desired output ports. The architecture is actually similar to that of modern routers, but with smaller area and buffer size .Figure:1 shows a NoC 16 buffer slots per input port. The buffer slots are divided into four queues, and each queue is called a virtual channel (VC) [10]. There are four cardinal input ports and output ports connected from and to +x, -x, +y and- y directions. The last pair of input/output ports is connected from and to the processing element (PE). The four VCs are sandwiched between the demultiplexer connected to the input port, and the multiplexer connected to the crossbar. Each input unit can communicate with router, virtual-channel allocator, and switch allocator, which are

responsible for Routing Computation (RC), Virtual-Channel Allocation (VA), and Switch Allocation (SA), respectively. The crossbar is controlled by the switch allocator for correctly



connecting input ports to output ports .

Figure: 1 NoC Router

The virtual channel allocator is to provide a common channel to the requestors for that VA receives neighboring router's virtual channel status and previous router's request signals and then generate virtual channel request signals with an available virtual channel of the next router. Once the virtual channel is allotted then switch allocator will grant the following flits when they arrive at flit buffers. If there are multiple requests, a SA will select the winner in a round-robin fashion for each priority level. Then the winning flit has permission to access crossbar. Crossbar is responsible for physical connection between input ports to its destined output ports, based on the grant.

IV. PROPOSED ROUTER

In proposed router shown in Figure: 2 the advantage of both buffered as well buffer less router are achieved. In order to get the both the advantage dual cross bar is used. At low traffic condition the flit traverse from the first crossbar and at high load condition flit traverse from second crossbar using elastic buffer. There are two crossbars with the primary crossbar having four input ports, the secondary crossbar having five input ports and both of them having five output ports. The four input links are connected to both crossbars via de-multiplexers, and the injection port of the PE is connected to the last input port of the secondary crossbar. . The function of processing element is to give feedback from output to input to show whether the flit is valid or not. The elastic buffer slots are connected serially, thus eliminating VCs and the corresponding virtual-channel allocator. Switch allocator

is modified to control the de-multiplexers, the crossbars, and the multiplexers to maintain the correct packet flow in both crossbars. Elastic buffers (EBs) are an efficient flow-control scheme that uses the storage already present in pipelined channels instead of input virtual-channel buffers (VCBs). Removing VCBs reduces the area and power consumed by routers, but prevents the use of virtual-channel.

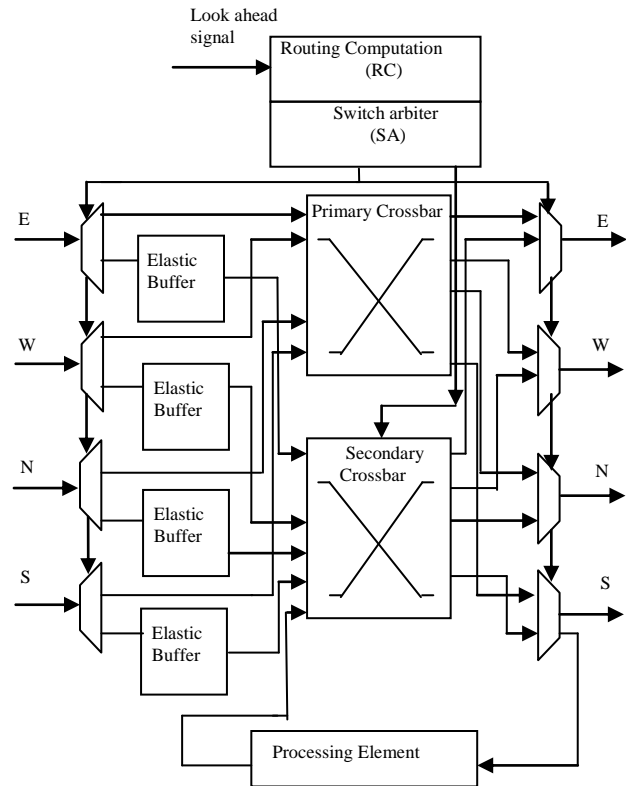
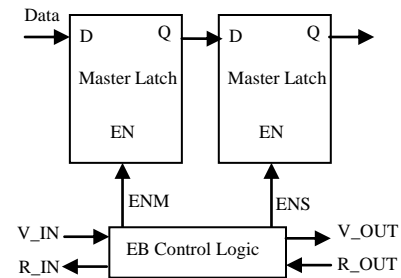


Figure: 2 Proposed Router

Elastic buffer shown in Figure: 3 uses a ready-valid handshake to advance a flit (flow-control digit). An upstream *ready* (R) signal indicates that the downstream EB has at least one empty storage location and can store an additional flit. A downstream *valid* (V) signal indicates that the flit currently being driven is valid. A flit advances

when ready signals two Buffers at the edge.



both the and valid between Elastic are asserted rising clock

Figure: 5 Proposed router on DSCH

Figure: 3 Elastic Buffer

V. SIMULATION AND RESULT

Implementation is done on DSCH 3.5 and simulation is done on MICROWIND 3.5 at 180 nm. The designing parameters are selected at the time of designing.NoC baseline router and proposed routers are design using the same platform for validation.

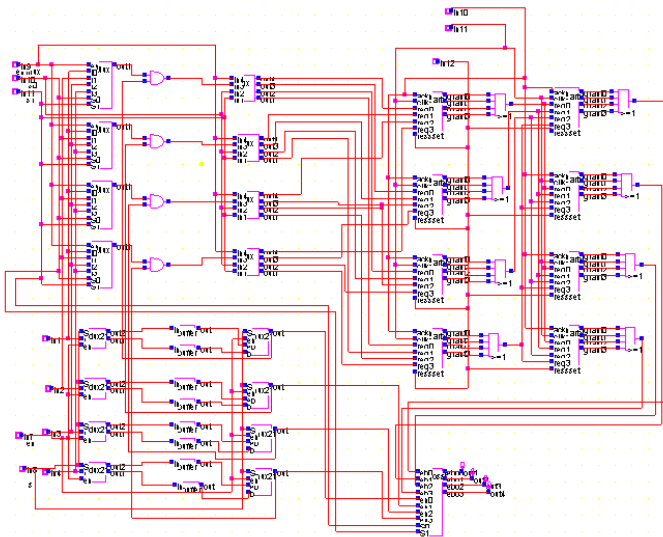


Figure: 4 Base line router on DSCH

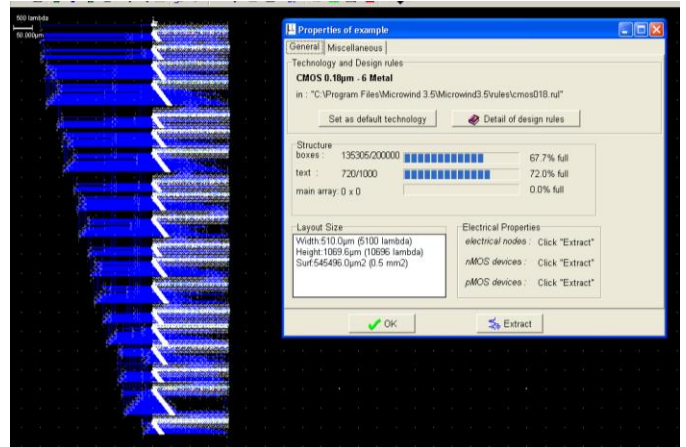
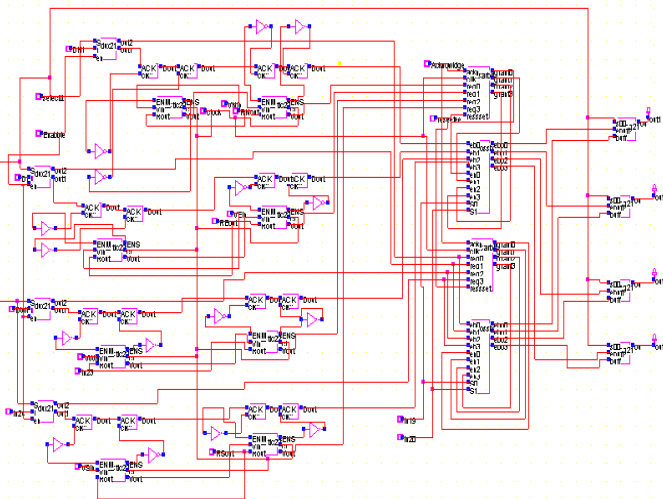


Figure: 6 Base line router area on Micro wind 3.5

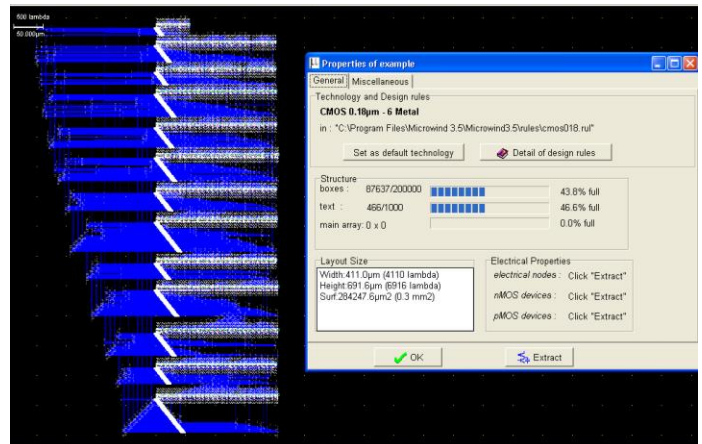


Figure: 7 Proposed router area on Micro wind 3.5

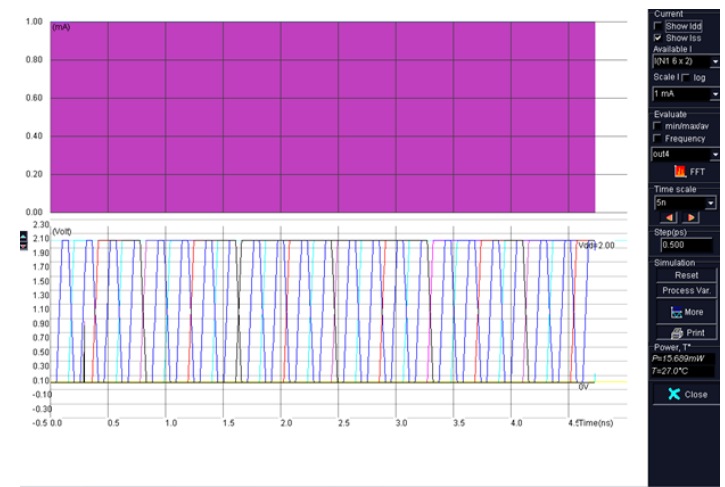


Figure: 8 Analog simulation of Base line router

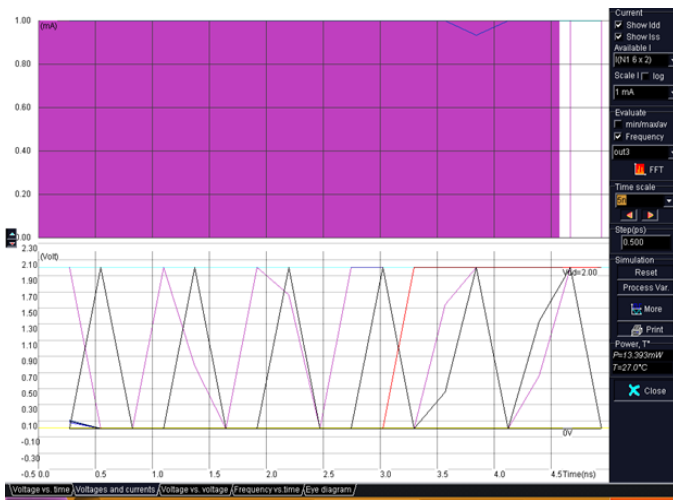


Figure: 9 Analog simulation of Proposed router

Table 1 Comparison based on average power and area

Design	Total average power(mW)	Area (mm ²)
Baseline router	15.689	545496.0
Proposed router	13.93	284247.6

The power of proposed router reduced to 11.2% and the area of the proposed router reduces by 47.89% compared to the base line router. Figure: 4&5 shows the circuit diagram of both routers. Area is calculated shown in Figure: 6&7 of both routers. Analog simulation of two routers is done as shown in Figure: 8 & 9 respectively. Table 1 shows the comparative analysis of both router in terms of power and area.

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In this paper we evaluate the performance of dual cross bar router design using elastic buffer with an objective of reducing power and area. The proposed design shows power reduction of 11.2% and area reduction 47.89% compare to baseline router result in increase in performance. With the proposed design we conclude that the advantage of both buffered and buffer less is achieved and single elastic buffer is enough to store a number of flit on each port with saving power when compared to the same number of VC router buffer based NoC architecture.

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Risk score based on expression of AP2- α , CHI3L1 and PBEF1 is a better predictor of prognosis in breast cancer

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Abstract- Modulation of AP-2 α , AP-2 γ , CHI3L1 and PBEF1 has been implicated in the pathogenesis of many human neoplasms. In order to get an insight into the role of these genes in breast cancer pathogenesis, we have studied the extent of AP-2 α , AP-2 γ , CHI3L1 and PBEF1 expression and evaluated their prognostic significance by calculating risk score among Indian sporadic breast cancer patients. Immunohistochemistry was carried out to study the expression level of four genes AP-2 α , AP-2 γ , CHI3L1 and PBEF1. Statistical methods were used to calculate risk score which was tested for prognostic significance. While AP-2 α (nuclear), CHI3L1, PBEF1, ErbB2, Stage, distant metastasis and nodal involvement correlated with patient survival in univariate analysis, multivariate analysis revealed that AP-2 α , CHI3L1, PBEF1, ErbB2, distant metastasis and lymph node involvement were independent predictors of survival. Of the markers of our interest, AP-2 α (nuclear) was found to be protective, whereas CHI3L1 and PBEF1 were found to be risky. A risk score calculated by combining the prognostic value of these three markers was found to be a significant predictor of survival by univariate analysis (HR = 2.532; 95% CI = 1.823-3.516; P = 2.912x10⁻⁸). The risk score segregated the patients into high and low risk group with significantly different survival times. It was observed that patients who fell in the low risk category showed better survival compared to the high risk category (Median survival: undefined versus 42 months; HR: 11.30; P <0.0001). Cox multivariate analysis revealed that risk score was the most significant predictor of survival (HR = 2.587; 95% CI= 1.747-3.832; P= 2.103x10⁻⁶). Thus, the present study suggests that these genes can be used as prognosticators. Risk score which combines the prognostic capability of AP-2 α , CHI3L1 and PBEF1 is a much better prognosticator and may help in the selection of high risk cancer patients for tailored treatments.

Key words- AP-2 α , CHI3L1, PBEF1, risk score breast cancer, prognosis.

I. INTRODUCTION

Breast cancer is the most common malignancy prevailing among women population across the world, and if it is diagnosed at an early stage of the disease, its treatment becomes possible (1, 2). Our understanding of tumor biology in recent years has achieved a significant improvement by immunohistochemistry. Evaluation of protein expression in sporadic cancers by immunohistochemistry has enabled the identification of new biomarkers that have diagnostic, therapeutic and prognostic value (3). Prognostic markers are indicators of aggressiveness, invasiveness, extent of spread of tumors, cell proliferation and thus, correlate with survival independent of systemic therapy and can be used to select patients at risk (4). Clinical prognostic factors are axillary lymph node status, tumor size, nuclear grade, histological grade, stage of the disease and distant metastasis. Candidate prognostic biomarkers in breast cancer include elevated levels of estrogen (ER) and progesterone receptor (PR); amplification and over-expression of ErbB2 (5, 6). Review of literature suggests that over expression of ErbB2, AP-2 α , AP-2 γ and CHI3L1 have prognostic significance in breast cancer, whereas not much is known about PBEF1, and these genes are the focus of our study. AP-2 transcription factors are a family of five developmentally regulated proteins, AP-2 α , β , γ , δ and θ , encoded by five different genes (7, 8). AP-2 proteins play an important role as regulators of gene expression in development, cell growth, cell differentiation and apoptosis. Alterations in AP-2 function have been linked with malignancy and studies suggest that AP-2 family acts as tumor suppressor genes (9). In breast and other cancers, reduced expression of AP-2 *in vivo* has been linked with disease progression (10-14). The AP-2 gene family has been implicated in regulation of both ER and ERB2 expression during the progression from normal breast epithelium to breast cancer (15), and represents a clinical marker of poor prognosis in breast cancer. CHI3L1 is a 40-kDa secreted glycoprotein that was discovered as a heparin-binding protein in the medium of human synoviocytes, chondrocytes, and MG-63 osteosarcoma cell line (16-18). CHI3L1 may play a role in the proliferation, differentiation, invasiveness, apoptosis, angiogenesis, remodeling of the extracellular matrix and stimulation of fibroblasts surrounding the tumor (19). Thus, CHI3L1 expression is associated with poor prognosis and shorter disease free survival in breast cancer and other malignancies (20-25). Therefore, CHI3L1 can be termed as a biomarker that can be used as a prognosticator. PBEF1 functions as an enzyme involved in NAD biosynthesis (26). PBEF1 has also been recognized as a hormone named Visfatin as it was found in high levels in visceral fat (27). PBEF1 has been shown to be over expressed in colon, pancreatic, colorectal, astrocytic cancers. However, the role of PBEF1 in breast cancer is largely not known (28, 29). In view of this and with emerging data on the role of some of these prognostic markers in breast cancer, the aim of this study was to evaluate the association of four genes (AP-2 α , AP-

2 γ , CHI3L1 and PBEF1) with survival of patients with breast cancer. To accomplish this, we generated risk score, which combined the independent capability of AP-2 α , CHI3L1 and PBEF1 to predict prognosis.

II. METHODS

Patient population.

The retrospective study included 174 breast cancer patients who underwent surgical resection at Kidwai Memorial Institute of Oncology between 2001 and 2002. The study protocol was approved by the Ethics Committee of Kidwai Memorial Institute of Oncology, Bangalore India. The patients were followed up at regular intervals and their clinical status was documented. Patients who met the following eligibility criteria were included: (1) diagnosis of breast tumors identified by histopathological examination; (2) all patients who underwent surgery (modified radical mastectomy, lumpectomy) followed by adjuvant radiation therapy and chemotherapy. All patients who were estrogen receptor positive had also undergone tamoxifen therapy. (3) Availability of follow-up data; (4) no preoperative treatment, such as chemotherapy and radiotherapy; (5) no history of familial malignancy or other synchronous malignancy (such as ovarian tumor); and (6) no death in the perioperative period. Overall survival was defined as the duration between surgery and death of the patient due to disease or the last follow up. Patient characteristics are listed in Table 1.

Tissue specimens.

Paraffin-embedded breast cancer samples were obtained from Kidwai Memorial Institute of Oncology. The samples were collected between 2001 and 2002 from patients who underwent surgical resection. Each tumor sample was assigned a histological grade based on the World Health Organization (WHO) classification criteria. clinical stage of the disease based on AJCC, 2002; distant metastasis based on TNM classification of breast tumors by UICC, 2002; lymph node status classified based on UICC, 2002; tumor size, classified as T1-4 based on TNM classification of breast tumors by UICC, 2002; pathological grade of the tumor based on Elston and Ellis, 1991; histological type of tumor based on WHO classification of tumors, 2003.

Immunohistochemistry.

IHC for AP-2 α , AP-2 γ , CHI3L1 and PBEF1 was done using AP-2 α polyclonal antibody (C-18; Cat# sc-184; Santa Cruz Biotechnology, USA), AP-2 γ polyclonal antibody (6E4/4; Cat# sc-12762; Santa Cruz Biotechnology, USA), PBEF1 antibody (Rabbit polyclonal antibody against purified GST-PBEF1 protein was made using standard immunization protocol) and CHI3L1 antibody (Rabbit polyclonal antibody against purified GST-CHI3L1 protein was made using standard immunization protocol) respectively. All samples were fixed in 10% formalin and paraffin embedded. Serial 3-5 μ m sections were cut from the retrieved cases and stained with Haematoxylin and Eosin to confirm the presence of tumor. Tissue sections were incubated overnight at 60°C, deparaffinized for 15 minutes two times in xylene. Hydration in absolute alcohol was carried out followed by rinsing in distilled water. Using Citrate buffer, pH 6.0, antigen retrieval was performed in a pressure cooker at high pressure for 20-30 minutes. The endogenous peroxidases were blocked by 0.5% hydrogen peroxide treatment for 20 minutes and the antibody blocking was carried out by immersing the slides in 2% milk for 30 minutes. Sections were incubated for 90 minutes at 24°C with mouse anti-human monoclonal AP-2 α antibody at a dilution of 1:100, with mouse anti-human monoclonal AP-2 γ antibody at a dilution of 1:50, PBEF antibody at a dilution of 1:500 and CHI3L1 antibody at a dilution of 1:500. After rinsing with TBS buffer, the sections were incubated with Biotin-2° antibody (BioGenex, SanRamon, CA) for 30 minutes at 24°C. Finally Streptavidin-3° antibody (BioGenex, SanRamon, CA) complex was added and sections were incubated at 24°C for 30 minutes. Visualization of the antigen-antibody complex was achieved by using the Diaminobenzidine tetrahydrochloride detection system (BioGenex, SanRamon, CA). After final washing, slides were counterstained with Mayer's hematoxylin, dehydrated and mounted. For AP2 α , a glioblastoma sample served as a positive control [11]. In addition, there are other studies which have used the same antibody [9, 10, 31, 32, 33]. For PBEF1 also, a glioblastoma sample served as a positive control [29]. For AP-2 γ immunostaining, the antibody used in this study has been used previously [9,31.32.33.35]. The specificity of CHI3L1 antibody was confirmed by western blot analysis that detected the protein of expected size from cell line extract which served as a positive control- data not shown. Negative controls included exclusion of the 1° antibody and replacement with TBS buffer. Estrogen receptor (ER), Progesterone receptor (PR) staining and ErbB-2 staining details are furnished in our manuscript (30).

Scoring of Immunoreactivity.

Tumor epithelial cellular immunostaining for AP-2 α , AP-2 γ , and PBEF1 and CHI3L1 were assessed in test sections by a pathologist. Labeling index was calculated based on number of cells positive and the intensity of staining. Based on cell positivity the labeling index ranged from <10%-100% and the scores were scaled as 0 if no staining was present. Score 1 was used if \leq 10% of cells were stained, score 2 if 10-50%, score 3 if 51-80% and score 4 if more than 80% of cells showed immunohistochemical staining

reaction. Based on cell intensity, the values given are mild=1, moderate=2 and severe=3. Labeling index which is a measure of expression ranged from 0 to 12 [35]. Control slides were checked for non-specific binding before assessing the staining intensity and percentage positivity of the tumor cells in test sections.

Survival and Statistical analysis.

Patients for whom expression details of AP-2 α , AP-2 γ , CHI3L1 and PBEF1 were available were included for analysis. Mean age of the patient cohort was 45 years. The follow up period was between January 2001 to January 2012, with the minimum and maximum follow up being 12 months and 132 months respectively. The mean survival period was (Median: 54; Range: 12 months to 10 years).

The correlation of expression of a given gene with survival was assessed by Cox regression method. The formula was devised using the Cox regression coefficients derived from the Cox proportional hazard analysis. Each patient was assigned a risk score that is a linear combination of the expression levels of the significant parameters weighted by their respective Cox regression coefficients. According to our analysis, patients having high risk scores are expected to have poor survival outcomes as compared to patients having low risk scores. The study involves calculation of risk scores for every patient as follows:

Risk score = ((-0.705 X labeling index of AP2- α) + (0.300 X labeling index of CHI3L1) + (0.279 X labeling index of PBEF1))

The significant parameters that formed the signature were of two types - risky and protective. Risky parameters were defined as those that had hazard ratio greater than 0. Protective parameters were defined as those that had hazard ratio lesser than 0. Using this definition, we found 1 protective parameter and 6 risky parameters.

Based on the risk score, the patients were divided into high-risk and low-risk groups using the median risk score as the cut-off. We used Cox regression analysis to evaluate the contribution of AP-2 α , CHI3L1, PBEF1, ErbB2, stage of the disease, distant metastasis, lymph node status, estrogen receptor, progesterone receptor, tumour size, grade, histological type, menopausal status, age, AP- γ and risk score as prognostic factors. Multivariate analysis was carried out for variables which showed correlation with survival using univariate analysis. Kaplan-Meier method was used to estimate overall survival. Graph Pad Prism 5.0 software was used for Kaplan-Meier graph plotting and calculation of P-values. P-values less than 0.05 were considered significant.

III. RESULTS

Expression pattern of AP2 α , AP2- γ , PBEF1 and CHI3L1.

We detected levels of AP-2 α , AP2- γ , CHI3L1 and PBEF1 by immunohistochemistry (IHC). Breast cancer tissues showed predominant nuclear and lower cytoplasmic staining for AP-2 α (**Figure 1B**); nuclear staining for AP2- γ (**Figure 1D**); cytoplasmic staining for CHI3L1 (**Figure 1F**) and PBEF1 (**Figure 1H**). Whereas, adjacent normal breast cells showed epithelial nuclear and myoepithelial nuclear staining for AP-2 α (**Figure 1A**) and AP2- γ (**Figure 1C**) respectively; epithelial cytoplasmic staining for CHI3L1 (**Figure 1E**) and PBEF1 (**Figure 1G**). For statistical analysis, the samples were divided into low or high expression groups using median labeling index (LI) as cut off. LI was calculated based on number of cells positive and the intensity of staining and it ranged from 0-12 for all the three genes. Out of 104 samples available, 46% (48/104) cases were found to show high expression (LI of ≥ 4 (median of LI) was considered as high expression) for AP-2 α (nuclear) immuno staining; 56% (96/172) for CHI3L1 (LI of ≥ 4 (median of LI) was considered as high expression) and 46% (50/109) for PBEF1 (LI of ≥ 9 (median of LI) was considered as high expression).

Correlation of different markers with overall survival by univariate Cox regression analysis.

The different markers were subjected to univariate Cox proportional hazard regression analysis. AP2- α , CHI3L1, PBEF1, ErbB2, Stage of the disease, distant metastasis, lymph node involvement, and tumor size correlated with patient survival (Table 2). AP-2 α (nuclear) was seen to be a good prognostic marker, while CHI3L1 and PBEF1 were found to be poor prognostic markers. However, parameters like AP-2 γ , estrogen receptor, progesterone receptor, grade, histological subtype, menopausal status and age of the patient showed no significant correlation with patient survival.

AP-2 α , CHI3L1 and PBEF1 are independent predictors of overall survival

The markers which stood significant in univariate analysis were subjected to forward condition multivariate Cox proportional hazard regression analysis. We found that AP2- α (HR = 0.609; B = -0.495; p = 0.005), CHI3L1 (HR = 1.361; B = 0.308; p = 0.001), PBEF1 (HR = 1.541; B = 0.433; p = 0.004), and confounding factor Stage (HR = 3.207; B = 1.165; p = 0.03) were independent predictors of survival in breast cancer patients (Table 3). However, ErbB2, distant metastasis and lymph node lost their significance in multivariate analysis.

Stratification of patients based on expression of AP2- α , CHI3L1 and PBEF1:

With the results of univariate and multivariate analysis indicating the reliability of AP2- α , CHI3L1, and PBEF1 to predict survival, we attempted stratifying the patients into high or low risk groups based on the expression. Patients with tumors having high expression level of AP-2 α nuclear positivity had better survival than patients expressing low levels (median survival: undefined versus 76 months; HR: 7.210; P <0.0001) (**Figure 2A**) suggesting that it is a good prognostic marker, whereas patients having low expression levels of CHI3L1 and PBEF1 had better survival than patients expressing high levels (median survival: undefined versus 75 months; HR: 5.442; P <0.0001 and median survival: undefined versus 53 months; HR: 4.929; P <0.0001 respectively) (**Figure 2B and 2C respectively**) which indicates that these are poor prognostic markers.

Risk score based on AP2 α , CHI3L1 and PBEF1 is an independent predictor of survival.

To combine the prognostic capabilities of the three genes (AP2- α , CHI3L1 and PBEF1) of our interest, we calculated a risk score that could predict patient survival (**Table 4**). Risk score is a linear combination of the expression levels of the significant parameters weighted by their respective Cox regression coefficients. According to our analysis, patients having high risk scores are expected to have poor survival outcomes as compared to patients having low risk scores. The risk score in the cohort ranged from -7.56 to 6.948, with the median value of 1.857. The risk score was evaluated for its influence on survival of the patients and was found to significantly correlate with survival as a continuous variable (HR= 2.532; P = 2.912x10⁻⁸). To assess the contribution and independency of risk score in predicting survival, multivariate analysis was carried out. ErbB2, stage, distant metastasis and nodal involvement were used in multivariate to adjust the risk score for independency. Risk score was seen to highly correlate with survival (HR = 2.587; p = 2.103x10⁻⁶) and was independent of ErbB2, stage, distant metastasis and nodal involvement (**Table 4**). Stage (HR = 2.260; p = 0.02) also appeared to be independent predictor of survival.

Stratification of patients based on risk score.

It is evident from the above results that risk score is much better than other parameters in predicting survival. Therefore, we attempted to stratify the patients based on risk score to predict survival. The relative expression values of individual genes vary based on the methodologies used, which in turn reflect on the risk score. The range of risk score of the present study cohort ranged from -7.56 to 6.948. The median value of the risk score for the present study cohort was calculated, which was noted to be 1.857. The median cut off divided the patient set into two groups, low risk and high risk. The low risk group showed better survival compared to the high risk group (median survival: undefined versus 42 months; HR: 11.30; P <0.0001) (**Figure 3A**). Further, to identify patients with very high risk for better treatment, we divided the patient set into 3 groups. While the low risk group remained the same (lesser than 50% i.e. median cut off), at 75% cut off the high risk group (from the previous stratification) was further divided into intermediate and high risk groups. Low and intermediate risk group showed better survival compared to high risk group (median survival: undefined versus 19 months respectively; P <0.0001) (**Figure 3B**). Also it was noted that most of the dead patients belonged to the high and intermediate risk groups, while all those belonging to low risk group were alive at the end of follow up (**Figure 3C**). Patients belonging to low risk group had low risk score and high risk group had high risk score (**Figure 3D**).

Nature of genes involved in risk score analysis.

Of the three genes that we took a closer look at, the nature of one gene was seen to be different from the other two genes. When patients were ranked according to risk score, AP-2 α appears to behave protective while CHI3L1 and PBEF were found to be risky with respect to their association between their expression and patient survival. The protective genes were expressed at a higher level in the low risk group compared to the high risk group and the risky genes were expressed at a higher level in the high risk group than in the low risk group (**Table 5, Figure 3E**).

IV. DISCUSSION

In this study, we analyzed the expression pattern of AP-2 α , AP-2 γ , CHI3L1, PBEF1 and ErbB2 expression among Indian sporadic breast cancer patients by immunohistochemistry and correlated the expression level of these markers with overall survival. Labeling index of the three genes of our interest were used to calculate the risk score, which stood significant in univariate analysis. These genes have been shown to correlate with survival (except AP-2 γ). Hence, we combined the prognostic capability of AP-2 α , CHI3L1 and PBEF1 and generated a risk score which was independent when compared to other known predicting clinical parameters

like ErBb2, nodal involvement, stage of the disease and distant metastasis. Patients with high risk score had shorter survival compare to patients with low risk score value. In multivariate analysis risk score was seen to highly correlate with patient survival and was independent of ErbB2, stage, distant metastasis and nodal involvement. However ErbB2, nodal status and metastasis were also shown to be independent predictors of survival. The three prognostic markers used in this study included one gene (AP-2 α) that was protective and two genes (CHI3L1, PBEF1) that were risky with respect to their level in the low risk group compared to the high risk group. Our findings suggest that the protective and risky nature of these genes is suggestive of their function being either inhibitory or promoting respectively of various properties of cancer cells like proliferation, migration and invasion.

In our study, though we have observed nuclear and cytoplasmic staining of AP-2 α tumor cells, it was predominantly nuclear staining. While our study is consistent with some (31-34), there are other studies that report only nuclear staining (35, 36). The adjacent normal breast cells show epithelial nuclear cell staining which is consistent with the reported studies (35, 37). Of 104 patients, 46% showed high expression of AP-2 α . Patients expressing higher levels (n=48) of AP-2 α had survived better than patients expressing lower levels (n=56) (undefined vs 76 months; p = <0.0001). AP-2 α has shown to be significant in both univariate and multivariate analysis in our findings, which is consistent with the reported literature (31). AP-2 α expression has been shown to be associated with good prognosis in many breast cancer studies (31, 32, 34, 37). Our study shows that AP-2 α (nuclear) is a marker of good prognosis in breast cancer patients.

Cytoplasmic staining was observed for CHI3L1. However, other studies have reported only cytoplasmic and not membranous staining (38-40). We observed cytoplasmic epithelial cells staining in adjacent an normal cell which is consistent with Roslind et al., 2007 (39) who has reported epithelial cytoplasmic staining. However, they have reported dot like staining pattern in the nuclear cells which was not seen in our findings. Of 172 patients, 47% showed high expression of CHI3L1. Patients expressing lower levels (n=76) of CHI3L1 had survived better than patients expressing higher levels (n=96) (undefined vs 75 months; p = <0.0001). CHI3L1 has shown to be significant in both univariate and multivariate analysis in our findings, which is consistent with the reported literature (38). CHI3L1 expression has been shown to be associated with poor prognosis in many malignancies including breast cancer (20-22, 24, 25, 38, 39), while some studies have also reported that CHI3L1 is not a predictor of survival in breast cancer patients (40). Our study shows that CHI3L1 is a marker of poor prognosis in breast cancer patients.

We have correlated the expression of PBEF1 with survival on a retrospective data of 109 breast cancer patients. Patients expressing lower levels (n=59) of PBEF1 had survived better than patients expressing higher levels (n=50) (undefined vs 53 months; p = <0.0001). We observed cytoplasmic staining pattern for PBEF1 in tumor cells, while adjacent normal cells show cytoplasmic staining in the epithelial layer of the tissue. PBEF1 has shown to be significantly associated with survival in both univariate and multivariate analysis in our findings. Prognostic significance of PBEF1 has not been reported previously for breast cancer and the present study is first of its kind to show that high expression of PBEF1 is significantly associated with shorter survival among breast cancer patients.

We found that these three genes (AP-2 α , CHI3L1 and PBEF1) are independent prognostic indicators. Risk score was calculated by combining the individual prognostic capabilities of these three genes. Risk score highly correlated with survival. It was also shown to be an independent prognostic indicator and was a better indicator than other known prognostic markers. When patients were ranked according to risk score, patients with high risk score fell in the high risk category and those with low risk score fell in the low risk category. Hence, risk score can be used to categorize patients. AP-2 α appears to behave like a protective gene This is well documented and reported in literature. Gee et al, Friedrichs and Pellikainen et al. suggest that AP-2 α is involved in development, apoptosis and cell cycle regulations. Altered expression of this protein is been associated with poor clinical outcome of breast cancer patients. CHI3L1 and PBEF1 seem to be risky genes with respect to their level in the low risk group compared to the high risk group. It has been shown that lectin binding is linked to tumor progression and K-ras activation in colorectal cancer. Hence, CHI3L1 maybe playing a role in tumor invasion [20], which supports our data that it is a marker of poor prognosis. Overexpression of PBEF1 has been correlated with poor response to doxorubicin-based primary chemotherapy in breast cancer [29]. Also, it has been shown to be a poor prognostic indicator in GBM [29], which is in corroboration with our study. Therefore, this study supported by previous studies suggests that AP-2 α , CHI3L1 and PBEF1 could be involved in inhibiting or promoting various properties of cancer cells like proliferation, migration and invasion that requires in-depth study. The effect of various drugs on the expression and effect of downregulation/overexpression of these genes on breast tumor growth needs to be explored.

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Table 1. Patient characteristics

Characteristic	Number of patients (%)
Total number of patients	174
AP-2α nuclear (n=104)	
High expression	48 (46 %)
Low expression	56 (54 %)
AP-2α cytoplasmic (n=104)	
High expression	49 (47%)
Low expression	55 (53%)
AP-2γ (n=72)	
High expression	33 (46%)
Low expression	39 (54%)
CHIL31 (172)	
High expression	96 (56%)
Low expression	76 (42 %)
PBEF1 (109)	
High expression	50 (46 %)
Low expression	59 (54 %)
ErbB2 (174)	
High expression	83 (48%)
Low expression	91 (52%)
Age (n=174)	
\leq 45	93 (53%)
$>$ 45	81 (47%)

Tumor size (n=160)	
T1	13 (8%)
T2	78 (49%)
T3	32 (20%)
T4	37 (23%)
Lymph node status (n=170)	
Positive	109 (64%)
Negative	61 (36%)
Distant metastasis (n=169)	
Positive	14 (9%)
Negative	155 (91%)
Stage (n=159)	
1	6 (4%)
2	52 (33%)
3	87 (55%)
4	14 (8%)
Histological type (n=164)	
Ductal	157 (96%)
Lobular	7 (4%)
Histological grade (n=158)	
1	2 (2%)
2	19 (12%)
3	137 (86%)
ER status (n=174)	
Positive	100 (57%)
Negative	74 (43%)
PR status (n=174)	
Positive	96 (55%)
Negative	78 (45%)
Menopausal status (n=168)	
Premenopausal	82 (48%)
Postmenopausal	86 (52%)

'n' indicates the number of patients for whom information was available

Table 2. Univariate Cox regression analysis

Variable	Regression coefficient	Hazard ratio (95% CI)	P-Value
AP-2 α nuclear	-0.705	0. 494 (0.346-0.706)	0.0001

AP-2 α cytoplasmic	0.146	1.157 (1.027-1.303)	0.017
AP-2 γ	-0.180	0.835 (0.417-1.673)	0.611
CHIL31	0.300	1.350 (1.238-1.473)	2.443x10 ⁻¹¹
PBEF1	0.279	1.322 (1.143-1.529)	0.0001
ErbB2	1.302	3.677 (1.991-6.794)	3.206x10 ⁻⁵
Stage ^a	1.474	4.368 (2.659-7.714)	5.770x10 ⁻⁹
Distant metastasis ^b	1.850	6.360 (3.346-12.091)	1.656x10 ⁻⁸
Lymph node status ^c	1.194	3.330 (1.563-7.095)	0.002
Estrogen receptor	-0.106	0.899 (0.520-1.555)	0.704
Progesterone receptor	-0.093	0.911 (0.528-1.572)	0.738
Tumor size ^d	0.493	1.637 (1.193-2.246)	0.002
Grade ^e	0.155	1.167 (0.545-2.501)	0.691
Histological type ^f	1.020	2.772 (0.383-20.086)	0.313
Menopausal status	-0.062	0.940 (0.540-1.637)	0.826
Age	-0.009	0.991 (0.967-1.016)	0.475

a, clinical stage of the disease based on AJCC, 2002; **b**, distant metastasis based on TNM classification of breast tumors by UICC, 2002; **c**, lymph node status classified based on UICC, 2002; **d**, tumor size, classified as T 1-4 based on TNM classification of breast tumors by UICC, 2002; **e**, pathological grade of the tumor based on Elston and Ellis, 1991; **f**, histological type of tumor based on WHO classification of tumors, 2003

Table 3. Multivariate Cox regression analysis

Variable	Regression coefficient	Hazard ratio (95% CI)	P-Value
AP-2 α nuclear	-0.495	0.609 (0.430-0.863)	0.005

CHI3L1	0.308	1.361 (1.139-1.627)	0.001
PBEF1	0.433	1.541 (1.144-2.076)	0.004
Stage	1.165	3.207 (1.122-9.165)	0.03

Table 4. Prognostic value of risk score – Univariate and multivariate analysis

Variable	Hazard ratio (95% CI)	P-Value
I-Univariate analysis		
Risk score	2.532 (1.823-3.516)	2.912x10 ⁻⁸
II-Multivariate analysis		
Risk score	2.587 (1.747-3.832)	2.103x10 ⁻⁶
Stage	2.260 (1.125-4.541)	0.02

Table 5. Expression of AP-2α, CHI3L1 and PBEF1 in high and low risk group

Gene	Low risk		High risk	
	Median	Mean ± SD	Median	Mean ± SD
AP-2α	8.000	8.764 ± 2.177	1.000	1.188 ± 1.330
CHI3L1	2.000	2.052 ± 1.305	9.000	9.520 ± 2.466
PBEF1	4.000	3.934 ± 2.901	12.000	11.380 ± 1.223

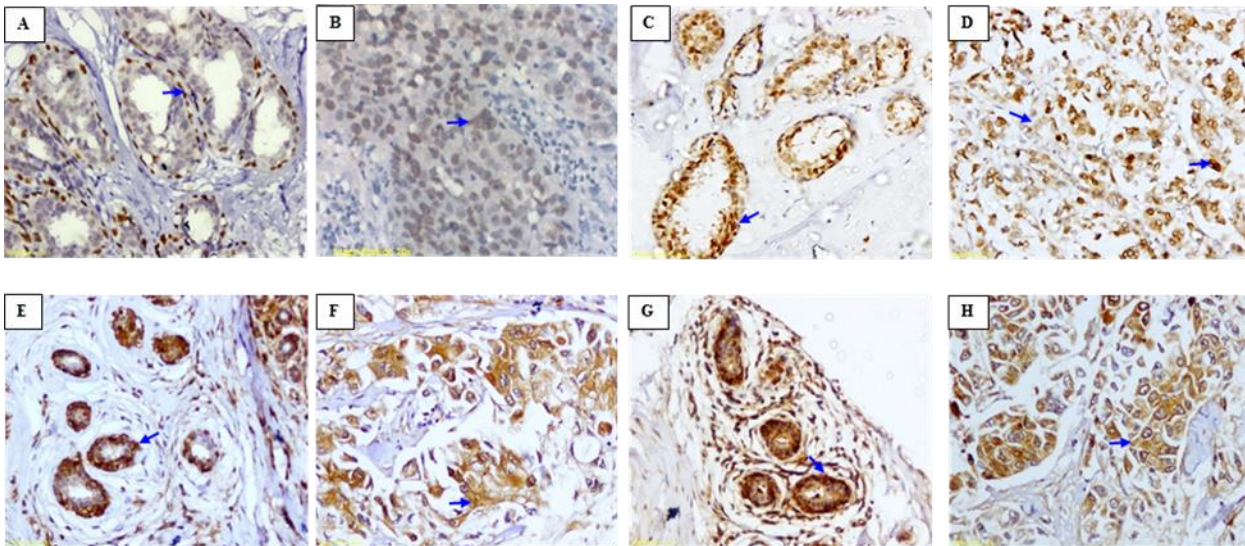


Figure 1: Immunohistochemical staining patterns for AP-2 α , AP-2 γ , CHI3L1 and PBEF1

The arrows indicate the region of staining. An example of (A) AP-2 α normal tissue showing epithelial nuclear positive staining, (B) AP-2 α tumor tissue showing strong cytoplasmic (upper arrow) and nuclear staining (lower arrow), (C) AP-2 γ normal tissue showing myoepithelial nuclear positive staining, (D) AP-2 γ tumor tissue showing strong nuclear staining, (E) CHI3L1 normal tissue showing epithelial cytoplasmic positive staining, (F) CHI3L1 tumor tissue showing strong cytoplasmic staining, (G) PBEF1 normal tissue showing epithelial cytoplasmic positive staining and (H) PBEF1 tumor tissue showing strong cytoplasmic staining.

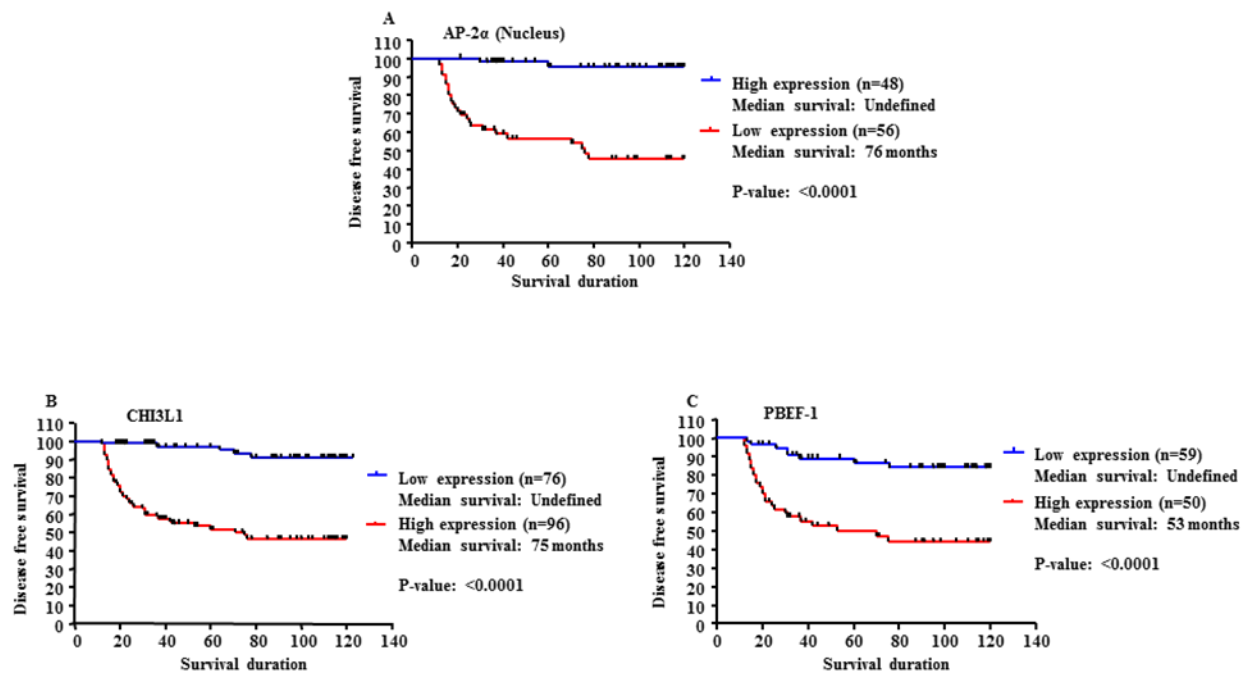


Figure 2: Expression of AP-2 α , CHI3L1 and PBEF1 and breast cancer patient survival

Kaplan Meier graphs for A. AP-2 α (Nucleus), B. CHI3L1 and C. PBEF1. In all cases, low risk group had better survival than high risk group.

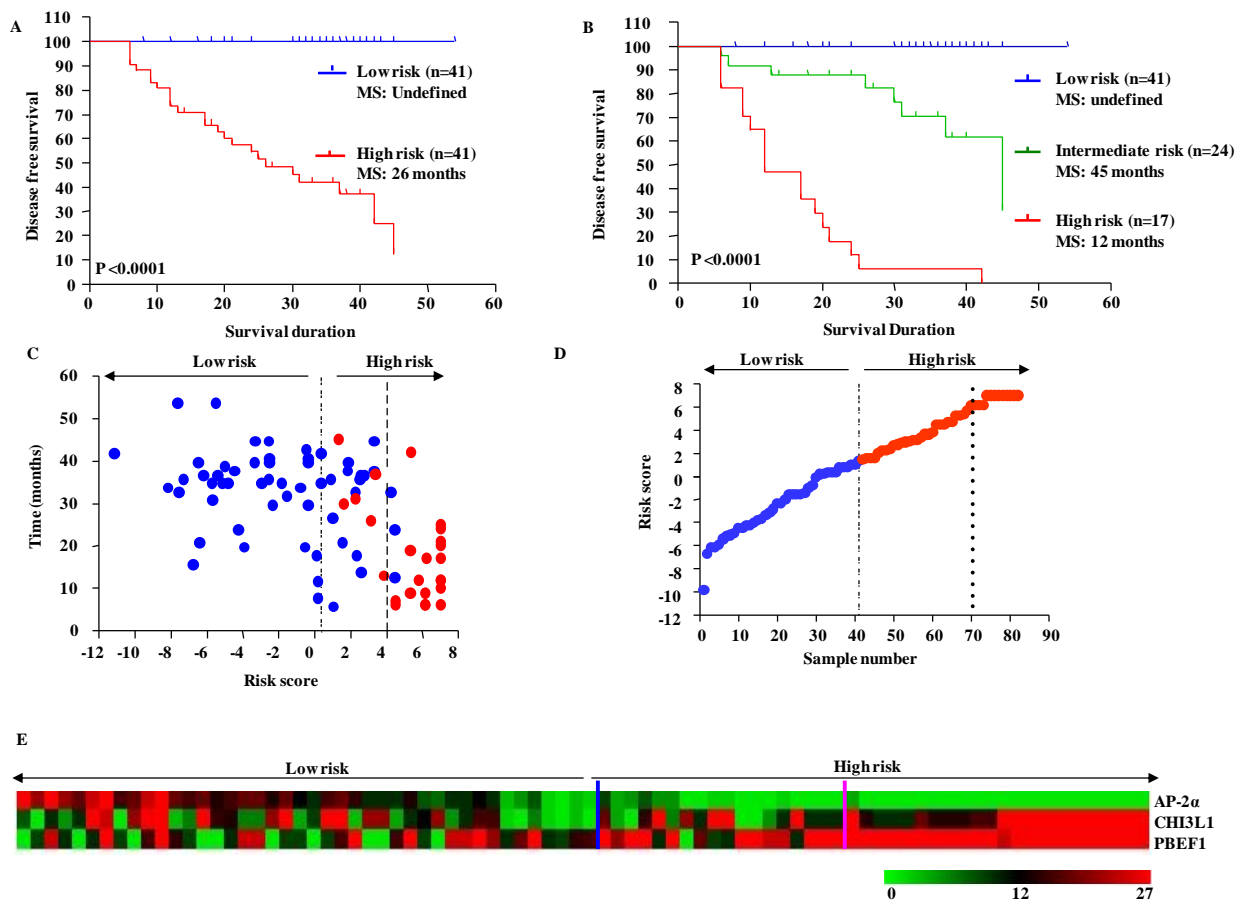


Figure 3: Kaplan-Meier survival estimates of breast cancer patients according to risk score

A. Kaplan Meier graph for risk score analysis showing low and high risk group classification,

B. Kaplan Meier graph for risk score analysis showing low, intermediate and high risk groups,

C. Distribution of patients according to their survival, risk score and censoring status. Red dots indicate patients who have died and blue dots indicate patients who were alive. All dead patients belonged to the high risk group. The dashed line divides the patients into 2 groups- low and high risk. Patients who lie before the dashed line are low risk and after the dotted line are high risk patients of second stratification. The patients that lie between the dashed and the dotted line are those who belong to the intermediate risk group of the second stratification,

D. Distribution of patients in the low and high risk groups according to their risk score. The dashed line divides the patients into 2 groups- low and high risk. The patients that lie between the dashed and the dotted line are those who belong to the intermediate risk group.

E. Heat map showing expression pattern of AP-2α (Nucleus), CHI3L1 and PBEF1. The blue line divides the patients into 2 groups- low and high risk. Patients who lie before the blue line are low risk and after the pink line are high risk patients of second stratification. The patients that lie between the blue and pink line are those who belong to the intermediate risk group of the second stratification.

Implementation of Multilevel Segmentation using Cognitive Approach - A Case study on Devanagari Script

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Abstract- Optical character recognition strategies are concentrated towards improving recognition efficiencies by adapting post processing techniques. OCR errors of complex scripts are due to improper segmentation as well as inappropriate rendering. Topological features of a script as a global knowledge and geometrical features of isolated patterns as local knowledge are combined together while segmenting the basic unit, syllable. A multilevel segmentation was implemented to adopt the idea of human visual perception capability into the proposed model to use the distinct features exhibited by Devanagari script. The proposed method is based on implementing cognitive approach in segmentation phase by dealing with the syllable as a meaningful unit of information right from segmentation phase itself instead of isolated pattern on document images of Devanagari script.

Index Terms- OCR, segmentation, syllable, Cognitive approach, Topology, Geometry.

I. INTRODUCTION

Optical Character Recognition (OCR) is a convenient and efficient tool for office Automation and information retrieval, and is becoming more and more important in today's office and library environment. Current OCR research and development is mostly centered around isolated patterns of pixels. In a general OCR model, the key step is to segment the scanned image. Segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as superpixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. As every individual word is traditionally built by juxtaposition of letters which are recognized using a combination of strokes and curves. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics. Each of the pixels in a region is similar with respect to some characteristic or computed property, such as color, intensity, or texture. Adjacent regions are significantly different with respect to the same characteristics. Several general-purpose algorithms and techniques have been developed for image segmentation. Since there is no general solution to the image segmentation problem, these techniques often have to be combined with domain knowledge in order to effectively solve an image segmentation problem for a problem domain. When the script is associated with a simple syntactic rule of defining isolated pattern as equivalent to a character, then the job of the recognizer becomes easy[1]. Under the influence of syntactic rules with shape variations and contextual formations,

the job of the recognizer becomes highly complex. The cumulative errors of all the above stages are addressed in the post processing stages with the help of knowledge sources like dictionary, phrase database etc. Error detection itself is a complex phenomenon in this context. Adaptability of syntactic rules at this stage is yet to progress. In certain scripts like Telugu, Devanagari, etc., (Bhrami derived) development of knowledge sources is still at a primitive stage. Shape variations within the structure is well defined for all the scripts which is an important knowledge source from the angle of syntactic rules[2]. Even though these rules are bounded by the limited approach at sub-word level pattern, it is possible to combine grammar rules in this unit with structural pattern recognition. The current research was motivated to adopt the idea of human visual perception capability into the proposed model to use the distinct features exhibited by each script. So, the target of this paper is to identify the script type of the texts without reading the contents of the document. The present research work concentrates on implementing cognitive approach in segmentation phase by dealing with the syllable as a meaningful unit of information right from segmentation phase itself instead of isolated patterns.

II. LITERATURE REVIEW

A. Related Work:

The development of OCR has incremental improvements in individual phases. The segmentation phase broadly follows three approaches: dissection method, recognition based segmentation or hybrid approach. Few of the Dissection methods used are discussed here. Initial systems for segmenting machine-printed characters are based on two simple features: white space and pitch [4]. Classifying the isolated patterns into identifiable glyphs is the major approach attempted till recent period. Dissecting the word into possible isolated patterns in Indic scripts is a continuation of the effort made in [7]. Even though isolated patterns are considered to be primitives of feature extraction stage, large numbers of errors are reported in the segmentation process. Sometimes the errors are due to in appropriate formulation of association rules among recognizable unit. Interestingly all these errors are attempted at the post processing stage [8]. The topological and geometrical features of a syllable are explored extensively in [9]. The concept of zone is introduced while defining syllable patterns in a script line. Three zones are Top, Middle and Bottom zones and are identified within the script line using difference profile algorithm on Horizontal Projection Profile. Pal and Chaudhuri [6] explored a feature based algorithm for automatic recognition of Devanagari script. A structured binary-tree classifier was used by

implementing global features for upper tiers of the tree, based on condensed run length approach, for classification and the lower tiers of the tree uses local features, estimated as moments, for classification. Pratap Reddy et. al. [11] proposed a classical approach in the segmentation of Canonical Syllables of Telugu document images. This model is based on the canonical definition of the Telugu script. The relation between zones and components is established in the segmentation process of canonical syllable. The components in the script are classified into six different classes. An individual component associated with either top zone or middle zone or bottom zone is classified as Top Zone (TZ class), Middle Zone (MZ class) and Bottom Zone (BZ class) respectively. A.S.C.S Sastry et al. [12] proposed a zone extraction method for Telugu text which uses statistical properties of peaks and valleys of the profile vector. In this the horizontal profile of a text line was first obtained and row with peak in the first half is upper bound of middle zone. Find the slope of the valley from the row with peak in lower half of profile with respect to the successive row. The row with the maximum slope of the valley is identified as the lower bound of middle zone.

B. Segmentation Challenges:

With isolated scripts, characters are written to be separable (although they may touch due to degradation) while connected scripts cannot be easily segmented. Scripts can also be broadly classified based on word composition into syllabic and non-syllabic. In non-syllabic scripts, characters are horizontally (or vertically) separable glyphs whereas in syllabic scripts, glyphs appear as syllables, which are in turn a complex combination of one or more characters. Sometimes, characters fuse together to form new shapes. The presence of language-specific constructs, in the domain of non-Latin scripts, such as shirorekha (Devanagari), modifiers (south-east Asian scripts), writing order, or irregular word spacing (Arabic and Chinese) requires different approaches to segmentation. While conventional vertical or horizontal profiling methods fail to segment characters directly from words, character segmentation from syllables using only connected component analysis itself is a complex task which is highly correlated with the script characteristics [3]. Casey and Lecolinet define four methods of character segmentation [4] as follows:

- III. The first is dissection based where the image is decomposed into classifiable units before feature extraction and classification. Due to its dis-connectivity from the later modules, the feedback mechanism is expensive.
- IV. The second method tries to classify subsets of spatial features collected from a word image as a whole. Segmentation hypotheses are generated and choosing best hypothesis along the word gives best recognition result. The challenge of this approach is to come up with minimal number of possibly correct hypotheses.
- V. The third involves over-segmenting of the word image i.e., one single character could be segmented into two or more parts. The over-segmentation in the vertical direction only happens to long characters such as ए and ह [3].

- VI. The fourth method recognizes an entire word as a unit and is a holistic strategy. A major drawback of this class of methods is that their use is usually restricted to a predefined lexicon.

III. INDIAN SCRIPT FEATURES

A. Devanagari Script characteristics:

India is a multilingual country. A significantly large number of scripts are used to represent these languages. Indian languages are broadly divided into two categories. The Northern Languages are stroke based and southern are cursive scripts. Most of the Northern languages are derived from Devanagari script. As any other script Devanagari script has its own specified composition rules for combining vowels, consonants, and modifiers. Devanagari script has 13 vowels [see Fig. 1(a)] and 34 consonants [see Figure 1(b)] along with 14 modifiers of vowels and of “rakar”, as shown in Figure 1(a) symbols. Some of them can be combined with their type[5]. Devanagari script consonants are written in a linear left-to-right order, vowel signs are positioned non-linearly above, below or either side of consonants. A modifier can be attached to a vowel or to a consonant. Consonants may have a half form when they are combined with other consonants. Except for some characters, the half forms of consonants are the left part of original consonants with the right part removed.

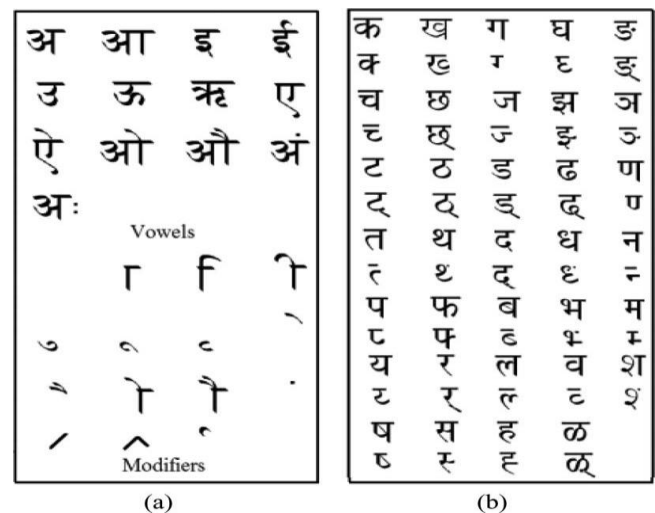


Figure 1 : (a) Vowels and modifiers of Devanagari script. (b) Consonants and their corresponding half forms (shown below the consonants) in Devanagari script.

Another distinctive feature of Devanagari script is the presence of a horizontal line on the top of all characters. This line is known as header line or “shirorekha” (see Figure 2). The words can typically be divided into three strips: top, core, and bottom, as shown in Fig. 3. The header line separates the top and core strips and a virtual base line separates the core and lower strips. The top strip generally contains the top modifiers, and bottom strip contains lower modifiers. When two or more characters appear side by side to form a word in Devanagari, the header lines touch and generate a bigger header line[5].

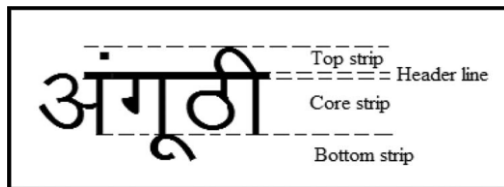


Figure 2 :Three strips of a word in Devanagari script.

The distinct visual appearance of every script is due to the presence of the segments like – horizontal lines, vertical lines, upward curves, downward curves, descendants and so on. The presence of such segments in a particular script is used as visual clues for a human to identify the type of even the unfamiliar script.

B. Language Dependent and independent features:

All languages have basic common features of representation. Identification of the characters in Latin and Han based scripts and easy because each character is independent by itself, However dealing with complex scripts(Bhrami based) it is very difficult as it is a combination of independent and dependent consonants. For example Devanagari characters hang from a horizontal line(called the head stroke) written at the top of the character, unlike English letters which are written up from the line below them. It is very important to learn the correct stroke order for Devanagari characters. In English Devanagari is often called a syllabary, rather than an alphabet, because each Devanagari character normally represents a consonant and a vowel combination or a vowel on its own. Each Devanagari character normally represents a complete syllable and a syllable can be combination of full form or half form. In this paper an exploration of cognitive science is to be proposed to identify the language dependent features.

IV. PROPOSED METHOD – SYLLABLE SEGMENTATION

The current research was motivated to adopt the idea of human visual perception capability into the proposed model to use the distinct features exhibited by each script. Syllable is a fundamental unit of information in any script based language, derived from the means of phoneme. The structural property of a syllable is dependent on the rules defined by the script. One or more isolated character is associated with a syllable in English. The patterns of individual vowels and consonants are fixed in nature. However the consonant-vowel cluster formation follows a predefined set of rules in combination with patterns of vowel modifier and consonant modifier [2].However it is difficult in complex scripts like Bhrami and Devanagari scripts. This can be explained clearly with two examples one in English(Latin derived) and another in Hindi(Devanagari derived). The word 'vijay' consists of 5 isolated patterns 'v', 'i', 'j', 'a' and 'y'. Each one of them map on a unique code which generate a glyph to render them correctly. Whereas the word विद्या consists of 4 meaning full units(2 syllables). The first syllable alphabet वि is complex in nature with a combination ध्या consists of 4

meaning full units(2 syllables). The first syllable alphabet वि is complex in nature with a combination of a consonant(/YA/) with a dependent consonant(/DYA/). Adding to this complexity the order in which they are rendered is also important.. A comparison between the Isolated Pattern approach and Syllable approach is presented in the below Figure 3(a) and (b).

Word	IP1	IP2	IP3	IP4	IP5	IP6
मुस्कान	म	ु	र	क	न	
भाषा	भ	।	ष	।		
विधाता	।	वे	ध	।	त	।
वास्तव	व	।	र	त	व	

Figure 3 : (a) Isolated Pattern Approach

Word	IP1	IP2	IP3	IP4
मुस्कान	मु	स्का	न	
भाषा	भा	षा		
विधाता	वि	धा	ता	
वास्तव	वा	स्त	व	

Figure 3 : (b) Syllable Approach

V. SEGMENTATION PHASES:

After scanning the document, the document image is subjected to pre-processing for back ground noise elimination, skew correction and binarization to generate the bit map image of the text. The pre-processed image then go through number of segmentation phases .

A. Line Segmentation:

In the first phase the preprocessed image is segmented into lines by using horizontal projection profile. The horizontal projection profile is the histogram of the number of ON pixels along every row of the image. White space between text lines is used to segment the text lines. The projection profile will have valleys of zero height between the text lines. Line segmentation is done at these points.

B. Word segmentation:

The spacing between the words is used for word segmentation. For Devanagari script, spacing between the words is greater than the spacing between characters in a word. The spacing between the words is found by taking the vertical projection profile of an input text line. Vertical projection profile is the sum of ON pixels along every column of the image.

C. Syllable segmentation:

For Devanagari script, character segmentation involves the removal of sirekha/Header line. In this third phase topological information of the script line is used to divide the syllable into three zone's, the top zone, bottom zone and middle zone, horizontally[9]. The middle zone, through its horizontal difference projection profile, is then used to determine the candidate boundaries of the syllable. Syllable is treated as a basic unit of information as equivalent to one meaningful unit as per the cognitive approach. Syllable is composed of one or more components[2]. These candidate boundaries are confirmed or modified based on the application of the knowledge source about its geometry(inter syllable distance, aspect ratio, length, etc.).

Algorithm used for syllable segmentation:

- [6] The horizontal projection profile of the meaningful unit is first extracted for every syllable.
- [7] The difference profile of the same is then computed from the above.
- [8] To determine the left boundary traverse the difference profile starting from the middle towards the beginning and determine at what point the maximum peak occurs. This point represents the left boundary of the core component.
- [9] Similarly the right boundary is located by starting from the middle of the difference profile and moving towards the end. The minima in this traversal indicates the right boundary of the core component.
- [10] In both traversals exempt the extreme points as they represent the start and end of the meaningful unit or syllable.
- [11] Once the boundaries of the core component are established this divides the syllable into three regions horizontally namely left region, center region and right region.
- [12] Now combine these 3 regions with the 3 vertical zones(top, middle and bottom) to segment the syllable into nine new regions namely Top-left(TL), Top-Center(TC), Top-Right(TR), Middle-Left(ML), Middle-Center(MC), Middle-Right(MR), Bottom-Left(BL), Bottom-Center(BC) and Bottom-Left(BL) regions.

Script analysis is then used as a knowledge source to indicate which of these regions are essential i.e., contain significant information for that script. Other regions may contain information but that would be redundant information. This information also forms part of the knowledge source. The vowel modifiers and the consonant modifiers are treated as non-core components. The geometric representation of core components will always be within the boundaries of middle zone. The geometrical features of non-core components might spread over all regions with a condition that their placement is around the core component only. The presence of another core component will be treated as a new syllable. An example is showed in Figure 4.

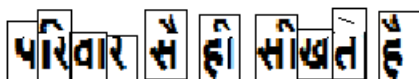
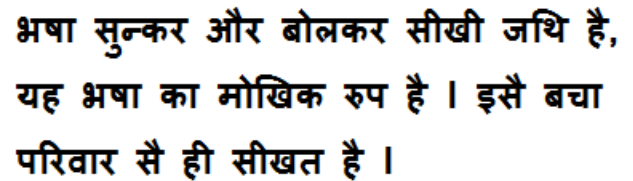


Figure 4 : Devanagari Script after syllable segmentation

Similar exercise may done on other scripts and identified essential regions can be evaluated. An attempt is made to customize the application depending on the script.

VI. RESULTS OF SYLLABLE SEGMENTATION

The segmentation process starts from dissection of lines. A test document image is presented in figure 5. document image is



presented in Figure 5.

Figure 5 : Sample Devanagari Script

Line Segmentation: Script line segmentation is carried out with the help of profile plot of horizontal plane. The horizontal projection profile is the histogram of the number of ON pixels along every row of the image. White space between text lines is used to segment the text lines. Figure(6) shows the segmented

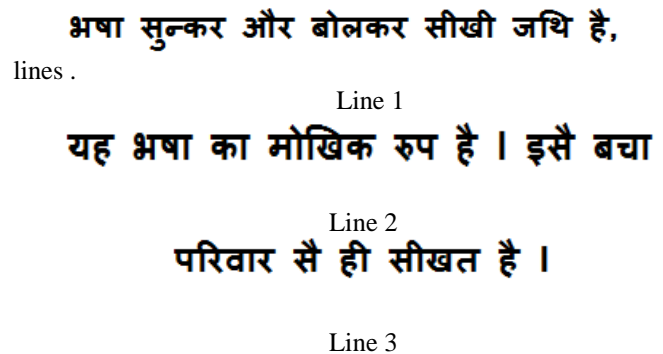


Figure 6 : Devanagari i Script Segmented into lines

Simple profile information is found to be insufficient for further processing. segmentation of syllables is more convenient if the middle zone is made the basis for syllable segmentation as shown below in Figure(7). Starting of a line is identified with the help of 5 non-zero values of difference profile proceeded by 2 zeros. The starting point(S) is identified as the first non-zero quantity. Ending(E) of the line is identified with the reverse phenomena in which 2 non-zero elements are to be followed by 5 zeros. The peak value in the positive plane & valley in the negative plane will provide us the labelling of Top line(T) & Bottom line(B) for each identified script lines.

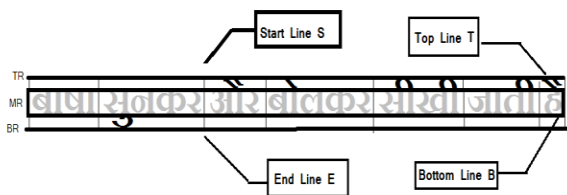


Figure 7 : Script line segmentation profiles with zones

The middle zone information of each script line is highlighted for the purpose of readability. The labeled information corresponding to zones is explored further in the second phase of segmentation model.

Word Segmentation: Word Level segmentation within the script line is the next step carried out and the results are presented in the Figure(8)



Figure 8 : Line1 Word Segmentation

The profile information of the vertical plane of the respective script line is explored during word segmentation. The same phenomena of identifying non zero quantities of difference profile yielded efficient results. However the spacing between words is much less when compared to line spacing we adopted a lower threshold of 2. Fixing of threshold is dependent on font size. For Devanagari script, character segmentation involves the removal of sirerekha /Header line .This can be achieved by computing the horizontal projection of the word image box. The row containing maximum number of black pixels is considered to be the header line. Figure 9 shows the constituent components getting separated after the removal of the sirerekha (the horizontal bar) from a word.

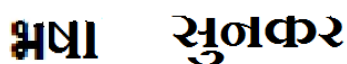


Figure 9 : Removal of the sirerekha from words

Sub-word level segmentation is carried out in the further step which is a more complex task. We first segment candidate patterns of syllable from the difference profile of a word as shown in figure(10). We can observe the peaks and valleys will appear successively in the difference profile of a word. We can observe the peaks and valleys will appear successively in the difference profile.



Figure 10 : Syllable Segmentation for Line1

In the present work, we optimized the number of regions of a syllable to four instead of nine for Devanagari script. The region MC is essential. Among other regions, consonant modifiers are recognized with MR and BC regions. The vowel modifier is associated with TC region in majority of the syllables. Few

exception cases are handled separately amounting to less than .05 percent of the total syllables. Script analysis is then used as a knowledge source to indicate which of these regions are essential i.e., contain significant information for that script. Other regions may contain information but that would be redundant information. This information also forms part of the knowledge source.

Four regions are found to be significant and other regions possess minute information or redundant information. For Devanagari script only four regions namely, middle-center(MC), top-center(TC), bottom-center(BC) and middle-right(MR) are sufficient and complete labeling will be made easy.

These rules are adopted in syllable segmentation process as presented in Figure 11.

वि			
L	C	R	
,	~		T
l	v		M
			B

Figure 11 : Syllable segmented into four Regions

VI. CONCLUSION

In this paper, an improved character identification is proposed. Especially in complex scripts where syllable representation is associated with a cluster of code points, the proposed framework will help in adapting script related locale features. Syllable segmentation approach is adopted in the present work where the wholistic unit, Syllable, is segmented using topological features of the script and the syllable is further segmented into 9 regions while exploring the geometrical features. The proposed model considers script dependent rendering(syntactic) rules. It is possible to extend this approach to any script in the world – to be carried out as a future task. The proposed method is designed in such a way that, appropriate knowledge source can transform it into the respective Devanagari derived script OCR system. Extension of the present model towards Bilingual and Multilingual OCR is the major future scope.

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Filtering Techniques used for Blurred Images in Fingerprint Recognition

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Abstract- In this world of mobile and cameras, new methods differ from the traditional methods. Traditional methods used contact-based fingerprint matching while the new technique uses contact-less fingerprint matching. Fingerprint matching using sensors uses greyscale images which are very much defining comparative to the images which are taken by cameras and mobiles. And in case of mobile and cameras images can be blurred including noise and distortion. In this paper, we are defining techniques to overcome the issues of blurred images and have to find out better minutiae to match with the database set. To extract the features from blurred images, images which are taken by low cost sensors are filtered and then further processed for minutiae matching.

Index Terms- Minutiae matching, low cost sensors, contact-based fingerprint matching, contact-less fingerprint matching, filtering.

I. INTRODUCTION

Fingerprint matching refers to the process of identifying the features and verifying the two human fingerprints. Pattern of fingerprint contains:

- Arch: The ridges enter from one side of the finger, rise in the center forming an arc, and then exit the other side of the finger. Figure 1 up-left shows arch pattern.
- Loop: The ridges enter from one side of a finger, form a curve, and then exit from that same side. Figure 1 up-right shows the loop pattern.
- Whorl: Ridges form circularly around a central point on the finger. Figure 1 lower-right shows whorl pattern.
- Composite: Ridge patterns are not perfectly defined. It is the mixture of two or more patterns. Figure 1 lower-left shows composite pattern.

A fingerprint appears as a pattern of interleaved ridges and valleys where ridges are darklines and valleys are bright in color. Fingerprint information is divided into three levels for identification purposes. There are four types of whorl patterns. Plain whorls consist of one or more ridges which make or tend to make a complete circuit with two deltas, between which an imaginary line is drawn and at least one re-curving ridge within the inner pattern area is cut or touched. Central pocket loop whorls consist of at least one re-curving ridge or an obstruction at right angles to the line of flow, with two deltas, between which when an imaginary line is drawn, no re-curving ridge within the

pattern area is cut or touched. Central pocket loop whorl ridges make one complete circuit which may be spiral, oval, circular or any variant of a circle. Double loop whorls consist of two separate and distinct loop formations with two separate and distinct shoulders for each core, two deltas and one or more ridges which make, a complete circuit.

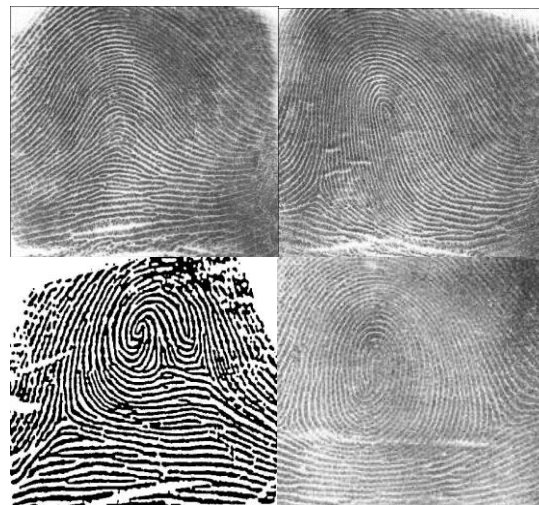


Figure 1: Fingerprint patterns (clockwise from up-left) Arch, Loop, Whorl, Composite

In the process of recognizing minutiae features we should have to find out the structure clear from the blurred images. Features of fingerprint which have different definitions:

- Termination: The ridge which has been started should have to be terminated. The end point of the ridge is called as termination.
- Bifurcation: One continuous ridge divides in two ridges.
- Short ridge (or dot): Ridges which are of small size comparative to other ridges.



Figure 2: Minutiae features: Termination, bifurcation, short ridge.

II. CHARACTERISTICS OF IMAGES

Fingerprint images taken by low cost cameras and others webcams have importance nowadays because they can be found easily like in laptops and mobiles. However, quality of these fingerprints differs from the dedicated sensors. But to resolve this problem new techniques are defined. The images which are taken by cameras are to be processed so that we can obtain the images similar to the dedicated sensors. These images which are obtained by these webcams cannot be as clear as dedicated sensors. So, different pre-processing techniques have to be applied. In this case our area of interest is on blur portion of the fingerprint image. Blur in the images takes place due to distortions in cameras and so as from low quality camera [2]. Fingertip image are taken and ridge structure is defined so that we can get the structure like from dedicated sensors. Dedicated sensors tends to produce image but there are some disadvantages if those sensors like non-uniform pressure, changes in ridge structure, residues which can be there from the previous fingerprint. Using our daily use cameras these problems will not take place. Blur in the images can take place due to several reasons but this blur have to be removed to get ridge structure. In our paper we are defining filtering techniques to get better image from blur image.

III. APPROACH TO REDUCE BLUR

For blur images we have to enhance the contrast of the image so that intensity and frequency of the image rise and blur image tend to give a sharpening values. For the rising of contrast, a method which is called as Histogram Equalization is used. For applying any of the methods the image should be converted into greyscale.

A. Histogram Equalization

The histogram equalization spreads out intensity values along the total range of values in order to achieve higher contrast[1]. Using histogram equalization function `histeq()` this can be done easily. `histeq` enhances the contrast of images by transforming the matrix values in an intensity image, or the values in the `colormap` of an indexed image, so that the histogram of the output image almost matches a specified histogram. After that we get the contrast image of the original image for further processing. In addition to histogram equalization, there is another upgraded method called as adaptive histogram equalization can be used. While `histeq` function works on entire image, adaptive histogram function `adapthisteq` works on small portions of image.

B. Wiener Filter

The wiener filtering is a restoration technique for blur reduction, i.e., when the image is blurred low-pass filter, it is possible to recover the image by inverse filtering or generalized inverse filtering. Wiener filter removes the additive noise and reduces the blurring simultaneously [3]. The function which is used for wiener deconvolution is `deconvwnr()`. Wiener deconvolution can be used effectively when the frequency

measures of the image and additive noise are known to some degree.

C. Regularized filter

Regularized deconvolution can be used when constraints we apply on the recovered image and limited information is known about the additive noise. The blurred and noisy image is restored by a constrained least square restoration algorithm that uses a regularized filter. Functions used to implement regularized filter is `deconvreg()`.

D. Regularized filter

When the blur is present in the fingerprint we are concerned about the output image after deblurring. Richardson lucy deconvolution applies the point spread function to reduce blur and get far better output image than the blur image. It restores the image using the PSF.

E. Median filter

The Median Filter block replaces the central value of an M-by-N neighborhood with its median value. If the neighborhood has a center element, the block places the median value there. Median filtering is similar to using an averaging filter, in that each output pixel is set to an average of the pixel values in the neighborhood of the corresponding input pixel [4]. However, with median filtering, the value of an output pixel is determined by the median of the neighborhood pixels, rather than the mean. The median is much less sensitive than the mean to extreme values (called outliers). Median filtering is therefore better able to remove these outliers without reducing the sharpness of the image. The `medfilt2` function implements median filtering.

IV. RELATED WORK

In order to implement the blur reduction techniques, we have to find first the different intensity values at different points pixelwise. These intensity values should be changed using filtering techniques. In proper processing of images contains the original image, this image is converted into greyscale. These greyscale images are used for further execution. Because we cannot process the image with RGB values so we have to convert the RGB matrix into one channel matrix. This matrix is used by the functions of filters.

Initially we take a image from any camera or mobile, there may be possible some blurriness in the features which are to be extracted. Resized image. Then histogram equalization is used to enhance the contrast of the image so that the intensity values of the image are sharpen. Then the wiener filtering technique is applied for better low-pass filtering. After that we get the better feature designing on the fingerprint image. Then binarization and thinning can be applied. Using feature extraction algorithm fingerprint features are evaluated and in final stage minutiae detection and matching is done [5].

V. EXPERIMENTAL RESULTS

Images are being taken by Sony Ericson LT26ii model cell phone and processed. In figure 3 original image taken and grayscale converted and once filtered image shown.

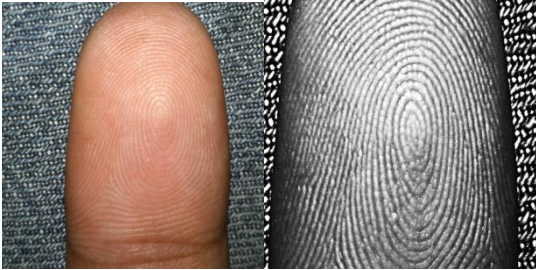


Figure 3: Original image (left) and once filtered and resized image (right).

Histogram equalization and adaptive histogram equalization for contrast enhancement is done.



Figure 4: histogram equalization (left) and adaptive histogram equalization (right).

In figure 5 Binarized and filtered using wiener filtered image is shown with better shown feature.

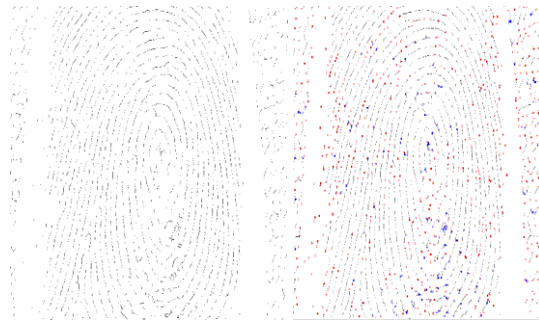


Figure 6: Thinned image (left) and minutiae detected image (right).

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Figure 5: Binarized image (left) and wiener filter after binarization (right).

In figure 6 thinning is done and minutiae are detected. These minutiae features are focused by different colours.

The Prevalence of Sickle cell Disease Phenotypes and Sickle Cell Gene Frequency in Some Tribals of Ghatanji and Kelapur Taluka, Distinct Yavatmal, Maharashtra (India)

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Abstract- Sickle cell disease (SCD) is a major genetic disorder among the tribal population. Hence the objective of the present study was to determine the prevalence and frequency of the sickle cell gene in some selected tribal population of the Ghatanji and Kelapur taluka of Yavatmal District (Central India). A total of 1078 tribal individuals were screened for SCD from 17 tribal villages constituting 3 tribal castes (Gond, Kolam, Pardhan). Using electrophoresis on cellulose acetate membrane 25 individuals were found heterozygous and 19 individuals were found to be homozygous for sickle cell gene. The sickle cell allele frequency was found to be 0.01414 in Gond, 0.03604 in Kolam and 0.00436 in Pardhans.

Index Terms- Sickle cell Anemia, Tribals, Gond, Kolam, Pardhan, Ghatanji, Kelapur.

I. INTRODUCTION

Sickle cell disease (SCD) is an autosomal recessive genetically transmitted hemoglobinopathy responsible for considerable morbidity and mortality. This is hereditary disorder due to defective hemoglobin structure. Sickle cell disorder is caused by a point mutation at sixth position in β globin chain, valine substituting glutamic acid, due to which in deoxygenated state the shape of erythrocytes change to sickle shape and also the fragility of cell membrane increases (Ingram, 1956). Prior to 1952, no information was available about the existence of sickle cell disease in India. In 1952 it was recorded for first time simultaneously amongst the tribal population group of Nilgiri hill and laborers in the tea garden of Assam (Lehman and Catbrush, 1952). Now it is firmly established that these genes harbor amongst different caste groups but with very high prevalence amongst scheduled caste, scheduled tribes and other backward communities (Bhatia and Rao, 1987, Sharma, 1983).

The prevalence of sickle cell gene has been reported in many parts of India including central India, where the prevalence in the different communities ranges from 9.4% to 22.2 % (Shukla and Solanki, 1985). According to studies carried out by Kate (2001), 10% of total population of the state of Maharashtra belongs to tribal population groups. Zade et al have studied and reported the high prevalence of Sickle cell disease in tribals of Amravati District. In the present work an effort has been made to screen few tribal communities of Ghatanji and Kelapur Taluka, Yavatmal district and find out the magnitude of prevalence of SCD in the tribal groups residing in this region.

II. MATERIAL AND METHODS

Screening of SCD was conducted in 17 tribal villages from Ghatanji and Kelapur Taluka, Yavatmal District from June 2012 to February 2013. A total of 1078 blood samples from individuals belonging to 3 different tribal castes were collected by organizing screening camps in co-ordination with the officials from Primary Health Centers. Few drops of blood were collected by bold finger prick for performing the solubility test (Huntsman et al, 1970) for preliminary diagnosis of SCD. Blood samples of solubility test positive subjects were later subjected to electrophoresis on cellulose acetate membrane (Dacie and Lewis, 1991) in the laboratory of Anthropological survey of India, Nagpur regional centre, as a confirmatory test for SCD. Allele frequency was calculated using Hardy Weinberg Principle. A dendrogram was drawn as per UPGMA clustering method using phylip - v 3.69 (Felsenstein, 1993) and MEGA -5 (Tamura et al, 2011).

III. RESULTS AND DISCUSSION

In the present work 3 tribal castes individuals i.e. Gond, Kolam and Pardhan suffering from SCD were found to be predominant in the study area. Zade *et al* recorded the presence of SCD in 5 tribal castes (Korku, Bhil Gaoli Gowari and Nihal) of Melghat region in Amravati district. A total of 438 tribal's were screened for SCD from 6 tribal villages of Melghat region in Amravati district and 43 heterozygotes and 12 homozygotes were documented (Zade et al, 2011). In the present work a total of 1078 tribals from 17 tribal villages of Ghatanji and Kelapur taluka of Yavatmal district were screened for SCD and 25 heterozygotes and 19 homozygotes were recorded. Similarly 1352 non tribal individuals belonging to Navboudha and Kunbi community were screened and 7 heterozygote and 6 homozygotes for SCD were recorded.

The sickle cell allelic frequency in the Melghat region of Amravati District was reported to be 0.3294 in Korku, 0.4934 in Bhil, 0.4071 in Gaoli, 0.2871 in Gowari and 0.2898 in Nihal (Zade et al, 2011). In the present work, the sickle cell allelic frequency was found to be highest in the Kolams followed by Gonds and Pardhans (Table 1).

Table 1: Showing the computed genotypic and allelic frequency of Normal and affected allele of the study Population.

Tribal casts	Genotypic frequency	Allelic frequency
Gond (n=495)	AA =0.9818 AS =0.00808 SS =0.0108	p(A) = 0.98584 q(S) = 0.01414
Kolam (n=291)	AA =0.9553 AS =0.0171 SS =0.02749	p(A) = 0.9553 q(S) = 0.03604
Pardhan (n=292)	AA =0.9691 AS =0.0102 SS =0.0205	p(A) = 0.9742 q(S) = 0.00436
Navboudha (n=344)	AA=0.9767 AS=0.008720 SS=0.0145	p(A)= 0.98106 q(S)= 0.01886
Kunbi (n=1008)	AA=0.9950 AS=0.003968 SS=0.0009920	p(A)=0.99698 q(S)=0.002976

The dendrogram was constructed using the genetic distance obtained from the sickle cell allele frequencies using UPGMA method. Pardhan, Gond and Kolams represent the indigenous, aboriginal, dark-skinned, Dravidian-speaking population of the Deccan, of which the Gonds are the most primitive tribe (Christopher von Fürer- Haimendor, 1982, Dunlop and Muzumdar, 1952, Kate, 2000). The Kunbi, Pardhans and Gonds form three different embranchments of which the Gonds occupy the basal position in the dendrogram. However the Navbuddha and Kolam forms a single clade (Figure 1).

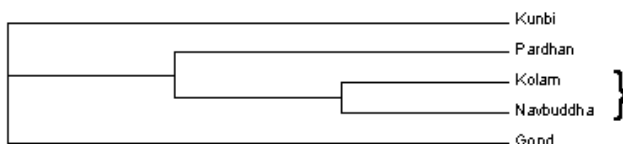


Figure 1 : Dendrogram Showing genetic relationship among five communities of Ghatanji and Kelapur Taluka of District Yavatmal.

According to the Anthropological studies, Navbuddhas (Mahars) occupy a position midway between Marathas and primitives. In the ancient past they may have been the admixture of Vedddian tribes and primitives of the eastern region. The primitives entering through the eastern gaps of Chattisgarh into Narbada and Tapti Valley and the Vedddian advancing from the South. Thus producing the middle race of above community (Shukla et al, 1958).

In the dendrogram study on the tribal groups of Melghat region of Amaravati District, Maharashtra it was reported that

Bhil and Gaoli tribals formed one clade and Gowari and Nihal formed the second clade whereas the korku tribe was forming the outgroup (Zade et al,2011).

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Security in Ad-hoc Networks

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Abstract- Ad-hoc networks are an emerging area of mobile computing. There are various challenges that are faced in the Ad-hoc environment. In this paper we attempt to analyze the demands of Ad-hoc environment. We focus on three areas of Ad-hoc networks, key exchange and management, Ad-hoc routing, and intrusion detection. The key issues concerning these areas have been addressed here. We have tried to compile solutions to these problems that have been active areas of research.

Index Terms- Ad-hoc, Routing, Intrusion, Wireless, Key.

I. INTRODUCTION

Ad-hoc networks are a new paradigm of wireless communication for mobile hosts. No fixed infrastructure such as base stations as mobile switching. Nodes within each other radio range communicate directly via wireless links while these which are far apart rely on other nodes to relay messages. Node mobility causes frequent changes in topology.

1.1 Security Goals

- 1) Availability
- 2) Confidentiality
- 3) Integrity
- 4) Authentication
- 5) Non-repudiation

1.2 Challenges

Use of wireless links renders an Adhoc network susceptible to link attacks ranging from passive eavesdropping to active impersonation, message replay and message distortion. Hence, we need to consider malicious attacks not only from outside but also from within the network from compromised nodes.

1.3 Key Management

Cryptographic schemes such as digital signatures are often employed to protect both routing info as well as data. Public key systems are generally espoused because of its upper hand in key distribution. Third party (trusted) called Certification Authority (CA) is used for key management.

II. KEY AGREEMENT IN WIRELESS AD-HOC NETWORKS

2.1 New key agreement scenario

Consider a group of people getting together for an Adhoc meeting in a room and trying to establish a wireless network through their laptops. They trust one another personally, however don't have any a priori shared secret (password) to authenticate

one another. They don't want anybody outside the room to get a wind of their conversation indoors. This particular scenario is vulnerable to any attacker who not only can monitor the communication but can also modify the messages and can also insert messages and make them appear to have come from somebody inside the room. This is a classic example of Adhoc network and the most simple way to tackle this example would be through location based key agreement - to map locations to name ladles and then use identity based mechanisms for key agreement. e.g.: participants writing the IP addresses on a piece of paper and passing it around. Then a certificate based key agreement mechanism can be used. These public key certificates can allow participants to verify the binding between the IP address and keys of other participants.

Two obvious problems

- a) Difficult to determine if the certificate presented by the participant has been revoked.
- b) Participants may be divided into 2 or more certification hierarchies and that they don't have cross certification hierarchies.

One obvious solution

A trusted third party capable of locating players, however not always feasible due to non-infrastructure nature of Adhoc networks.

2.2 Password based Authenticated Key Exchange

A fresh password is chosen and shared among those present in the room in order to capture the existing shared context. If this password is a long random string, can be used to setup security association, but less user friendly.

2.3 Password authenticated Diffie - Hellman key exchange

2.3.1 Two party version

In the elementary DH protocol, *two parties* A and B agree on a prime p and a generator g of the multiplicative group \mathbb{Z}_p^* (i.e. the set $\{1, 2, \dots, p-1\}$). A and B choose random secrets S_A and S_B such that $1 <= S_A, S_B <= p-1$.

(1) A computes g^{S_A} , encrypts it with the shared secret password P and sends it to B.
A --> B : $A, P(g^{S_A})$.

(2) B extracts g^{S_A} from the message computes g^{S_B} and also computes the session key $K = (g^{S_A})^{S_B}$. B then chooses a random challenge C_B and encrypts it using the key K . B encrypts S_B using P . It then sends the two quantities to A.
B --> A : $P(S_B), K(C_B)$.

(3) A extracts S_B from $P(S_B)$ and computes the key $K = (g^{SA})^{SB}$. It then extracts C_B by decrypting $K(C_B)$. A then generates challenge (random) C_A , encrypts both C_A and C_B with K and sends it to B.
A \rightarrow B : $K(C_A, C_B)$.

(4) This message(3) convinces B that A was able to decrypt the message in (2) correctly. B then encrypts C_A using K and sends it to A.
B \rightarrow A : $K(C_A)$.

A decrypts the message to see if the plaintext is indeed C_A . This would convince A that B knew K . This would in turn convince A that B knew P .

2.3.2 Multi-party version

There are let's just say n players M_1, M_2, \dots, M_n who all share a password P , each generating a random quantity S_i which is its contribution to the eventual session key $K = g^{S_1 S_2 \dots S_n - 1 P}$.

III. SECURE ROUTING IN AD-HOC NETWORKS

3.1 Problems associated with Ad-hoc routing

3.1.1 Infrastructure

An Ad-hoc network is an infrastructure less network. Unlike traditional networks there is no pre-deployed infrastructure such as centrally administered routers or strict policy for supporting end-to-end routing

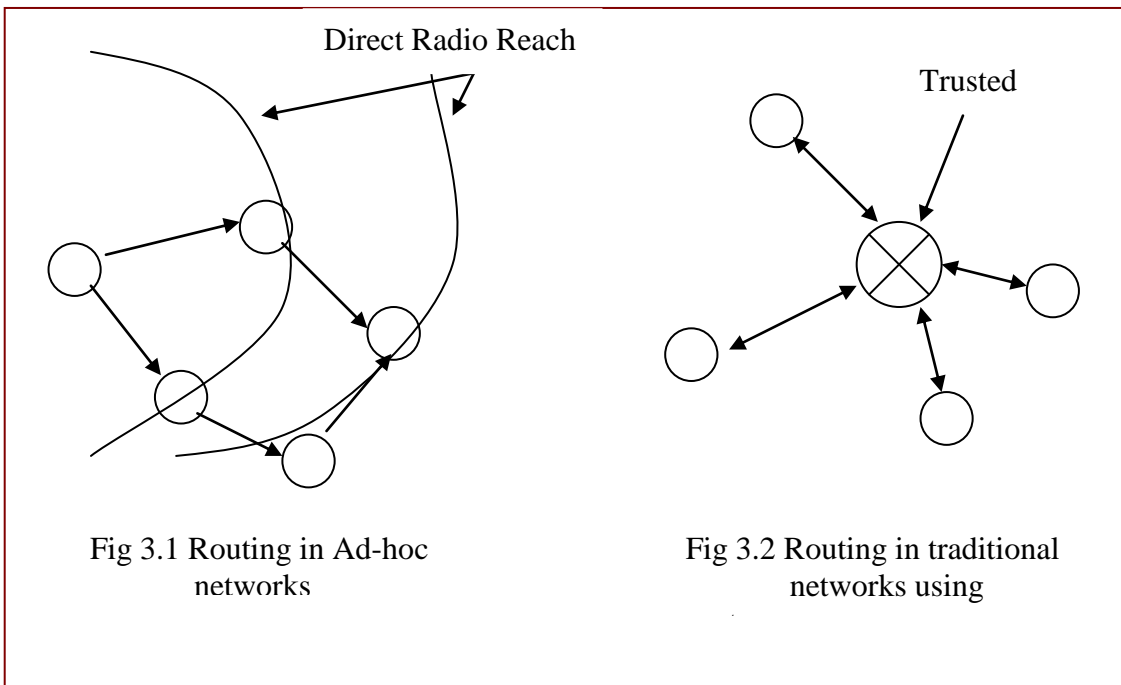


Fig 3.1 Routing in Ad-hoc networks

Fig 3.2 Routing in traditional networks using

3.1.2 Frequent changes in network topology

Ad-hoc networks contain nodes that may frequently change their locations. Hence the topology in these networks is highly dynamic. This results in frequently changing neighbors on whom a node relies for routing.

3.1.3 Problems associated with wireless communication

As the communication is through wireless medium, it is possible for any intruder to tap the communication easily. Routing protocols should be well adopted to handle such problems.

3.1.4 Problems with existing Ad-hoc routing protocols

3.1.4.1 Implicit trust relationship between neighbors

Current Ad-hoc routing protocols inherently trust all participants. Most Ad-hoc routing protocols are cooperative by nature and depend on neighboring nodes to route packets. This naive trust model allows malicious nodes to paralyze an Ad-hoc network by inserting erroneous routing updates, replaying old messages, changing routing updates or advertising incorrect

routing information. While these attacks are possible in fixed network as well, the Ad-hoc environment magnifies this makes detection difficult.

3.1.4.2 Throughput

Ad-hoc networks maximize total network throughput by using all available nodes for routing and forwarding. However a node may misbehave by agreeing to forward packets and then failing to do so, because it is overloaded, selfish, malicious or broken. Misbehaving nodes can be a significant problem.

3.1.4.3 Attacks using modification of protocol fields of messages

Current routing protocols assume that nodes do not alter the protocol fields of messages passed among nodes. Routing protocol packets carry important control information that governs the behavior of data transmission in Ad-hoc networks. Since the level of trust in a traditional Ad-hoc network cannot be measured or enforced, enemy nodes or compromised nodes may participate directly in the route discovery and may intercept and filter routing protocol packets to disrupt communication. Malicious

nodes can easily cause redirection of network traffic and DOS attacks by simply altering these fields.

3.1.5 Attacks using impersonation

Current Ad-hoc routing protocols do not authenticate source IP address. A malicious node can launch many attacks by altering its MAC or IP address. Both AODV and DSR are susceptible to this attack.

3.1.6 Attacks using fabrication

Generation of false routing messages is termed as fabrication messages. Such attacks are difficult to detect.

3.1.7 No way to detect and isolate misbehaving nodes

misbehaving nodes can affect network throughput adversely in worst-case scenarios. The existing Ad-hoc routing protocols do not include any mechanism to identify misbehaving nodes.

3.1.8 Easily leak information about network topology

Ad-hoc routing protocols like AODV and DSR carry routes discovery packets in clear text. These packets contain the routes to be followed by a packet. By analyzing these packets any intruder can find out the structure of the network.

3.1.9 Lack of self-stabilization property

Routing protocols should be able to recover from an attack in finite time. An intruder should not be able to permanently disable a network by injecting a smaller number of mal-informed routing packets

3.2 Solutions to problems in Ad-hoc-routing

3.2.1 Using pre-deployed security infrastructure

Here we assume existence of certain amount of security infrastructure. The type of Ad-hoc environment that we are dealing with here is called managed-open environment.

Assumptions

A managed-open environment assumes that there is opportunity for pre-deployment. Nodes wishing to communicate can exchange initialization parameters before hand, perhaps within the security of an infrastructured network where session keys may be exchanged or through a trusted third party like a certification authority.

ARAN protocol in managed-open environment

ARAN or Authenticated Routing for Ad-hoc Networks detects and protects against malicious actions by third parties and peers in Ad-hoc environment. ARAN introduces authentication, message integrity and non-repudiation to an Ad-hoc environment.

ARAN is composed of two distinct stages. The first stage is simple and requires little extra work from peers beyond traditional ad hoc protocols. Nodes that perform the optional second stage increase the security of their route, but incur additional cost for their ad hoc peers who may not comply (e.g., if they are low on battery resources).

ARAN makes use of cryptographic certificates for the purposes of authentication and non-repudiation.

Route Maintenance

ARAN is an on-demand protocol. Nodes keep track of whether routes are active. When no traffic has occurred on an existing route for that route's lifetime, the route is simply deactivated in the route table. Data received on an inactive route causes nodes to generate an Error (ERR) message that travels the reverse path towards the source. Nodes also use ERR messages to report links in active routes that are broken due to node movement. All ERR message must be signed.

Key revocation

ARAN attempts a best effort key revocation that is backed up with limited time certificates. In the event that a certificate needs to be revoked, the trusted certificate server, T, sends a broadcast message to the ad hoc group that announces the revocation.

3.2.2 Concealing Network topology or structure

1) Using independent Security Agents (SA)

This method is called the Non-disclosure method (NDM). In NDM a number of independent security agents (SA) are distributed over the network. Each of these agents SA_i owns a pair of asymmetric cryptographic keys K_{SA_i} and $K_{SA_i^-}$. Sender s wishes to transmit a message M to receiver R without disclosing his location. S sends the message using a number of SAs: $SA_1 \rightarrow SA_2 \rightarrow \dots \rightarrow SA_N \rightarrow R$. The message is encapsulated N times using the public keys $K_{SA_1} \dots K_{SA_N}$.

To deliver the packet, S sends it to the first security agent SA_1 which decrypts the outer most encapsulation and forwards the packet to the next agent. Each SA knows only the address of the previous and the next hop. The last agent finally decrypts the message and forwards it to R . It introduces a large amount of overhead and hence is not preferred for routing.

2) Zone Routing Protocol (ZRP)

It is a hierarchical protocol where the network is divided in to zones. The zones operate independently from each other. ZRP involves two separate routing protocols.

Such a hierarchical routing structure is favorable with respect to security since a well designed algorithm should be able to contain certain problems to small portion of the hierarchy leaving other portions unaffected.

3.2.3. Installing extra facilities in the network to mitigate routing misbehavior

Misbehaving nodes can reduce network throughput and result in poor robustness. Sergio Marti Et al propose a technique to identify and isolate such nodes by installing a watchdog and a pathrater in the Ad-hoc network on each node.

Assumptions

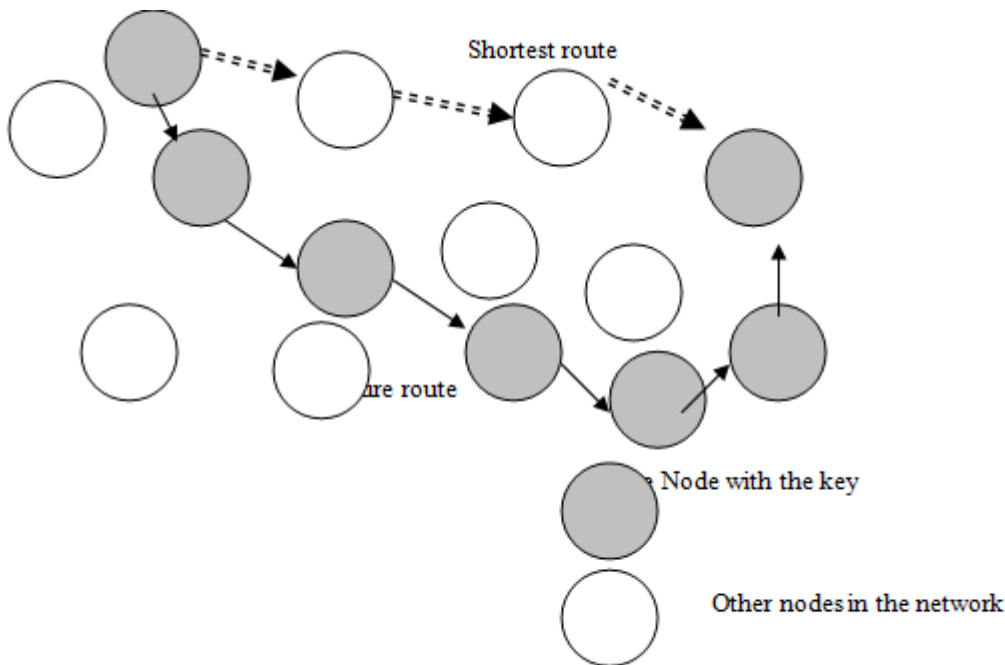
It is assumed that the wireless links are bi-directional. Most MAC layer protocols require this. It also assumes support for promiscuous mode of operation for the nodes. This helps the nodes supervise each other operation. The third assumption is that the underlying Ad-hoc routing protocol is DSR. It is possible to extend the mechanism to other routing protocols as well.

Mechanism

The watchdog identifies misbehaving nodes, while the pathrater avoids routing packets through these nodes. When a node forwards a packet, the node's watchdog verifies that the next node in the path also forwards the packet. The watchdog does this by listening promiscuously to the next node's transmissions. If the next node does not forward the packet, then it is misbehaving. The pathrater uses this knowledge of misbehaving nodes to choose the network path that is most likely to deliver packets.

3.2.4 Security-Aware Ad-hoc Routing (SAR)

It makes use of trust levels (security attributes assigned to nodes) to make informed, secure routing decision. Current routing protocols discover the shortest path between two nodes. But SAR can discover a path with desired security attributes (E.g. a path through nodes with a particular shared key).



3.2.5 Secure Routing Protocol

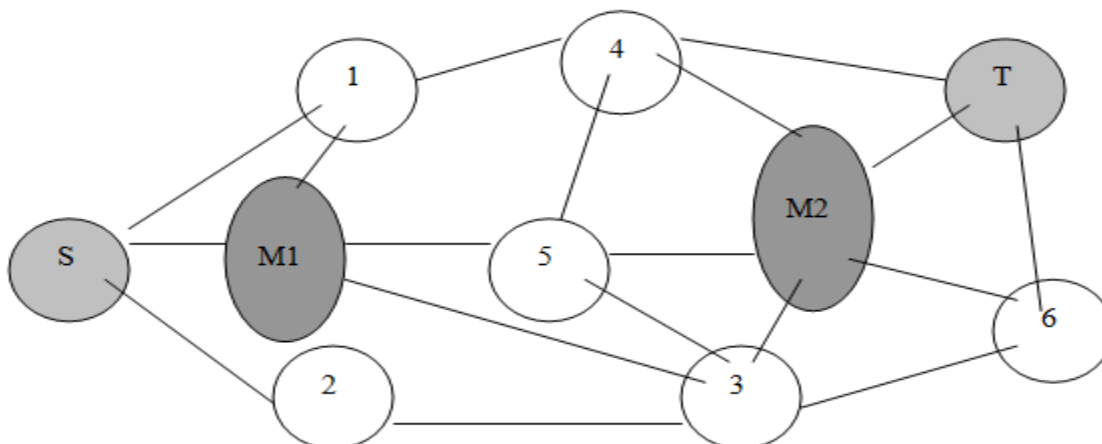
3.2.5 Secure Routing Protocol

Assumptions

A Security Association (SA) exists between the source node (S) and destination node (T). The SA would be established by

any of group key exchange schemes. However the exists of SAs with any of the intermediate nodes is unnecessary.

Working



The source node (S) initiates the route discovery by constructing a route request packet. The route request packet is identified by a random query identifier (rnd#) and a sequence number (sq#). We assumed that a security association (a shared key K_{ST}) is established between source (S) and destination (T).

S constructs a Message Authentication Code (MAC) which is a hash of source, destination, random query identifier, sequence number and K_{ST} i.e. $MAC = h(S, T, rnd\#, sq\#, K_{ST})$. In addition the identifier (IP addresses) of the traversed intermediate nodes are accumulated in the route request packet.

Intermediate nodes relay route requests. The intermediate nodes also maintain a limited amount of state information regarding relayed queries (by storing their random sequence number), so that previously seen route requests are discarded.

More than one route request packet reaches the destination through different routes. The destination T calculates a MAC covering the route reply contents and then returns the packet to S over the reverse route accumulated in the respective request packet. The destination responds to one or more route request packets to provide the source with an as diverse topology picture as possible.

IV. INTRUSION DETECTION IN WIRELESS AD-HOC NETWORKS

Each node within the network has its own individual IDS agent and these agents run independently and monitor user and system activities as well as communication activities within the radio range. If an anomaly is detected in the local data or if the evidence is inconclusive, IDS agents on the neighboring nodes will cooperatively participate in a global intrusion detection scheme. These individual IDS agents constitute the IDS system to protect the wireless ad-hoc network.

A majority based Intrusion Detection Algorithm can include following steps :

- 1) The node sends to its neighboring node an “intrusion state request”.
- 2) Each node , including the one which initiates this algorithm then propagates the state information, indicating the likelihood of an intrusion to its immediate neighbors.
- 3) Each node then determines whether the majority of the received reports point towards an intrusion, if yes then it concludes that the network is under attack.
- 4) Any node which detects an intrusion to the network can then initiate the remedial/response procedure.

4.5 Anomaly detection in wireless ad-hoc networks

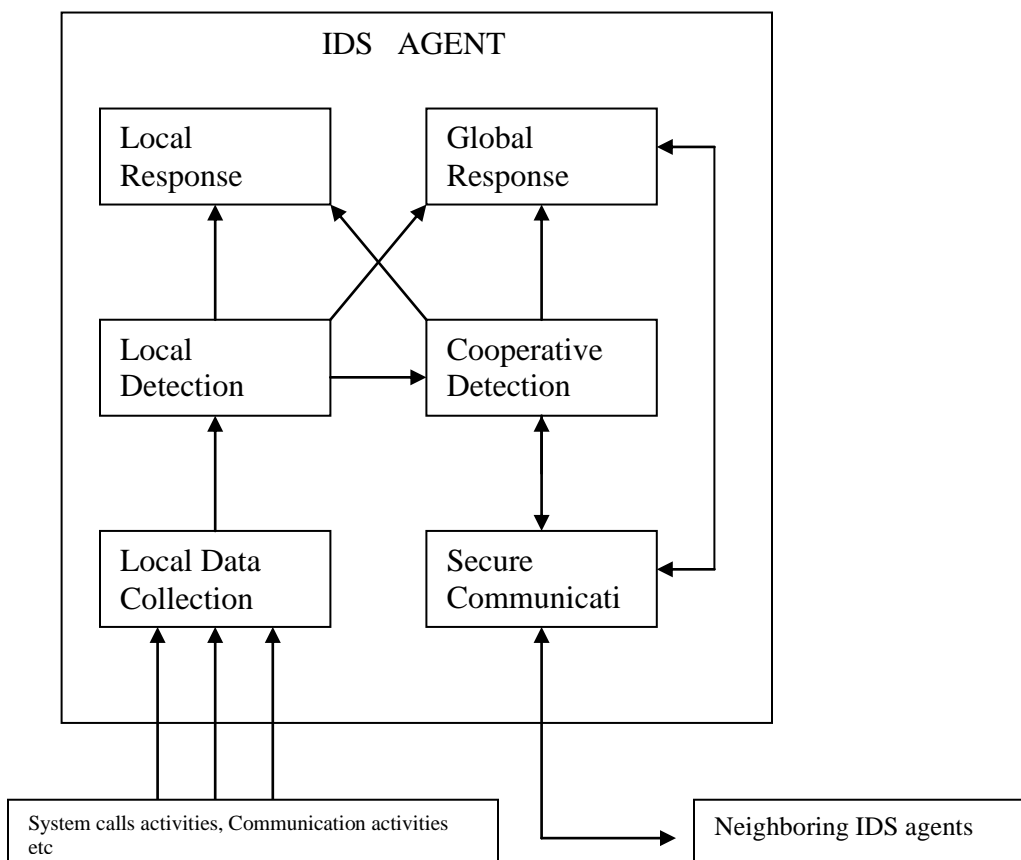
4.5.1 Detecting Abnormal Updates to Routing Tables

A legitimate change in the routing table is caused by physical motion of the nodes or changes in the membership of the network. For a node , it own movement and the change in its own routing table are the only data it can trust and hence we use it as a basis of the trace data. The physical movement is measured by distance , direction and velocity. The routing table change is measured by Percentage of changed routes (PCR), and the percentage changes in the sum of hops of all routes (PCH).

4.5.2 Detecting Anomalous activities in other layers

For MAC protocols , trace data could be in the form of total number of channel requests, the total number of nodes making those requests etc, for last s seconds.

Similarly, at the Wireless Application layer can use service as the class and can contain following features – for the past s seconds, the total number of requests to the same service, total number of services requested, the average duration of service, the number of nodes that requested service, the total number of service errors etc



V. CONCLUSION

We have presented an overview of the existing security scenario in the Ad-Hoc network environment. Key management, Ad-hoc routing and intrusion detection aspects of wireless Ad-hoc networks were discussed. Ad-hoc networking is still a raw area of research as can be seen with the problems that exist in these networks and the emerging solutions. The key management protocols are still very expensive and not fail safe. Several protocols for routing in Ad-hoc networks have been proposed. There is a need to make them more secure and robust to adapt to the demanding requirements of these networks. Intrusion detection is a critical security area. But it is a difficult goal to achieve in the resource deficient Ad-hoc environment. But the flexibility, ease and speed with which these networks can be set up implies they will gain wider application. This leaves Ad-hoc networks wide open for research to meet these demanding application.

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Integration of Antennas and Solar Cells for Satellite and Terrestrial Communication

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Abstract- Autonomous communications systems often involve the use of separate solar cells and antennas, which necessitate a compromise in the utilization of the limited surface area available. These separate items may be combined, provided that the antennas and solar cells are compatible. To show the compatibility of solar cells and antennas, the concept is used to create linearly polarized slot antenna, a circularly polarized slot antenna, a circularly polarized slot antenna and a slot array. The concept offers advantages in terms of surface coverage, volume, weight and electric performance. Slot antennas provide large metallic surfaces (the ground plane) on which solar cells can be directly grown. This yields high area coverage efficiency for the solar cells. In this, it is possible to nearly completely cover the ground plane with exception of a very small area close to the radiating edges of the slot antenna without degradation of the RF performance.

Index Terms- Circularly polarized array, SOLANT, solar cells, solar antenna

I. INTRODUCTION

One method for achieving this is to integrate the two kinds of device on the same element. In particular, solar panels occupy a large proportion of the total surface area of communications satellites, providing large flat surfaces over which antennas can be mounted, or printed. Printed antennas, commonly used in microwave communications, are naturally suited for this combination, in particular when their radiating patches can be isolated from the feed circuits. Amorphous silicon solar cell technology has been found to be suitable for realizing the solar antennas. Of course, the integrated combination of these devices would also be of interest for terrestrial systems. Most satellite systems use separate solar cells and antenna's, which compete for the use of the limited surface available. Therefore, combining both could reduce the cost design of spacecraft missions, provided that the antennas and solar cells are compatible. In particular, solar panels constitute a significant part of communication satellites, providing large flat surfaces on to which antennas can be mounted or printed. Printed antennas, commonly used in microwave communications, are particularly well suited for this integration, especially in configurations where their radiating elements (patches or apertures) can be isolated from the feed circuits.

There are several possibility of placing solar cells directly on the patches. Other combinations like putting solar cells behind reflectarray antennas have also been studied. In the case

of patch antennas, the cells cannot be close to the patches' radiating edges due to destructive interactions. As technology has been advancing rapidly, an idea emerged to integrate the antenna and solar cell into (monolithic) building block units. These units may then be replicated as desired to create a structure whose transmitting aperture is also used as the light –collection area. A novel hybrid technology where amorphous silicon solar cells are either integrated or physically combined with printed slot antennas is presented

This basic idea is demonstrated with the help of two innovative designs where the solar cells are directly grown on a stainless steel ground – plane or glued onto a standard copper layer printed on a dielectric substrate. performance when compared with a simple juxtaposition of antennas and solar cells. Firstly, the introduction of slot antennas, the ground plane of which can be used as “negative” collector cathode for the solar cells. Secondly, the possibility of producing solar cells with arbitrary shapes that don't restrict the antenna layout. This has led to the novel concept of fully integrated design where the two elements are physically and functionally merged together into a single device. This fully integrated” SOLANT design represent a best-of – both world” solution. Since a higher level of integration of both RF and dc functionality is the objective more over the use of slot instead of patches, allows the solar cells to be directly deposited on to the slots ground plane, resulting in an efficient and lightweight device. The concept can also have interesting spin-offs for terrestrial applications, for example: roof tiles used for simultaneous power generation and reception of satellite TV, isolated base stations for mobile telephone, alarm systems, sea buoys, container tracking, etc.

II. SOLANT SATELLITE APPLICATIONS

Space related applications of SOLANT antennas, in a first approach, can be split into two categories of missions:

1. Large space craft needed to comply with the increasing demand for tele-communication, multimedia and increasing scientific objectives. The need to implement several complex instruments on one single space craft leads to an increase in the number and size of antennas and solar generators.
2. Constellation of numerous smaller satellites (mini, micro, nano-satellites) where the integration of solar cells with antenna can lead to considerable reduction in space craft size, mass, and cost.

One can make a preliminary review of the missions that could profit from integration of antenna with solar cells, where the emphasis would be on:

3. Missions where there is a natural coherence between the sun direction and antenna bore-sight. This option may be very attractive for the Future Science Program; both in-terms of deep space missions to the outer planets (Mars and beyond) and missions at the L2 Lagrangian point of the earth-sun system. At this location, the sun, the earth, and the moon are all located behind the payload which points away from the Sun.
4. Missions where there is an advantage to conform the antenna to the spacecraft body(e.g., spinning satellites). An obvious example of such a mission is a one-axis stabilized satellite. In this case a large cylindrical part of the satellite surface can be covered by integrated solar cells and radiating elements. Each of them faces halftime the sun and the earth. The sub-arrays of the integrated antennas with solar cells should not be fed all at time, but an electronic feeding network will have to allow for a continuous rotation of the beam that opposes to the satellite spinning.
5. Missions requiring very large antennas and/or solar arrays.
6. Missions requiring very small spacecrafts.

For all of the above missions there is the option to save “real estate” by combining two functions maintaining performance equal or to increase capability (e.g., to offer communication in a non-nominal situation). SOLANT could even be a mission enabling solution.

III. AMORPHOUS SILICON(A-SI:H) THIN FILM SOLAR CELL TECHNOLOGY

To demonstrate the SOLANT principle, amorphous silicon (a-Si:H) solar cells have been selected. These cells are thin, light, flexible films that can be cut to fit arbitrary patch or array shapes and, eventually, conformed to curved surfaces. Another fundamental advantage of these solar cells is the fact that they do not involve a rigid semi-conductor wafer as substrate (germanium, silicon, etc....)They can also be grown on plastic or glass as well as on metals such as stainless steel or aluminum

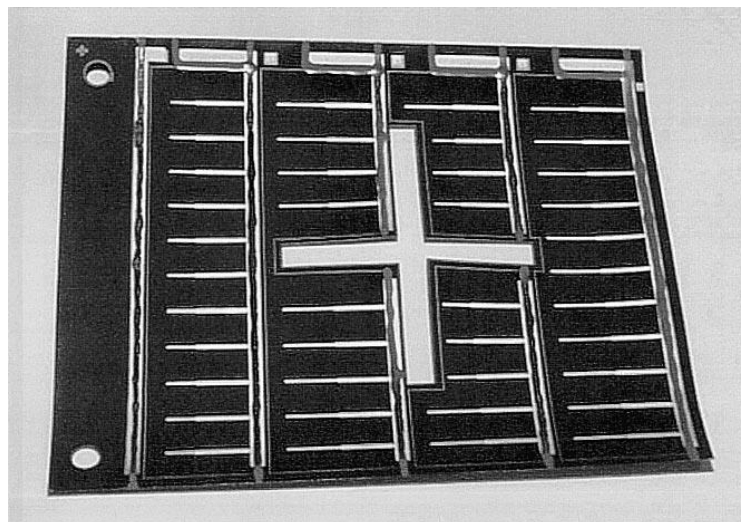
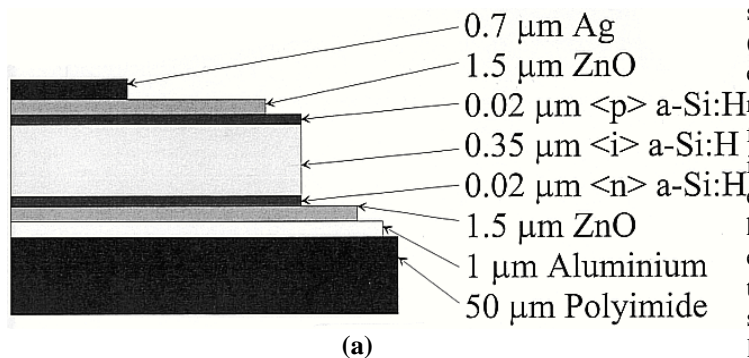


Fig.1. (a) Cross section of an amorphous Solar cell, showing the different layers. (b) Picture of a a-Si:H SOLANT module

Fig. 1(a) shows a lateral view of an amorphous silicon solar cell on a plastic film (polyimide). The polyimide substrate is covered by an aluminum layer (back contact) and by a ZnO layer, which prevents aluminum diffusion. The layers mentioned above also form a mirror for the incident solar light in order to increase absorption and consequently, produce more current. The actual solar cell is made of three silicon layers: a thin high conductivity phosphor doped n- layer, an intrinsic (un doped) layer with a low defect density and a very thin highly conductive p-layer. Most photons are absorbed in the intrinsic layer, while the doped layers are responsible for the build up of an electric field within the solar cell itself. The collector layer on top of the cell must be transparent and conductive and hence it is made of transparent conductive oxides(TCOs)-either indium tin oxide or zinc oxide. Since TCOs have a rather low conductivity compared to metals, a finger pattern is deposited on top [see fig1(b)],made of a Cr adhesion layer covered by thicker Ag layer .Overall the cell thickness is less than 5μm but usually a 50 μm thick polyimide substrate is used as a support in standalone applications.

Although this type of cell is less efficient than Ga-As solar cells which are currently used in space applications, a-Si:H cells shows a better watt/kilogram ratio due to their light weight .Moreover they are inexpensive and have shown promising hardness against cosmic radiation. Solar cells (as the name implies) are designed to convert available light into electrical energy. They do this without the use of either chemical reactions moving parts. The development of the solar cell stems from the work of the French physicist Antoine-Cesar Becquerel in 1839. Becquerel discovered the photo voltaic effect while experimenting with a solid electrode in an electrolyte solution; he observed that voltage developed when light fell upon the electrode. About 50 years later, Charles Frits constructed the first true solar cells using junctions formed by coating the semiconductor selenium with an ultra thin, nearly transparent layer of gold. Fritz’s devices were very inefficient, transforming

less than 1 percent of the absorbed light into electrical energy. By 1927 another metal semiconductor junction solar cell, in this case made of copper and the semiconductor copper oxide, had been demonstrated. By the 1930s both the selenium cell and the copper oxide cell were being employed in light-sensitive devices, such as photometers, for use in photography. These early solar cells, however, still had energy-conversion efficiencies of less than 1 percent. This impasse was finally overcome with the development of the silicon solar cell by Russell Kohl in 1941. In 1954, three other American researchers, G.L. Pearson, Daryl Chapin, and Calvin Fuller, demonstrated a silicon solar cell capable of a 6-percent energy-conversion efficiency when used in direct sunlight. By the late 1980s silicon cells, as well as those made of gallium -arsenide, with efficiencies of more than 20 percent had been fabricated. In 1989 a concentrator solar cell, a type of device in which sunlight is concentrated onto the cell surface by means of lenses, achieved an efficiency of 37 percent due to the increased intensity of the collected energy. In general, solar cells of widely varying efficiencies and cost are now available.

IV. SLOT BASED SOLAR ANTENNAS

As stated in introduction, it is possible to carry the integration of antennas and solar cells by resorting to slot antennas instead of patches. Slot antennas large metallic surface (ground plane) on which solar cells can be directly grown. This yields a simple layered structure with high area-coverage efficiency for the solar cells. In this, it is possible to nearly completely cover the ground plane with exception of a very small area close to the radiating edges of the slot antenna without degradation of the RF performance.

The choice of the slot antennas could introduce some drawbacks that have to be considered such as narrower bandwidth and lower CP performance. However these drawbacks can be overcome through efficient design. From an overall system point of view, slot remain an interesting alternative to patches, particularly when the effect of solar cells on the RF performance must be minimized.

In the remainder of this section, we describe a circularly polarized slot antenna.

Circularly Polarized Slot SOLANT

This project also presents a circularly polarized micro strip planar array that resonates at 32 GHz and provides a broadside beam, a minimum gain of 28 dB, and a bandwidth greater than 1 GHz. This low profile, small mass antenna shall be surface mounted on a micro space craft that is being developed for future, deep space, NASA missions. Challenges arising from the development of this Ka-band antenna include the minimization of the array's feed network loss and the attainment of the required bandwidth. High-gain micro strip arrays that have previously been developed for Ka-band or higher frequencies have primarily been linearly polarized. In the case of this array, circular polarization (C.P) is achieved by employing the sequential rotation technique in which each patch element is excited at a single feed point. This technique is employed to minimize the insertion loss that occurs in the micro strip transmission line feed network and to satisfy the array bandwidth requirement. To further reduce the insertion loss, the feed network uses a combined parallel and series feed technique that was developed. Designing the micro strip line feed network with matched impedances throughout the entire circuit, the bandwidth performance is further enhanced.

The proposed system is the dual band SOLANT antenna. This type antenna increases the peak gain. In the 2.4 GHz band, the peak gain is about 3.2 dBi with less than 0.5 dBi of gain variation. In the 5 GHz band, the peak gain is about 5.5 dBi and the gain variation is less than 1dBi. It can fulfill the requirements of indoor wireless applications very well. We have designed antenna elements that capture electromagnetic energy from naturally occurring solar radiation and thermal earth radiation. The size of the antenna is relative to the wavelength of light we intend to harvest. The basic theory of operation is as follows:

The incident electromagnetic radiation (flux) produces a standing-wave electrical current in the finite antenna array structure. Absorption of the incoming EM radiation energy occurs at the designed resonant frequency of the antenna. When an antenna is excited into a resonance mode it induces a cyclic plasma movement of free electrons from the metal antenna. The electrons freely flow along the antenna generating alternating current at the same frequency as the resonance. Electromagnetic modeling illustrates the current flow is toward the antenna feed-point. In a balanced antenna, the feed-point is located at the point of lowest impedance. Figure 2 was acquired from modeling the electromagnetic properties of an SOLANT antenna.

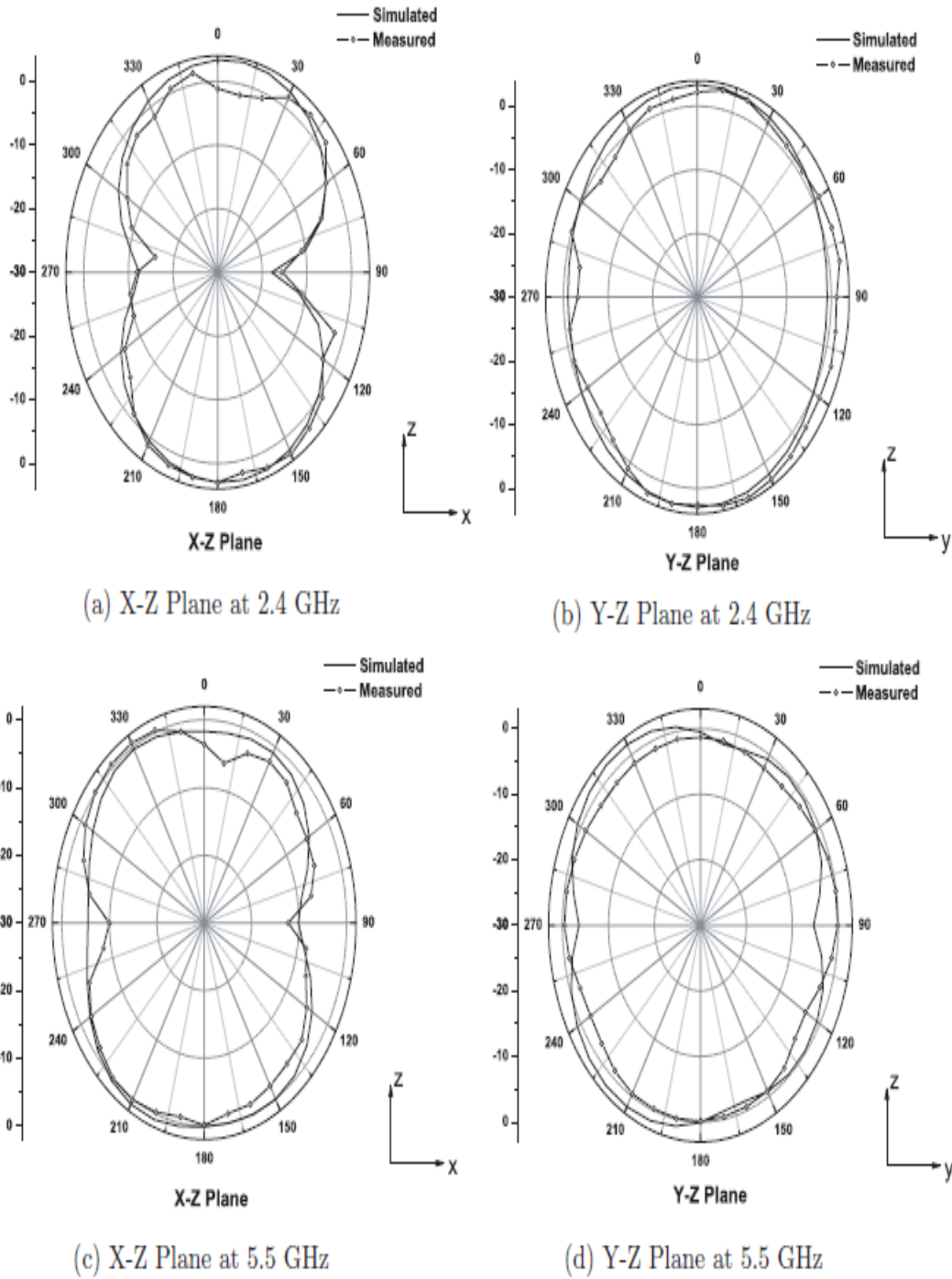


Fig.(2). Radiation pattern of SOLANT

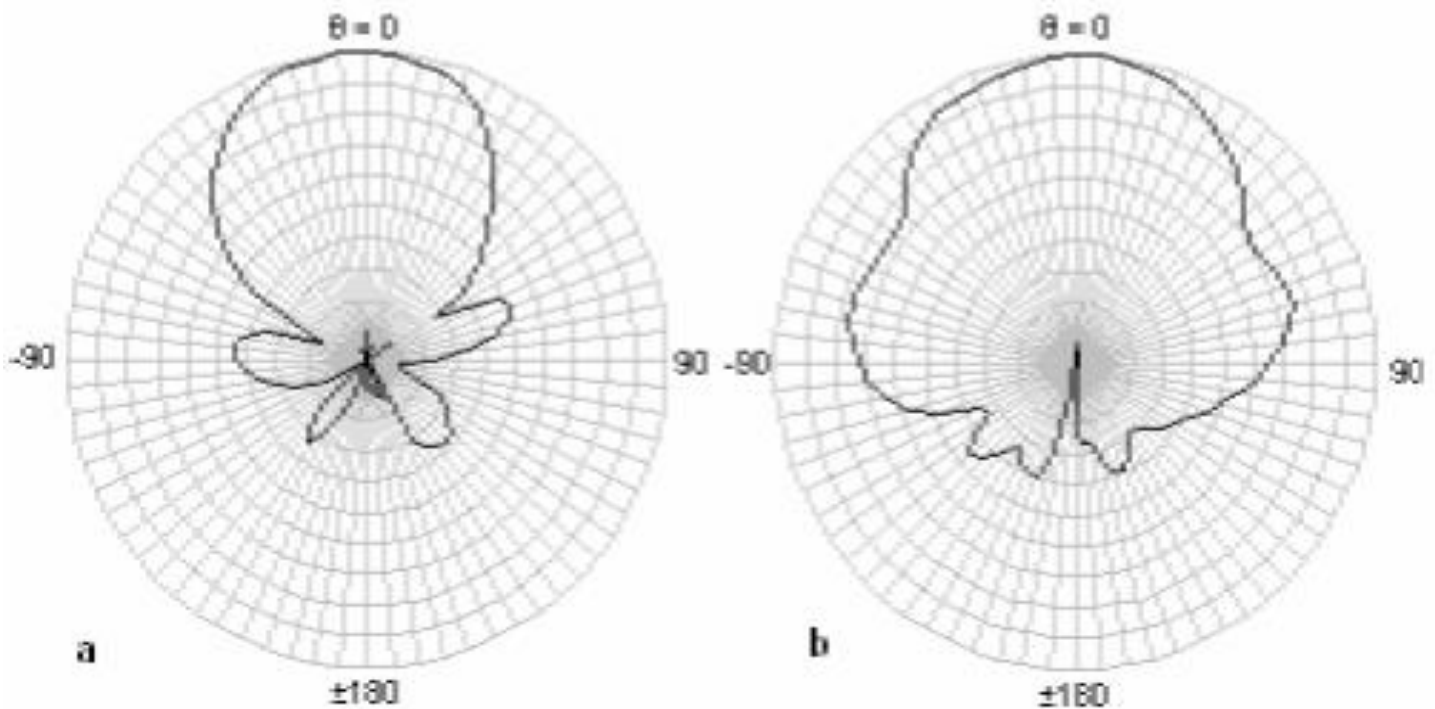


Fig.(3). Typical Radiation pattern of Antenna

V. RESULTS

The SOLANT can be simulated by using MATLAB software and also the simulation can be tested for various array factor and amplitude of current.

VI. CONCLUSION

The concept of integration of antennas and solar cells has been presented and demonstrated. The fully integrated slot design can simultaneously comply with all of the standard RF requirements (gain, radiation pattern) as well as the standard dc requirements (power, voltage current).

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An Analysis on Land Use/Land Cover Using Remote Sensing and GIS – A Case Study In and Around Vempalli, Kadapa District, Andhra Pradesh, India

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Abstract- Remote Sensing as a direct adjunct to field, recently playing an important role in the study and assess the natural resource in any part of the world. Anthropogenic changes in land use and land cover and land use are often assumed to be identical, they are rather quite different. Land cover may be defined as the biophysical earth surface, while land use is often shaped by human, socio-economic and political influences on the land. Remote Sensing (RS), integrated with Geographic Information System (GIS), provides an effective tool for analysis of land use and land cover changes at a regional level. The geospatial technology of RS and GIS holds the potential for timely and cost – effective assessment of natural resources. The techniques have been used extensively in the tropics for generating valuable information on forest cover, vegetation type and land use changes. Therefore, we have used RS and GIS to study land use land cover changes in and around Vempalli area of Kadapa district, Andhra Pradesh, India covering an area of about 711 sq. km. In this view the present work has been taken up to study and assess some of the natural resources and environmental potential of study area which is falling in the Survey of India toposheets No: 57 J 07 and 57 J 11. Under this study three thematic maps such as location map, drainage map and land use / land cover maps were prepared. The land use and land cover analysis on the study area has been attempted based on thematic mapping of the area consisting of built-up land, cultivated land, water bodies, forest and uncultivated land using the satellite image. The research concludes that there is a rapid expansion of built-up area. Land use and land cover information, when used along with information on other natural resources, like water, soil, hydro-geomorphology, etc. will help in the optimal land use planning at the macro and micro level.

Index Terms- Land use/ Land cover, Remote Sensing and GIS, Kadapa District, Andhra Pradesh.

I. INTRODUCTION

Multidisciplinary scientific integrated surveys were carried out to quantify the resource potential of the area, to know the status of exploitation of resources and to identify any degradation due to unscientific management. The investigation agents broadly outline the development options based on available resources. The thematic maps produced on resources will enable planners to formulate programs to optimize productivity from existing resources, and to initiate measures to

correct imbalances due to unscientific management and inherent deficiency.

The land use/land cover pattern of a region is an outcome of natural and socio – economic factors and their utilization by man in time and space. Land is becoming a scarce resource due to immense agricultural and demographic pressure. Hence, information on land use / land cover and possibilities for their optimal use is essential for the selection, planning and implementation of land use schemes to meet the increasing demands for basic human needs and welfare. This information also assists in monitoring the dynamics of land use resulting out of changing demands of increasing population. Land use and land cover change has become a central component in current strategies for managing natural resources and monitoring environmental changes. The advancement in the concept of vegetation mapping has greatly increased research on land use land cover change thus providing an accurate evaluation of the spread and health of the world's forest, grassland, and agricultural resources has become an important priority.

Viewing the Earth from space is now crucial to the understanding of the influence of man's activities on his natural resource base over time. In situations of rapid and often unrecorded land use change, observations of the earth from space provide objective information of human utilization of the landscape. Over the past years, data from Earth sensing satellites has become vital in mapping the Earth's features and infrastructures, managing natural resources and studying environmental change.

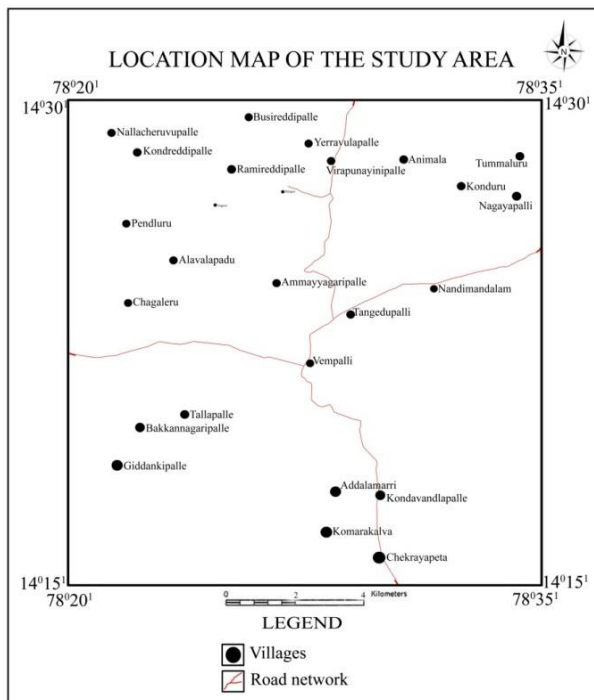
Remote Sensing (RS) and Geographic Information System (GIS) are now providing new tools for advanced ecosystem management. The collection of remotely sensed data facilitates the synoptic analyses of Earth - system function, patterning, and change at local, regional and global scales over time; such data also provide an important link between intensive, localized ecological research and regional, national and international conservation and management of biological diversity (Wilkie and Finn, 1996).

A total of three thematic maps such as location, drainage and land use and land cover maps were prepared based on image interpretation studies with limited checks. The land use-land cover pattern falls under the broad categories of built-up land, cultivated land, forest land, water bodies and uncultivated lands. In this study area major natural resource is forest. Because of human activities the extent of the land under forest is getting reduced. In the same way land used for cultivation is also decreasing. But at the same time land under built up area is

increasing. Recently the functioning of the real estates people and property promoters are bringing a serious disaster to forest area and agricultural land. This is an unhealthy situation of land management. In this context studies on land use land cover change detection are essential to understand the existing situation and plan for the future.

Study area: The study area lies between Kadapa and Pulivendula, Kadapa district, Andhra Pradesh, India, situated between parallels of 78°20' to 78°35'E longitude and 14° 15' to 14°30'N latitude with intended boundary falling in Survey of India toposheet no.57J07 and 57J11. The total area covered is approximately 711 square kilometers.

Figure 1: Location map of the study area



The climatic conditions of this area as its minimum temperature in November-January at about 28-30° C. The hottest temperature ranges between the 40-45° C ranges during April-May. There are extensive outcrops of limestones, Dolomites, Granite and Quartzites in major parts of the area, which could be utilised as building material. The major minerals in the study area are vein type barites, asbestos and the small deposits of white clay and iron ore. Vempalli, Chakrayapeta, Virapunayinipalli are the mandal head quarters and Nandimandalam, Komarakalva, Kondavandlapalli, Addalamarri, Tallapalli, Bakkannagaripalli, Giddankipalli, Ammayagaripalli, Chagaleru and Tummularu are the important villages in the study area.

OBJECTIVES

- To study the present status of water resources, natural resources, land resources, soil productivities, cropping patterns, forest cover etc using satellites data, collateral data and field data.

- To prepare the thematic maps namely location, land use-land cover, and drainage.
- To prepare action plan for land resources and water resources.

II. MATERIALS AND METHODS

The study has made use of various primary and secondary data. These include Survey of India (SOI) topographic sheets of 57J07 and 57J11 of 1:50,000 scale and satellite image IRS P6 geocoded data of 1:50,000 scale. The Indian Remote Sensing Satellite (IRS) data was visually and digitally interpreted by using the image interpretation elements (such as tone, texture, shape, pattern, association etc.) and ArcGIS software was used for processing, analysis and integration of spatial data to reach the objectives of the study. Adequate field checks were made before finalization of the thematic maps. The main goal of this study is to extract the land use/land cover changes and categories of the study area.

Preparation of thematic map

These maps are the true representation of earth's phenomena such as spatial distribution of natural resources existing at the time of survey (Ravi Gupta, 2003). In the present study satellite image (IRS P6) which is a true record of the various environmental resources information on the base map. These map showing spatial distribution of forest, agriculture, soil, water resources etc., and prepared by visual interpretation of the satellite imagery. Visual interpretation is carried out based on the image characteristics like tone, size, shape, pattern, texture etc. in conjunction with existing map/literature. These pre-field thematic maps are modified substantiated and confirm after limited field checks.

Figure 2: Cartographic Model



III. RESULTS AND DISCUSSIONS

Analysis of Land use /Land cover by using Remote Sensing Data: The land use/land cover categories of the study area were mapped using IRS P6 data of 1:50,000 scale. The satellite data was visually interpreted and after making thorough field check, the map was finalized. The various land use and land cover classes interpreted in the study area include, built-up land, cultivated land, forest land, uncultivated lands and water bodies.

Figure 3: Land use/ Land cover map of the Study area

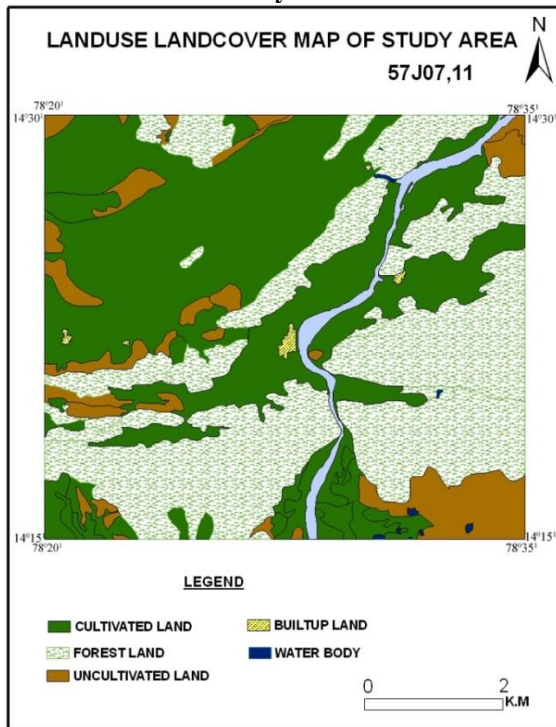


Table 1: Land use land covers classification system

LEVEL 1	Area in Sq. Km	Percentage of the area %
1. Built-up land	8.2	1.15
2. Cultivated land	335.13	47.13
3. Forest land	296.55	41.71
4. Water bodies	1.42	0.2
5. Uncultivated land	69.60	9.79

Detailed accounts of these land use /land cover classes of the study area are described in the following section.

A. Builtup Land: Built up land is composed of areas of intensive with much of the land covered by structures. Included in this category are cities, towns, villages, industrial and commercial complexes and institutions. In the study area major towns or villages are vempalli, Nandimandalam, Chagaleru, Tallapalle, etc. The transportation facilities in the study area are roads. The highway roads are present in the area are routes between, Pulivenduala- Kadapa, Vempalli- Rayachoti, Vempalli- Jammalamadugu. The industrial mining of asbestos, serpentine and uranium minerals is carried out at some places in the study area.

B. Cultivated land: All the cultivated land with or without crops orchards and plantations are considered in this class. This land use class is further subdivided into two sub-classes they are wet land (crop land) and dry land (fallow land). Crop lands are the agricultural lands under crop. In the study area the crop lands have wet cultivation and dry cultivation. Wet cultivation includes food crops such as paddy, wheat, etc. were present on either side of the Papagni River and its tributaries noticed in Vempalli,

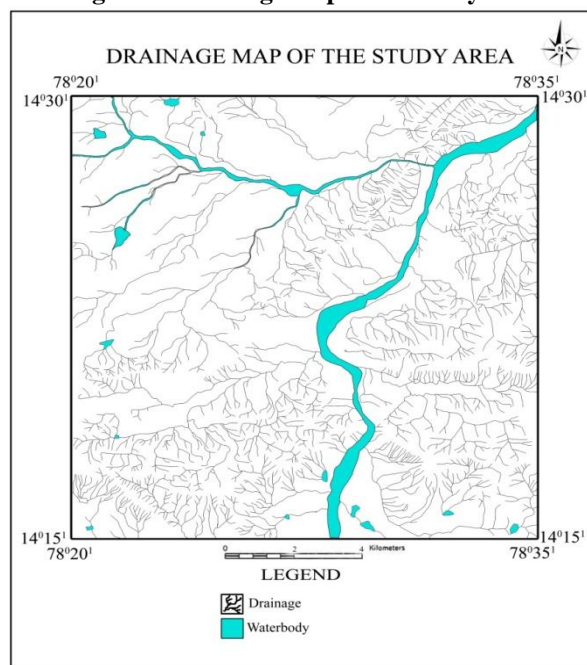
Tummuluru, Konduru, Alavallapadu, Kondavandlapalli, Ramireddipalli and Addalamarri. Dry cultivation includes trees orchards, groundnut, etc and the areas which have this type of cultivation is noticed at Ammayagaripalli, Virapunayanipalli, Chagaleru, Chakrayapeta..etc.

Fallow lands refer to all land which was taken up for cultivation but is temporarily out of cultivation for a particular period. The study area have more fallow lands and are surrounded by the villages of Tangedupalli, Giddankipalli, Alavallapadu, Busireddipalli, Nandimandalam, Etc.

C. Forest Land: Forest, comprises of thick and dense canopy of trees. These lands are identified by their red to dark red tone and varying in size. They are irregular in shape with smooth texture. The forests are found on the south eastern part of the study area. The study area covers mostly the dense and scrub forest. The relative concentration of scrubs, bushes and smaller trees are predominant in this category. In the satellite image such forest are identified by yellow tone with smooth texture. The forest areas are Giddankipalli, Kondavandlapalli, Nagayapalli, Animala, Busireddipalli, etc.

D. Water Resources: The water bodies include both natural and man-made water features namely rivers / streams / lakes / tanks and reservoirs. The water features appear black in tone in the satellite image. The shallow water and deep water features appear in light blue to dark blue in color. Tanks with plantation are identified by the square/rectangle shape and red color tone. Tanks without plantation are recognized by the shape and light blue to dark blue tone. Embankments are noticed in Kondavandlapalli, Alavallapadu, Bakkannagaripalli, Chakrayapeta, Busireddipalli etc. A major river Papagni flows in the study area. Small canals are noticed in the vegetation area. Tanks are mostly concentrated in the south east and North West parts of the study area with few dry tanks scattered around in the northern parts.

Figure 4: Drainage map of the study area



E. Uncultivated Land: Land, which does not support any vegetation are known as uncultivated lands or waste lands. Barren rocky, salt affected land, land with and without scrub, sandy area, sheet rocks and stony regions include in this category. Such lands are formed due to the chemical and physical properties of soil, temperature, rainfall and local environmental conditions. In the study area uncultivated lands are present in the south east part.

i) Land with scrub: These lands are subject to degradation, erosion or thorny bushes. Such areas are identified from their yellowish tone and their association with uplands, and their irregular shapes. Land with scrub found in the western part of the study area.

IV. CONCLUSION

The study has classified as per the major land use/land cover types. The Indian Remote Sensing Satellite (IRS) data, image processing and Geographical Information System techniques were used to identify the land use categories such as built-up lands, cultivated lands, forest lands, water bodies and uncultivated lands. Satellite images in combination with predated topographic sheet of Survey of India were used for analyzing land use and land cover change detection. It is helpful for further macro and micro level planning. With the help of Geographic Information System the various land use and land cover zones are mapped, which in turn helps for decision maker for planning purpose. The cultivated lands are well distributed throughout the study area and it covers 335.13 sq. km (47.13 per cent). Forest occupies 296.55 sq. km and sharing about 41.71 per cent of the total land use land cover of the study area. The built-up land occupies 8.2 sq. km (1.15 per cent) and there was a rapid expansion of built-up lands. Uncultivated land occupies 69.60 sq. km (9.79 per cent). A water bodies occupy 1.42 sq. km (0.2 per cent) but well developed dendritic drainage pattern is there in the study area.

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Spell Suggester for Search Queries

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Abstract- Spell Suggestion plays a vital role in search applications. Lucene is an open source java library for building search applications. Lucene offers many built in features to develop rapid search applications. It offers spell suggestions for single term queries. In this paper, an algorithm is proposed for multi term spell suggestions and it is implemented.

Index Terms- component; Information Retrieval, Spell Suggestion

V. INTRODUCTION

With the availability of huge data and the necessity of retrieving useful information from that data in makes search applications popular. There is thirsty need for search applications in all areas where data exist and information is needed. Open source search libraries and tools offer basic building blocks using which users can develop fully fledged search applications[3].

Lucene is an open source search library. Apart from core search features like indexing and searching, it provides much functionality to enrich the search performance and user experience. Analyzers for various languages, support for various query types, hits ranking, index term and query term expansion, advanced search, faceted search, spell checking, hit highlighting, stemming, location aware search are few of them[2].

Spell checker is an important module which helps user in making correct queries. It will enrich the user experience. Lucene has spell check module. It offers spell checking for single term queries. In this paper, a spell suggester is developed using lucene to provide query suggestions to multi term queries.

I. RELATED WORK

Lucene API provides much functionality to build search engine applications. Lucene offers a Spell Checker module to provide query suggestions to the misspelled queries. To find the suggestions for the dictionary of terms are required. Some applications uses query history as the dictionary from which it gets the query suggestions. Lucene uses the Spell Checker dictionary. It is constructed from the lucene's inverted index. In turn inverted index will be built by analyzing the textual content in the documents. Lucene uses string distance algorithms to calculate the similarity between the query and its suggestion. Lucene uses Jaro Winkler Distance, Levenstein Distance and NGram Distance to find the string distance[1,4].

If we analyze lesser textual content and build inverted index using it, it contains fewer terms only. So the Spell Checker index developed from that inverted index also contain fewer terms and

when we try to get suggestions for the misspelled term then appropriate suggestions will not come because of fewer terms.

When we build the inverted index from documents of one domain, its spell checker index contains terms related to that domain only. When we apply queries of some other domain, because of lack of terms related to the domain of query, it may not provide accurate query suggestions. So it is better to build spell check index from the inverted index constructed from relevant domain specific documents.

Lucene's spell checker provides suggestions for single term queries. In this paper a Multi Term Query Suggester module is developed to provide suggestions to multi term queries.

II. METHODOLOGY

Multi Term Spell Suggestion is aimed to develop based on the building blocks of Single term spell suggestions available in Lucene. A corpus of English movie reviews is taken as the dataset for this experiment. All the documents in that corpus are analyzed and indexed using lucene functionalities. Index is tested using Luke tool[5]. Spell Index is generated from that inverted index using SpellChecker. SuggestionComparator is developed to compare given two suggestions to know the best suggestion in them.

Algorithm for SuggestionComparator is given below

1. Algorithm SuggestionComparator(suggestion1, suggestion2, indexSearcher, corpusIndex, queryParser, termProximityThreshold)
2. //Description: SuggestionComparator compares 2 suggestions and returns Positive number if suggestion2 is better suggestion, Negative or 0 if suggestion1 is better than suggestion2
3. //Input:
 - a. Suggestion1: one suggestion for the user query
 - b. Suggestion2: another suggestion for the given query
 - c. indexSearcher: Lucene's Index Searcher
 - d. corpusIndex: Lucene index constructed with large number of text content
 - e. queryParser: Lucene's QueryParser
 - f. termProximityThreshold: proximity threshold to check the terms within the specified distance to each other
4. //Output: An Integer Number
5. {
6. Get HitCount h1 for suggestion1 from corpusIndex using queryParser and indexSearcher
7. Get HitCount h2 for suggestion2 from corpusIndex using queryParser and indexSearcher

```

8. If h1!=h2 then return h2-h1
9. Else
10. {
11. Prepare a proximity query 'pq1' from suggestion1 with
    term proximity equal to 'termProximityThreshold'
    using queryParser
12. Prepare a proximity query 'pq2' from suggestion2 with
    term proximity equal to 'termProximityThreshold'
    using queryParser
13. Get HitCount hc1 for pq1 from corpusIndex using
    indexSearcher
14. Get HitCount hc2 for pq2 from corpusIndex using
    indexSearcher
15. return hc2-hc1
16. }
17. }
    
```

Multi Term Spell Suggester is developed using the following algorithm.

```

1. Algorithm MultiTermSpellSuggester (query,
    SingleTermSpellSuggester, spellIndex, corpusIndex,
    indexSearcher, queryParser, suggestionCount,
    minHitThreshold, queryTermExtractor,
    suggestionComparator)
2. //Description: MultiTermSpellSuggester analyzes the
    user's query and identifies misspelled terms in it. Then
    it returns the best spell suggestion for the given query
3. //Input:
    a. query: user's query for which spell suggestions
        need to be given
    b. SingleTermSpellChekcer: SpellChecker provided
        by lucene
    c. spellIndex: Lucene's Spell Checker Index
    d. corpusIndex: Lucene index constructed with large
        number of text content
    e. indexSearcher: Lucene's IndexSearcher
    f. queryParser: Lucene's Query Parser
    g. suggestionCount: a configuration parameter.
        Describes the number of spell suggestions need to
        be considered for each term in the given query
    h. minHitThreshold: a configuration parameter. To
        classify a term as correctly spelled or misspelled. If
        that term have hitCount less than 'minHitThreshold'
        then classify it as misspelled term.
    i. queryTermExtarctor: Lucene's
        QueryTermExtractor
    j. suggestionComparator: an instance of
        SuggestionComparator
4. //output: Spell Suggestion for the given query
5. {
6. Parse the query using queryParser and build
    luceneQuery
7. Extract the weighted terms from the luceneQuery using
    queryTermExtractor
8. FOR each weighted term ti, DO
9. {
10. Get document frequency 'df_ti' for that term in the
    corpusIndex using IndexReader associated with the
    index Searcher.
    
```

```

11. IF df_ti < minHitCount THEN
12. {
13. Get singleTermSpellSuggestions for 'ti' using lucene
    SpellCheck module and add them to list 'sugs_ti'
14. }
15. ELSE
16. {
17. Add 'ti' to list 'sugs_ti'
18. }
19. }
20. //Now each query term has a set of suggestions for it
21. Find all possible suggestions with combinations such
    that each combination is formed by replacing the terms
    in the query with one of their corresponding suggestions
22. Add all such suggestions to the 'suggestions' list
23. Add query to suggestions list
24. Sort the 'suggestions' list using the
    suggestionComparator such that the best suggestion
    stands first in the list
25. Return the best suggestion, which is the first element in
    the list after sorting
26. }
    
```

MultiTermSpellSuggester is implemented. It is tested with various queries and got satisfactory results.

III. RESULTS

A corpus of documents containing reviews of English movies is analyzed using Lucene API and inverted index is constructed. Constructed Inverted index is tested using Luke tool. Spell index is constructed from that inverted index using Lucene SpellChecker construction utilities. Lucene's spell check features for single term queries are tested and made sure that spell index is constructed correctly. The MultiTermSpellSuggester algorithm is implemented. It is tested with various multi term queries and got satisfactory results. Some of the test cases are described in Table 1.

Table 1 Results Table A

Query Type	Query	Suggestion
Single Term Query	scwargenegar	schwargenegger
Field based Single term	content: scwargenegar	content: schwargenegger
Phrase Query	"arnol scwargenegar"	"arnold schwargenegger"
Field based Phrase Query	content: "arnol scwargenegar"	content: "arnold schwargenegger"

Multi Term Query	content:"arnod scwageneegar" terminator actoon	content:"arnold schwargeneegger" terminator action
Boolean Query	arnol AND scwageneegar	arnold AND schwargeneegger
Query with Operators	arnol +scwageneegar	arnold +schwargeneegger
Boosted Query	arnol^4 scwageneegar	arnold^4 schwargeneegger
Proximity Query	"arnol scwageneegar"~5	"arnold schwargeneegger"~5



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A. for parameters 'SuggestionThreshold'=5, 'minHitCount'=5

IV. CONCLUSION

Results A corpus of documents containing reviews of English movies is analyzed using Lucene API and inverted index is constructed. Constructed Inverted index is tested using Luke tool. Spell index is constructed from that inverted index using Lucene SpellChecker construction utilities. Lucene's spell check features for single term queries are tested and made sure that spell index is constructed correctly. The MultiTermSpellSuggester algorithm is implemented. It is tested with various multi term queries and got satisfactory results. Some of the test cases are described in Table 1 (for 'SuggestionThreshold'=5, 'minHitCount'=5).

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Use of High Voltage Amplifier in Electroporation for Transfection Related Medical Applications

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Abstract- Electroporation, a biophysical effect finds immense significance in the fields of medical applications. Used as a method of transfection, it can be employed to find cure for three dangerous and life threatening medical conditions like cancer, decrease in insulin production and autoimmune diseases.

Electrical apparatus used for these treatments are generally based on dc voltage pulses, which due to their inefficiency in producing desired output, have paved ways for electrical apparatus that use ac pulses. Therefore, a high voltage linear amplifier design using vacuum tube valves has been referred to, for the production of the same.

Index Terms- Autoimmune diseases, electroporation, high voltage amplifier, insulin, oncogenes, transfection.

I. INTRODUCTION

The process of forcing nucleic acids into cells so as to biologically alter their working is called transfection. This is done by opening transient pores on the cell membrane. Transfection can be carried out by a number of methods like chemical, viral, particle, optical and electroporation.

On application of a high magnitude electric field across a biological cell, the permeability of its outer plasma membrane undergoes a significant increase due to molecular rearrangement, leading to pore formation, thus helping in the passage of large molecules across the cell membrane. This process of applying several hundred volts across millimeters of cell distance, so as to introduce foreign bodies into it, is called electroporation or electropermeabilization.

Apparatus that have been used for medical applications of electroporation, used dc pulses earlier, which proved inefficient

as presence of non-conducting capacitive layers in tissues led to the attenuation of dc pulses. DC pulses also being sensitive to the presence of bulk extracellular liquids couldn't detect the presence of cell populations of varying shapes and sizes and thus gave birth to apparatus using ac pulses.

II. HIGH VOLTAGE AMPLIFIER

Since the method of electroporation of human cells using ac pulses, is in a very primitive stage, the ac pulse generating source for such apparatus is difficult to find. The success of such an apparatus lies in its ability to produce ac pulses of varying shapes and its function over specified ranges. Further, since electroporation is being conducted on biological cells, utmost care has to be taken. These considerations led to the reference of the amplifier that has been used, with the following specifications.

Maximum output voltage = 4 kV_p

Linear Bandwidth (□□3 dB) = 500 Hz – 5 MHz

Amplifier Voltage Gain = 400 V/V (52 dB)

Output Impedance = Less than 100 ohms

Input Impedance = Greater than 1 kilo ohm

The biological cell or variable load in the experiment is substituted by a parallel resistor or capacitor combination, resistance being as low as 1 kilo ohm and capacitance as great as 100 pF. The amplifier provides a 10 ms delay in 1 MHz sine wave, amplitude 3 kV_p and a repetition rate of 50 ms up to 10 maximum repetitions.

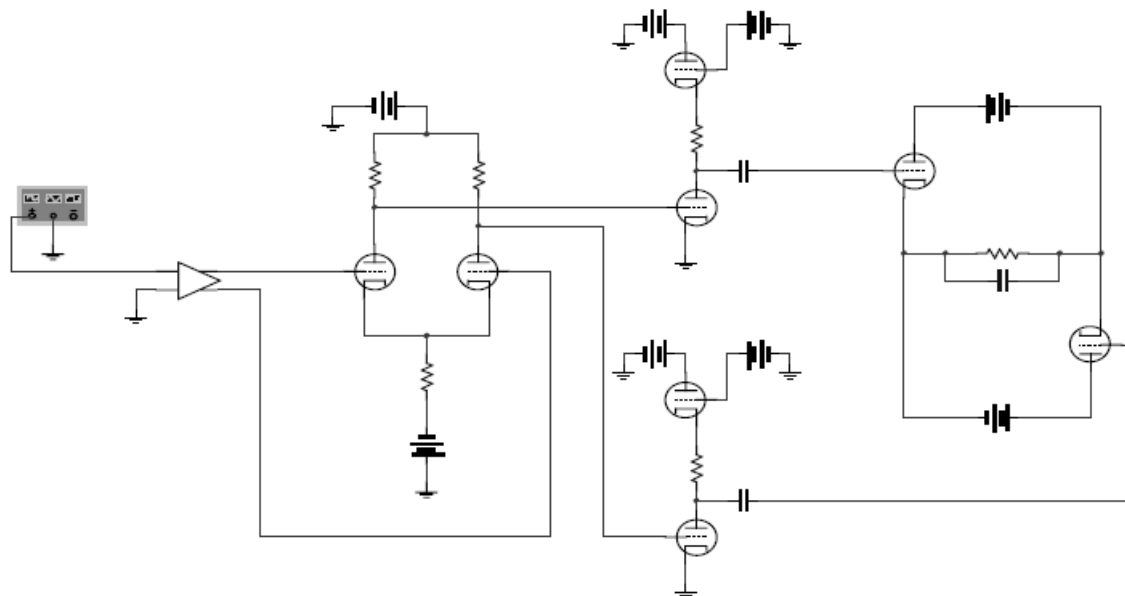


Fig 1: Proposed High Voltage Amplifier

III. AMPLIFIER DESIGN

High frequency and wide linear bandwidth combinations producing high voltage output are realized by using vacuum tubes which have to meet output specifications that demand impedance to be less than 100 ohms. A modified circlotron buffer is used in the output stage which provides low output impedance and thus eliminates the need of an expensive component which is an impedance matching transformer.

The proposed amplifier in figure 1 consists of a number of stages in which the first stage i.e the input stage is a differential signal producing stage(to be utilized by the second stage),where an op-amp buffer is used. In the second stage,a differential triode valve produces half the voltage gain. A series of push pull amplifiers constitute the third stage and provide the rest of the gain. The final stage has the modified circlotron as discussed above.

IV. TRANSFECTION

Once the biological load or cell has been electro orated by the above method, the pores formed in the cell membrane give easy passage to the molecules to go inside the cell. This deliberate process of introducing foreign materials especially nucleic acids into the cells is called transfection. Another term for transfection is transformation since genetic material inside the cells are transformed and genetically modified. In transfection, the material to be deposited inside is mixed with a cationic lipid, thus producing liposomes that fuse to the cell membrane and deposit their cargo inside. The general structure of a synthetic cationic lipid has been shown in fig 2.

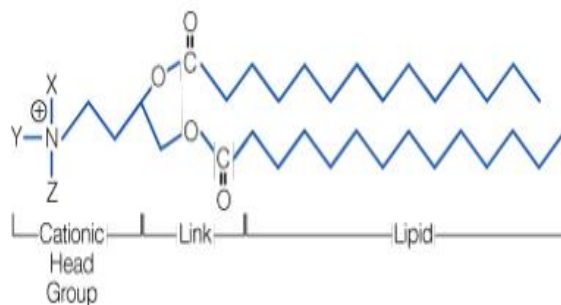


Fig 2: General structure of a cationic lipid

Various methods that are employed under transfection are (Fig 3 shows the related diagram):

1. Chemical methods:
 - a. Use of calcium phosphate
 - b. Use of highly branched organic compounds
 - c. Lipo fection
 - d. Use of cationic polymers
2. Non chemical methods
 - a. Electroporation
 - b. Sono poration
 - c. Optical transfection
 - d. Protoplast transfusion
3. Particle based methods:
 - a. Use of gene gun
 - b. Magneto fection
 - c. Impale fection
4. Viral methods
5. Hybrid methods

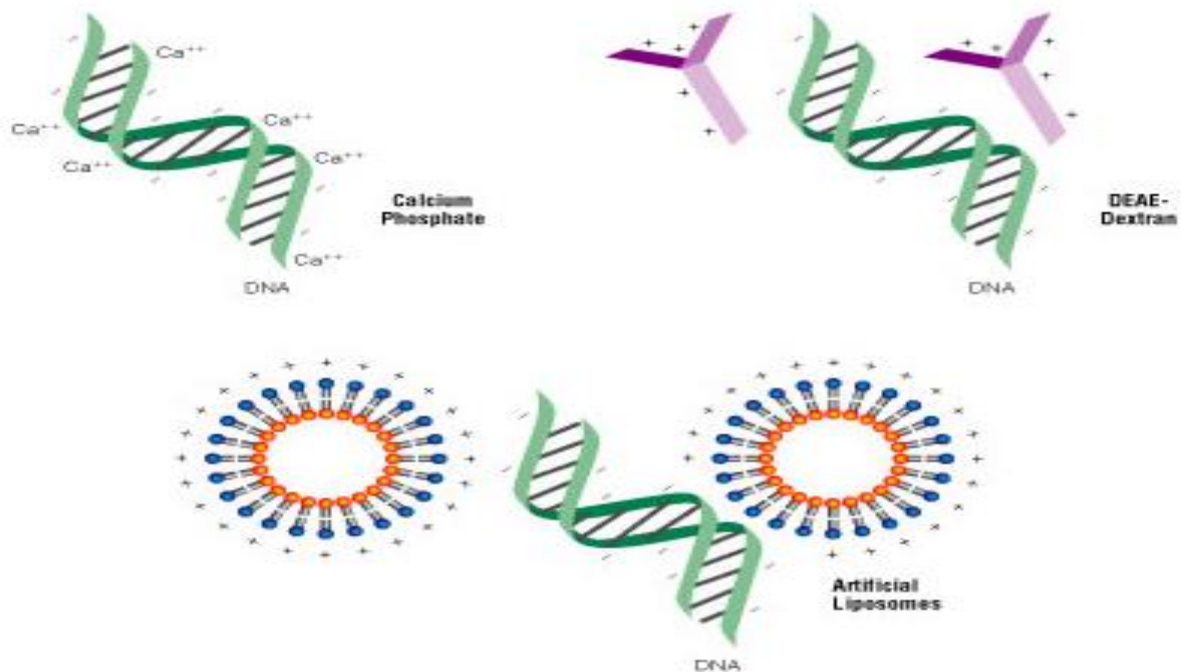


Fig 2: various transfection technologies.

Thus on transfection of nucleic acid materials into the cell, they affect the genes of the nucleus, help in gene therapy, protein metabolism and mutation of cancer cells etc. In this paper, we have studied the effect of transfection carried out by electroporation, for finding methods, which can help in finding cure for cancer, decrease in insulin levels and autoimmune diseases. Let us now see some of the uses of this method.

V. EFFECT ON ONCOGENES

All cells have nuclei that contain genes. The genes that trigger cancer are called oncogenes.

1. **Transfection of DNA to detect the presence of oncogenes:** Laboratory tested oncogenes are similar to RAS genes. DNA transfection has been found to be a very promising method of detecting oncogenes and experimental tumor. It has thus led to the knowledge of several oncogenes. To generate recombination events, fragments of random genes are ligated together inside transfected cells. Proto-oncogenes are activated by fusion events like gene fusions, gene truncation, enhancer activation etc. These proto-oncogenes were earlier absent in cancer cells. Thus, to detect oncogenes, presence of putative oncogenes has to be demonstrated. Thus, by the above process, we can detect the presence of oncogenes and take precautions to prevent it from mutating further.
2. **Transfection to stop oncogenes from mutating:** Even though much research hasn't been done in this direction,

but if we transfect some material into the cells, which react with the mutating oncogenes and stop the replication process, spread of cancer can be stopped at a very early stage.

3. **Effect of oncogene transfection:** To increase the growth related properties of heterohybridomas cell line in humans and mice, expression plasmids containing oncogenes v-src, c-Ha-ras are transfected by electroporation into them.

VI. EFFECT ON INSULIN PRODUCTION

Insulin is produced in the pancreas of the human body. When the production of insulin goes down, a person suffers from diabetes. Thus, we have suggested transfection as a method to inject material into pancreatic cells that can help in keeping insulin production on.

For the treatment of type 1 diabetes, beta-cell replacement therapy has proved inefficient due to the availability of limited supply of islet tissues. Thus, a retrovirus vector pLNCX can be used to transfer human insulin into bone marrow stem cells (hMSCs). These transfected hMSCs were found to secrete insulin for more than 3 weeks.

Thus transfection of insulin cells into the bone marrow can help in keeping the production of insulin on and thus prevent type 1 diabetes.



Fig 3: computer generated insulin

VII. EFFECT ON AUTOIMMUNE DISEASES

When the body immune system loses its ability to differentiate between foreign objects and the cells present in the body, it attacks both alike, thus harming the cells of ones own body. This is basically treated with immunosuppression i.e., decreases the immune response. Another condition related to this is inflammation. By activating anti-inflammatory genes or suppressing inflammatory genes, we can find a cure for these diseases.

Calcitonin gene-related peptide (CGRP) shows prominent anti-inflammatory actions. On examination, it has been found that CGRP-transfected dendritic cells (DC) prevent the development of Experimental Autoimmune Optic neuritis (EAON) and experimental autoimmune encephalomyelitis (EAE). Due to autoimmune syndrome, normal optic nerves were infected, leading to optic neuritis.

It has also been shown that transfection works better than other methods of introducing these compounds into the cells. Thus transfection of cgrp can help in finding a cure for autoimmune diseases.

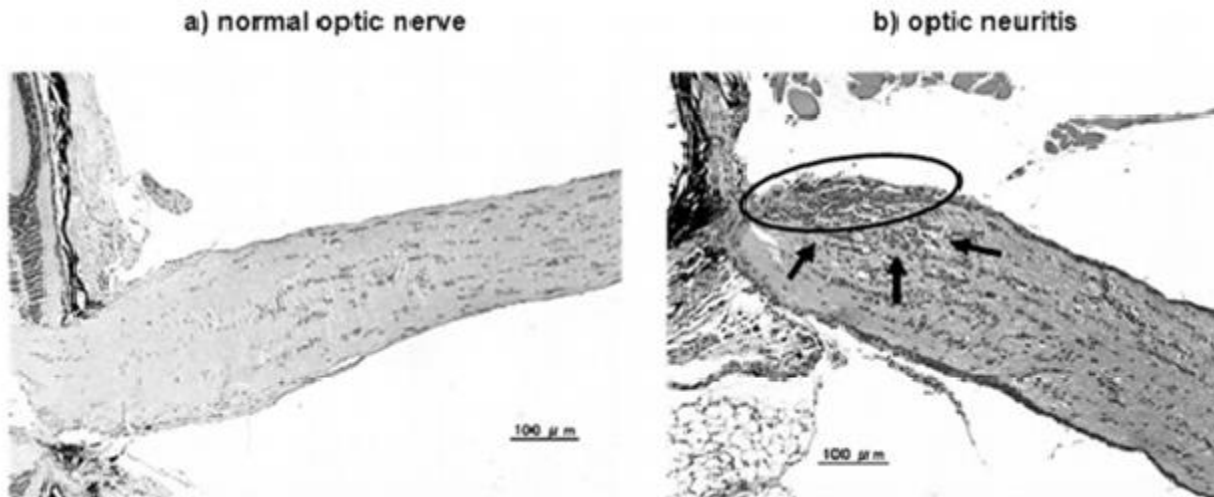


Fig 4: Normal optic nerves and optic nerves with optic neuritis disorder

VIII. CONCLUSION

We can thus say that by applying methods of electroporation, to be carried out by the use of high voltage amplifier, transfection can be carried out in human cells. This can eventually help in finding a cure, bringing awareness or doing some research work in the field of transfection to treat cancer, diabetes, autoimmune diseases, HIV aids etc.

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The Impact of Justice on Teachers' Commitment in Jaffna Education Division

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Abstract- The study was designed to investigate the impact of the justice on employee commitment in Jaffna education division's schools. The design of the study was descriptive survey design. By application of simple cluster sampling method, the total of 32 schools was drawn from Jaffna education division. Accordingly the population (teachers) was divided into cluster (schools) and some of these clusters were randomly selected. Finally, it was possible to the researcher to collect 143 responses from the population. In an attempt to focus the study, one reach question was posed and nine hypotheses were formulated and tested. The instrument for the study was a five point likert type questionnaire. Answers to these questions were analyzed using mean, coefficients and regression. The results revealed that, if the teachers' perception of organizational justice is positive, this will increase their commitment to their organization. It is believed that studying other variables that affect organizational commitment in teachers may be useful. In particular, determining other variables that influence teachers' affective commitment to the organization, which means identifying themselves with the organization, and undertaking the necessary work in this regard may increase teachers' job performance.

Index Terms- distributive justice, procedural justice, interactional justice, affective commitment, normative commitment and continuance commitment

I. INTRODUCTION

In this study, researcher has to identify the impact of justice on employee commitment. Organizational justice refers to people's perception of fairness in organizations, consisting of perceptions of how decisions are made regarding the distribution of outcome and the perceived fairness of those outcomes themselves (Greenberg and Baron 2003). Organizational justice comprises the sub-dimensions of 'distributive justice', 'procedural justice' and 'interactive justice'.

In the organizational context, procedural justice is considered an important resource in social exchange, where else, distributive justice considered to be more closely related to economic exchange (Loi et.al. 2006). Another form of justice that focus on employees' perceptions of the quality of the interpersonal treatment received during the enactment of organizational procedures labeled as interactional justice (Skarlicki and Folger 1997). An immediate implication of inequity can arise in one of three ways:(1) own inequity (the persons' input-outcome ratio is unbalance); (2) comparison

inequity (the persons' input-outcome is balance but it is unbalance when compared with that of another person in similar circumstances); (3) own-comparison inequity (the persons' input-outcome ratio is unbalance it is also unbalance with respect to the comparison person) (Weick dan Nettet 1968).

According to the results of a study conducted by Folger and Konovsky (1989), individuals with a high-level perception of organizational justice also have a high level of commitment to the organization. Some studies indicate that the level of perceived organizational justice has a positive influence on the motivation, attitude and behavior of the employees towards the organization (Austin and Walster, 1974; Greenberg, 1990). In contrast, a negative perception of organizational justice leads to some negative consequences. According to the results of the study conducted by Meyer et al. (2002), if the perceptions of organizational justice are positive, then that has a higher level of influence on the organizational commitment of employees than their influence individually.

Distributive justice is a perception of justice that encompasses the perceptions of the members of the organization regarding fair distribution of resources among the members of the organization. It is based on 'Equity Theory' developed by Adams (1965) and 'a theory of justice' by Rawls (1999). Both of these theories concern distribution of resources. Distributive justice in organizations is a concept that explains the distribution of all kinds of acquisitions such as duties, goods, services, opportunities, punishments/rewards, roles, status, wages and promotion among individuals, on the basis of their similarities and differences (Walster et al., 1978; Greenberg, 1990; Foley et al., 2002).

Procedural justice refers to the perceived fairness of the means used to determine the amount of benefits (Folger and konovsky 1989). Past research demonstrates that procedural justice often is more predictive of a variety of work attitudes, including organizational commitment (Warner et.al. 2005). The fairness of the decision making process itself seems to be more important than the actual amount of compensation that is received by individual (Tepstra and Honoree 2003).

Interactive justice is a concept that concerns perceptions of employees about the treatment they have received during the application of organization. According to Folger and Bies (1989), indicators of the existence of interactive justice are demonstrating due respect to employees, introducing consistent criteria, giving feedback on time and behaving appropriately and sincerely. According to the results of a study conducted by Wasti (2001), the perception of organizational justice increases the

positive commitment that employees feel towards the organization

Organizational commitment has been identified as a critical factor in understanding and explaining the work-related behavior of employees in organizations. Mowday et al. (1979) defined organizational commitment as an effective response which moves beyond passive loyalty to an organization.

Grouping the causes of organizational commitment in three dimensions, Meyer and Allen (1997) defined affective, continuance and normative commitment in the following way:

- i. **Affective commitment** is defined as the affective desire on the part of individuals employed in an organization to continue to work in the organization as a result of identifying themselves with the organization.
- ii. **Continuance commitment** can be defined as the state where employees continue to stay in the organization with the thought that if they leave the job, they will suffer financially and their job opportunities will be limited.
- iii. **Normative commitment** can be explained as the situation where employees do not leave the job as a result of a moral obligation of duty.

The most widely discussed form of psychological attachment to an organization is affective commitment. Although Meyer and Allen's (1991) 3-component model includes affective, continuance, and normative commitment, affective commitment is considered to be the more effective measurement of organizational commitment. Affective commitment takes its root from the work of Kanter (1968) who described cohesion commitment as the attachment of an individual's fund of affectivity to the group. Although the core of this component is an affective tendency, it has been described in a broad way (Gonzalez & Guillen, 2008). More recently, Mowday et al. (1982) viewed affective commitment as the relative strength of an employee's identification with and involvement in a particular organization.

The literature indicates that continuance commitment is a well-developed component of organizational commitment with a well-founded and strong chain of causality (Meyer & Allen, 1997). According to some scholars, however, whether continuance commitment is really a commitment is questionable (Gonzalez & Guillen, 2008). In addition, McGee and Ford (1987) reported that the two dimensions of continuance commitment, high sacrifice and low alternatives, are significantly and differentially related to affective commitment. More specifically, high sacrifice indicates a positive relationship and low alternatives show a negative relationship to affective commitment.

As a result, a third component of commitment was identified as the obligation dimension and labeled normative commitment, also referred to as moral commitment in the literature (Jaros et al., 1993). Meyer and Allen's (1997) discussion of normative commitment begins with an outline of earlier (Meyer & Allen, 1991; Wiener, 1982) and more recent (Rousseau, 1995) theorizing of relevance to the development of normative commitment.

II. RESEARCH QUESTION

Here the research question is stated as "To what extent the organizational justice components influence the development of organizational commitment of an employee?"

III. OBJECTIVES OF THE STUDY

The present study attempts to explore the relationship between perceived organizational justice and organization commitment. Theoretically, the current results suggest that an organization justice perception plays a significant role in the development of organizational commitment. Perceived organizational justice was expected to correlate significantly with organization commitment. The people perceive justice in organizations are more likely to feel satisfied with employment and feel less likely to leave and feel more committed to job. Hence the main objective of this research is to find how strongly the organization justice dimensions contribute to the development of organization commitment. The researcher wishes to analyze the following sub objectives also,

IV. HYPOTHESES

After the review of the relevant literature researcher found out the research problem and developed some assumptions to solve the problem. Based on assumed causal relationship given in the conceptual model, the following hypotheses were developed by the researcher to carry out the research.

H1: The distributive justice perception influences on the development of affective commitment

H2: The distributive justice perception influences on the development of normative commitment

H3: The distributive justice perception influences on the development of continuance commitment

H4: The procedural justice perception influences on the development of affective commitment

H5: The procedural justice perception influences on the development of normative commitment

H6: The procedural justice perception influences on the development of continuance commitment

H7: The interactional justice perception influences on the development of affective commitment

H8: The interactional justice perception influences on the development of normative commitment

H9: The interactional justice perception influences on the development of continuance commitment

V. METHODOLOGY

The research was a descriptive survey aimed at investigating the impact of justice on employee commitment. The instrument used for the study was questionnaire developed through extensive literature and based on three research question. There were 947 teachers worked in 32 schools at Jaffna education

division. Due to excessive costs and time involved, it was difficult to the researcher to pick a random sample or stratified sample from the total population. To overcome this problem the researcher used simple cluster sampling method. Accordingly the population (teachers) was divided in to clusters (schools) and some of these clusters were randomly selected. Finally it was possible to the researcher to collect 143 responses from the population.

A questionnaire consists of three parts were used to measure variables. The part one of the questionnaire deals with demographic data, part two deals with organizational justice and the final part deals with employee commitment.

To collect the data related to organizational justice perceptions and organizational commitment, five point likert type scale were used in the questionnaire (where 1 = strongly disagree, 2 =

disagree, 3 = neither agree nor disagree, 4 = agree; and 5 = strongly agree).

Data collected was analyzed using mean values, correlation and regression analysis

VI. DATA ANALYSIS AND FINDINGS

The level of justice perception among employees

Even though the respondents worked at a same organizational climate, the perception of justice differs among them. Hence it is essential to assess the respondents' perceived organizational justice in organizations. The respondents level of justice perceptions are furnished below,

Table 1: The level of organizational justice perception

Organizational Justice	Total	Percentage
Low	9	6.3%
Moderate	45	31.5%
High	89	62.2%
Total	143	100.0%

The level of organizational justice perception varies to employees to employees. Here the most of the respondents showed high level (62.2%) of perceived organizational justice and other rest showed moderate & low level (31.5% & 6.3%) of justice perception.

The level of organizational commitment

The level of commitment respondent shows o an organization differs from individuals to individuals, here the commitment differences of respondent of furnished below,

Table 2: The level of Organizational Commitment

Employee Commitment	Total	Percentage
Moderate	87	60.8%
High	56	39.2%
Total	143	100.0%

According to the above table, only the moderate and high level of commitment was identified but none of respondents found with low level of commitment. In that 39.2% of employees show high level of commitment and other 60.8% of employees show the moderate level of commitment.

The main objective of the research is to identify that to what extent the organizational justice perceptions contribute to the development of organization commitment. To assess the achievement of this objective, several hypothesis were formulated and tested here by using statistical analysis techniques such as regression analysis, correlation and mean.

The distributive justice and affective commitment

To test how the distributive justice perception contributes to the development of affective commitment the following hypothesis was developed.

H1: The distributive justice perception influences on the development of affective commitment

The above hypothesis was tested using regression analysis technique. The results are furnished below.

Table 3 The regressions result for distributive justice and affective commitment

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df 1	df 2	Sig. F Change
1	.459 ^a	.210	.205	.64447	.210	37.565	1	141	.000

a. Predictors: (Constant), Avg Distributive Justice
b. Dependent Variable: Avg Affective Commitment

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.124	.262		8.110	.000
	Avg Distributive Justice	.430	.070	.459	6.129	.000

a. Dependent Variable: Avg Affective Commitment

In the above model summary, r^2 is 0.210. It indicates that 21% of affective commitment is caused by the distributive justice perception. The remaining 79% of development affective commitment is determined by other factors.

According to the above coefficients table the constant value is 2.124 and beta value is .459 which is significant at 0.05 significance level. It implies that distributive justice has positive significant impact of affective commitment. Thus it can be concluded that when distributive justice perception increases the affective commitment of employees also will increase in these organizations. So the above hypothesis is accepted.

The distributive justice and normative commitment

To test how the distributive justice perception contributes to the development of normative commitment the following hypothesis was developed,

H2: The distributive justice perception influences on the development of normative commitment
The above hypothesis was tested using regression analysis technique. The results are furnished below,

Table 4 The regression results for distributive justice and normative commitment

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df 1	df 2	Sig. F Change
1	.352 ^a	.124	.118	.56232	.124	19.928	1	141	.000

a. Predictors: (Constant), Avg Distributive Justice

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.533	.229		11.086	.000
	Avg Distributive Justice	.273	.061	.352	4.464	.000

a. Dependent Variable: Avg Normative Commitment

As shown in the above model summary, r^2 is 0.124. It describes that 12.4% of normative commitment is caused by the distributive justice perception. The remaining 87.6% of development normative commitment is determined by other factors.

Based on the above coefficients table the constant value is 2.533 and beta value is .352 which is significant at 0.05 significance level. It implies that distributive justice has positive significant impact of normative commitment. Thus it can be

concluded that when distributive justice perception increases the normative commitment of employees also will increase in these organizations. So the above hypothesis is accepted.

The distributive justice and continuance commitment

To test how the distributive justice perception contributes to the development of continuance commitment the following hypothesis was developed.

H3: The distributive justice perception influences on the development of continuance commitment

The above hypothesis was tested using regression analysis technique. The results are furnished below.

Table 5 The regression results for distributive justice and continuance commitment

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df 1	df 2	Sig. F Change
1	.261 ^a	.068	.061	.56355	.068	10.282	1	141	.002

a. Predictors: (Constant), Avg Distributive Justice

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.518	.229		10.997	.000
	Avg Distributive Justice	.197	.061	.261	3.206	.002

a. Dependent Variable: Avg Continuance Commitment

In the above model summary, r^2 is 0.068. It illustrates that 6.8% of continuance commitment is caused by the distributive justice perception. The remaining 93.2% of development continuance commitment is determined by other factors.

The above coefficients table indicates that the constant value is 2.518 and beta value is .261 which is significant at 0.05 significance level. It implies that distributive justice has positive significant impact of continuance commitment. Thus it can be concluded that when procedural justice perception increases the continuance commitment of employees also will increase in these organizations. So the above hypothesis is accepted.

The procedural justice and affective commitment

To test how the procedural justice perception contributes to the development of affective commitment the following hypothesis was developed.

H4: The procedural justice perception influences on the development of affective commitment

The above hypothesis was tested using regression analysis technique. The results are furnished below.

Table 6 The regression results for procedural justice and affective commitment

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df 1	df 2	Sig. F Change
1	.444 ^a	.197	.191	.65002	.197	34.532	1	141	.000

a. Predictors: (Constant), Avg Procedural Justice

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.181	.263		8.282	.000
	Avg Procedural Justice	.419	.071	.444	5.876	.000

a. Dependent Variable: Avg Affective Commitment

Based on the above model summary, r^2 is 0.197. It describes that 19.7% of affective commitment is caused by the procedural justice perception. The remaining 80.3% of development affective commitment is determined by other factors.

According to the above coefficients table the constant value is 2.181 and beta value is .444 which is significant at 0.05 significance level. It implies that procedural justice has positive significant impact of affective commitment. Thus it can be concluded that when procedural justice perception increases the

affective commitment of employees also will increase in these organizations. So the above hypothesis is accepted.

The procedural justice and normative commitment,

To test how the procedural justice perception contributes to the development of normative commitment the following hypothesis was developed,

H5: The procedural justice perception influences on the development of normative commitment
The above hypothesis was tested using regression analysis technique. The results are furnished below.

Table 7 The regression results for procedural justice and normative commitment

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df 1	df 2	Sig. F Change
1	.477 ^a	.227	.222	.52801	.227	41.519	1	141	.000

a. Predictors: (Constant), Avg Procedural Justice

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.183	.214		10.206	.000
	Avg Procedural Justice	.373	.058	.477	6.444	.000

a. Dependent Variable: Avg Normative Commitment

Here in the model summary, the r^2 indicates that 22.7% of normative commitment is accountable for their procedural justice perceptions and the other 77.3% of development of normative commitment is determined by other factors.

Based on the above coefficients table the constant value is 2.183 and beta value is .477 which is significant at 0.05 significance level. It implies that procedural justice has positive significant impact of normative commitment. Thus it can be concluded that when procedural justice perception increases the normative commitment of employees also will increase in these organizations. So the above hypothesis is accepted.

The procedural justice and continuance commitment

To test how the procedural justice perception contributes to the development of continuance commitment the following hypothesis was developed.

H6: The procedural justice perception influences on the development of continuance commitment.
The above hypothesis was tested using regression analysis technique. The results are furnished below

Table 8 The regression results for procedural justice and continuance commitment

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df 1	df 2	Sig. F Change
1	.344 ^a	.119	.112	.54802	.119	18.977	1	141	.000

a. Predictors: (Constant), Avg Procedural Justice

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.291	.222		10.318	.000
	Avg Procedural Justice	.262	.060	.344	4.356	.000

a. Dependent Variable: Avg Continuance Commitment

It is clear from the model summary, that r^2 is 0.119. It denotes that 11.9% of continuance commitment is influenced by the procedural justice perception. The remaining 88.1% of

development continuance commitment is determined by other factors.

The above coefficients table indicates that the constant value is 2.291 and beta value is .344 which is significant at 0.05

significance level. It implies that procedural justice has positive significant impact of continuance commitment. Thus it can be concluded that when procedural justice perception increases the continuance commitment of employees also will increase in these organizations. So the above hypothesis is accepted.

The interactional justice and affective commitment,

To find how the interactional justice perception contributes to the development of affective commitment the following hypothesis was developed,

H7: The interactional justice perception influences on the development of affective commitment.

The above hypothesis was tested using regression analysis technique. The results are furnished below.

Table 9 The regression results for interactional justice and affective commitment

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df 1	df 2	Sig. F Change
1	.484 ^a	.235	.229	.63452	.235	43.209	1	141	.000

a. Predictors: (Constant), Avg Interactional Justice

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.993	.264		7.539	.000
	Avg Interactional Justice	.436	.066	.484	6.573	.000

a. Dependent Variable: Avg Affective Commitment

Here in the model summary, r^2 indicates that 23.5% of affective commitment is accountable for their interactional justice perceptions and the other 76.5% of development of affective commitment is determined by other factors.

The above coefficients table describes that the constant value is 1.993 and beta value is .484 which is significant at 0.05 significance level. It implies that interactional justice has positive significant impact of affective commitment. Thus it can be concluded that when interactional justice perception increases the affective commitment of employees also will increase in these organizations. So the above hypothesis is accepted.

The interactional justice and normative commitment

To conclude how the interactional justice perception contributes to the development of normative commitment the following hypothesis was developed,

H8: The interactional justice perception influences on the development of normative commitment.

The above hypothesis was tested using regression analysis technique. The results are furnished below.

Table 10 The regression results for interactional justice and normative commitment

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df 1	df 2	Sig. F Change
1	.471 ^a	.222	.217	.52985	.222	40.256	1	141	.000

a. Predictors: (Constant), Avg Interactional Justice

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.160	.221		9.785	.000
	Avg Interactional Justice	.351	.055	.471	6.345	.000

a. Dependent Variable: Avg Normative Commitment

It is clear from the above model summary that, $r^2 = 22.2\%$. It denotes that 22.2% of normative commitment is influenced by the interactional justice perception. The remaining 77.8% of development normative commitment is determined by other factors.

According to the above coefficients table the constant value is 2.160 and beta value is .471 which is significant at 0.05 significance level. It implies that interactional justice has positive significant impact of normative commitment. Thus it can be concluded that when interactional justice perception increases the normative commitment of employees also will increase in these organizations. So the above hypothesis is accepted.

The interactional justice and continuance commitment

To measure how the interactional justice perception contributes to the development of continuance commitment the following hypothesis was developed,

H9: The interactional justice perception influences on the development of continuance commitment,

The above hypothesis was tested using regression analysis technique. The results are furnished below,

Table 11 The regression results for interactional justice and continuance commitment

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df 1	df 2	Sig. F Change
1	.276 ^a	.076	.070	.56108	.076	11.618	1	141	.001

a. Predictors: (Constant), Avg Interactional Justice

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.456	.234		10.510	.000
	Avg Interactional Justice	.200	.059	.276	3.408	.001

a. Dependent Variable: Avg Continuance Commitment

It is precise that, r^2 is 0.076. It describes that 7.6% of continuance commitment is influenced by the interactional justice perception. The remaining 92.4% of development continuance commitment is caused by other factors.

The above coefficients table illustrates that the constant value is 2.456 and beta value is .276 which is significant at 0.05 significance level. It implies that interactional justice has positive significant impact of continuance commitment. Thus it can be concluded that when interactional justice perception increases the continuance commitment of employees also will increase in these organizations. So the above hypothesis is accepted.

VII. CONCLUSION

It is revealed that procedural justice is more important in developing the continuance commitment and normative commitment while the interactional justices strongly influence the affective commitment. In this study, the distributive justice has no significant effect to any dimension of organizational commitment. This probably due to the samples concern more towards the procedural justice compared to distributive justice.

It was observed that most of the respondents had moderate level of commitment in the organization.

It was revealed that most of the respondents perceived high level of organizational justice and all others perceived moderate level of organizational justice.

VIII. SUGGESTIONS AND RECOMMENDATIONS

It is believed that taking measures that will increase teachers’ organizational commitment, especially reinforcing organizational justice in schools, will be useful. If teachers’ perception of organizational justice is positive, this will increase their commitment to their organization. Therefore, it may be useful to revise practices of distributive, interactive and procedural justice in schools.

It is believed that studying other variables that affect organizational commitment in teachers may be useful. In particular, determining other variables that influence teachers’ affective commitment to the organization, which means identifying themselves with the organization, and undertaking the necessary work in this regard may increase teachers’ job performance.

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Use of Communication Strategies by Tourism-oriented EFL Learners in Relation to Attitude towards English Speaking and English Language and Exposure to Oral Communication in English

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Abstract- This study investigated the relationship of attitude towards English speaking and English language, exposure to oral communication in English, and communication strategy use by tourism-oriented EFL learners studying at the universities in the Southwest China to improve their oral English communication. The communication strategy questionnaire (CSQ) and the attitude towards English speaking and English language questionnaire (AESEL) were used for data collection, and the quantitative method such as Analysis of Variance (ANOVA) and Chi-square tests were employed for data analysis. The findings showed that students' use of Communication Strategies (CSs) had strong relationship with the variable of attitude towards English speaking and English language, although the variable of exposure to oral communication in English was found to have just minor relationship with the students' choice of CSs. This study implied that the tourism-oriented EFL learners should be instructed on the basis of their strong motivation and encouraged to have more exposure to the target language.

Index Terms- communication strategies, tourism-oriented EFL learners, attitude towards English speaking and English language, exposure to oral communication in English

I. INTRODUCTION

English as the global language has never been denied because it truly links the world together. British Council (2011) stated that English has already become a country's successful participation in the global economy and it works as an effective communication tool for providing individuals with access to useful knowledge, skills and employment opportunities. It has been found that communication among non-native speakers of English represents 80 percent of global English use (Finster, 2004). With the rapid development of economy, China, although it is a non-English speaking country, has been involved in more and more communication in English.

World Tourism Organization (WTO) predicated that China would be the world's largest tourist destination by the year 2020 based on China Daily's estimate (2004). Communicating in English with tourists in terms of understanding their expectations are keys to the tourists' satisfaction. In tourism industry both the supplier and the demander should communicate perfectly in order to ensure the quality and the needed performance standards. Feng (2011) claimed that with the rapid development of tourism industry, China now needs millions of English-speaking people to work in a variety of tourism fields, including hotels, travel agencies, tour guides, etc.

With this, much progress of tourism-oriented EFL teaching and learning should be made to meet the needs of the development of society. Tourism-oriented EFL programs in China are offered at different school levels: colleges or universities, vocational colleges, and secondary vocational schools. The tourism-oriented EFL learners at tertiary level are expected to have better English language proficiency, especially their oral communication ability. However, the lack of oral communication opportunities and communication strategies leads to the difficulty of oral communicating with English-speaking people for the tourism-oriented EFL learners in underdeveloped or developing areas. The southwest is one of the developing areas in China, and the tourism-oriented EFL learners in this area need more help with their English communication. Dörnyei (1995) brought up an important and interesting point in his study on the teachability of communication strategies (CSs) and even further suggests that "some people can communicate effectively in an L2 with only 100 words. The importance of communication strategies has been recognized and attracted many researchers' interests.

In terms of the definition of communication strategies, Tarone et al. (1976, p. 5) provided an early definition of communication strategies (CSs) as "a systematic attempt by the learner to express or decode meaning in the target language, in situations where the appropriate systematic target language rules have not been formed". Furthermore, Tarone (1983, p. 419) defined communication strategies as "mutual attempt[s] of two interlocutors to agree on a meaning in situations where requisite meaning structures do not seem to be shared". As these strategies reflected learners' attempts to make themselves understood to their interlocutors, they were considered interactional in nature. Moreover, Tarone (1983, p. 65) offered the following necessary criteria for communication strategies, in which she explicitly distinguished production strategies from learning strategies: 1) A speaker desires to communicate

meaning to a listener; 2) The speaker believes the linguistic or sociolinguistic structure desired to communicate meaning and the structure is unavailable or is not shared with the listener; 3) The speaker chooses to: a) avoid --- not attempt to communicate meaning; or b) attempt alternate means to communicate meaning. It was accepted that communication strategies are alternate means to express a concept or an intention, the correct way of saying which does not exist in learners' interlanguage system. The three criteria needed to be fulfilled for a strategy to be called communication strategy.

Researches have been increasingly conducted to improve the tourism-oriented EFL learners' communication ability. A great number of research works on communication strategies have been conducted. The first group mainly focused on the nature of communication strategies, namely, the definitions, identifications and classifications (e.g. Tarone, 1977; Bialystok, 1983 and 1990; Nakatani, 2006; Mariani, 2010; Somsai and Intaraprasert, 2011; Bui and Intaraprasert, 2012). Then, there were empirical studies which investigated the use of communication strategies in relation to different factors, such as communicative tasks, learners' general language proficiency, types of programs (e.g. Liskin-Gasparro, 1996; Wannaruk, 2003; Paramasivam, 2009).

However, the available research on communication strategies showed that although the role of communication strategies in developing learners' communication competence is important, very few studies have been conducted with Chinese students. To the best knowledge of the researcher, empirical works on communication strategy use carried out with tourism-oriented EFL learners in relation to attitude towards English speaking and English language and exposure to oral communication in English in the Chinese context have not been found. Thus, this present investigation aimed to fill this gap so that English communication strategy could be used for its expected goal.

In this study, two research questions were answered: 1) What is the overall frequency of each type of communication strategies employed by Chinese tourism-oriented EFL learners in relation to attitude towards English speaking and English language and exposure to oral communication in English? 2) Does the employment of strategies for coping with oral communication problems vary significantly according to the attitude towards English speaking and English language and exposure to oral communication in English? If it does, what are they?

II. RESEARCH ELABORATIONS

A. Terms used in the study

- Communication Strategies

The term 'communication strategies' (CSs and communication strategy for CS) for the present investigation refers to knowledge or ability used by tourism-oriented EFL learners to cope with oral communication problems due to their inadequate linguistic knowledge and sociocultural knowledge in an oral communication in English as well as learning techniques employed by the students in an oral interaction in order to improve, and maintain their oral communication in English. Communication strategies may occur in either pseudo communication or real-life communication both inside and outside language classroom settings. In the present study, 'communication strategies' and 'strategies for coping with oral communication problems' will be used interchangeably.

- Students

'Students' for the present study refers to Chinese undergraduate students who are tourism-oriented EFL learners from Guizhou University and Guizhou Normal College in Guizhou Province, Yunnan University and Yunnan Normal University in Yunnan Province, Guangxi University and Guangxi University for Nationalities in Guangxi Province, all of which are located in the southwest of China.

- Attitude towards English Speaking and English Language

'Attitude towards English Speaking and English Language' indicates the students' thoughts, feeling and emotion towards English. 'Attitudes towards English Speaking and English Language' in the present study will be divided into two groups: 'positive attitude' and 'negative attitude' based on the responses to the Attitude towards English Speaking and English Language questionnaire (AESEL).

- Exposure to Oral Communication in English

'Exposure to Oral Communication in English' in this study refers to opportunities students can use English to communicate orally, whether with native English speakers or non-native English speakers, like their teachers and friends. The students will be classified as: limited exposure to classroom English only and non-limited exposure to classroom English.

B. Research objectives

The present study was carried on with exploratory purposes. It aimed at:

-Investigating whether the choices of communication strategy use vary significantly by the attitude towards English speaking and English language, and the students' exposure to oral communication in English;

-Examining the patterns of a significant variation in the frequency of the students' reported communication strategy use at three levels of the overall, categorized and individual CSs use with reference to the attitude towards English speaking and English language and the exposure to oral communication in English.

C. Participants

Because not all the universities in southwest China offer tourism-oriented bachelor degree program, convenience sampling method was adopted for data collection. 814 tourism-oriented EFL learners were purposively selected from 6 universities (2 universities in

Yunnan Province, 2 universities in Guizhou Province and 2 in Guangxi Province). The detailed information about the 814 participants was in Table 2.

D. Instruments

-The instruments used in the present study included two questionnaires. The first questionnaire is the Communication Strategy Questionnaire (CSQ). This questionnaire was modified by the researcher based on the topologies of communication strategies by Dörnyei and Scott (1997), Nakatani, (2006), Mariani (2010), and Somsai and Inatarprasert (2011), which were considered as the most recently established ones. With considerations of the research objectives, the research context, and the operational definition of communication strategies of this present study, this questionnaire included 35 items, including 20 items of strategies for coping with communication problems (CCP), 10 items of strategies for understanding interlocutor’s messages (UIM), and 5 items of strategies for carrying on the conversation as intended (CCI).

-The second questionnaire is Attitude towards English Speaking and English Language Questionnaire (AESEL). It was constructed on the basis of Ockert’s (2010) language learning attitude questionnaire and the researchers’ language learning attitude questionnaire (LLAQ), in which all of the items were modified to be used for the AESEL. The modification included: slightly changed items for being appropriate for the present study, covering 40 items. The first 20 items included the attitudes towards speaking English and the last 20 items include the attitudes towards English language. Additionally, the sum of scores would be taken to identify the students’ attitudes towards speaking English and the English language on the basis of 5-Point rating scale. As the possible maximum score was 200 and the possible minimum score was 40, the respondents who got 120 scores (including 120) or over would be considered to hold positive attitude, while those who got under 120 scores would be considered to hold negative attitude.

-These items were firstly translated from English to Chinese by the researcher in order to avoid the respondents’ misunderstanding or unanswering, and then were double checked by two Chinese experts in the field of Teaching English as a Foreign Language (TEFL). The questionnaires were piloted and improved.

E. Procedure

During November and December, 2012, the researcher went to the six universities in the Southwest China in person to collect the data from the Communication Strategy Questionnaire (CSQ) and Attitude towards English Speaking and English Language Questionnaire (AESEL), to which 814 university tourism-oriented EFL learners gave their responses.

F. Analysis

The data collected were analyzed in quantitative method as follows:

-Information about the students’ attitude towards English speaking and English language and exposure to oral communication in English were coded with numbers.

-The data about the students’ exposure to oral communication in English and attitude towards English speaking and English language were processed with assistance of SPSS and cross-checked to avoid mistakes that might influence the results. The items in CSQ were categorized into three groups: strategies for coping with communication problems (CCP) including 20 items, strategies for understanding the interlocutor’s messages (UIM) including 10 items, and strategies for carrying on the conversation as intended (CCI) including 5 items. Meanwhile, the items in AESEL questionnaire were calculated to categorize into positive and negative processed by SPSS.

-The reliability was examined to see whether the data would be qualified for quantitative analysis. The results of Alpha Coefficient (α) or Cronbach Alpha was used to check the internal consistency of the CSQ and AESEL. The reliability of the two questionnaires was 0.90 which was considered acceptable and was above the acceptable criterion of 0.70 as suggested in Fraenkel and Wallen (1993). The reliability estimate of the CSQ and AESEL according to 814 Chinese tourism-oriented EFL learners was demonstrated in Table 1 below.

Table 1: Reliability Estimate of the CSQ and AESEL as a Whole and the Three Categories

CSQ Category	CSQ as a Whole (35 items)	Category 1 (20 items)	Category 2 (10 items)	Category 3 (5 items)
Reliability Estimate (Alpha Coefficient: α)	.90	.84	.83	.72

III. FINDINGS

A. Variation in frequency of the students’ overall reported CS use

Table 2: A Summary of First Level Analysis

Variables		Number	Mean	S.D.	Sig. Level	Variation Pattern
Attitude towards English Speaking and English Language	Positive	579	2.61	.37	P<0.01	Positive> Negative
	Negative	235	2.46	.38		

Exposure to Oral Communication in English	Limited Exposure to Classroom English	638	2.56	.37	N.S	---
	Non-limited Exposure to Classroom English	176	2.60	.39		

Note: 'N.S.' stands for no significance.

As shown in Table 2, the results from the ANOVA revealed that the frequency of students' overall strategy use varied significantly according to students' attitude towards English speaking and English language. It meant that the students whose attitude was positive towards English speaking and English language employed the strategies more frequently than those whose attitude was negative. Meanwhile, there was no significant difference found regarding exposure to oral communication in English.

B. Variation in frequency of the students' use of CS under the three categories

- Variation according to attitude towards English speaking and English language

Table 3: Variation in Frequency of Students' Use of CSs in the CCP, UIM, CCI Categories according to Attitude towards English Speaking and English Language

Strategy Category	Positive (n=579)		Negative (n=235)		Sig. Level	Variation Pattern
	Mean	S.D.	Mean	S.D.		
CCP Category	2.57	.40	2.42	.42	P<0.01	P>N
UIM Category	2.70	.48	2.61	.53	P<0.01	P>N
CCI Category	2.60	.52	2.31	.54	P<0.01	P>N

As shown in Table 3, the results from the ANOVA showed that significant variations were found in frequency of students' use of strategies in the CCP, UIM and CCI categories in relation to attitude towards English speaking and English language. The students with positive attitude towards English speaking and English language reported employing the strategies more frequently than the students with negative attitude towards English speaking and English language did.

- Variation according to exposure to communication in English

Table 4: Variation in Frequency of Students' Use of CSs in the CCP, UIM, CCI Categories according to Exposure to Oral Communication in English

Strategy Category	Limited Exposure (n=638)		Non-Limited Exposure (n=176)		Sig. Level	Variation Pattern
	Mean	S.D.	Mean	S.D.		
CCP	2.52	.40	2.56	.45	N.S.	-
UIM	2.68	.48	2.68	.53	N.S.	-
CCI	2.49	.53	2.64	.56	P>0.05	Non-limited>Limited

The results from the ANOVA in Table 4 demonstrated that the significant variations were found in the use of strategies related to exposure to oral communication in English in the CCI category, although no significant difference was found in the CCP and UIM categories. It meant that the students with non-limited exposure to oral communication in English reported more frequent use of these CCI strategies than those whose exposure to oral communication in English was limited.

C. Variation in frequency of the students' CS use at individual level

- Variation according to the students' attitude towards English speaking and English language

Table 5: Variation in Frequency of Students' Use of Individual CSs according to Students' Attitude towards English Speaking and English Language

Individual Communication Strategies		% of high use (3 and 4)		Observed χ^2
Used More by Students with Positive Attitude towards English Speaking and English Language		Positive Attitude	Negative Attitude	P<.05
CCP 2	Using familiar words, phrases or sentences	78.6	61.3	$\chi^2=28.33$ P<.001
UIM 6	Trying to catch the interlocutor's main point	75.6	62.1	$\chi^2=15.32$ P<.05
UIM 10	Noticing the interlocutor's gestures and facial expressions	71.5	54.5	$\chi^2=29.96$ P<.001
UIM 8	Guessing the meaning of what the	68.9	58.7	$\chi^2=8.93$

	interlocutor has said			$P < .05$
CCI 5	Responding to the interlocutor despite an imperfect understanding of the message	61.7	45.1	$\chi^2 = 25.55$ $P < .001$
CCP 5	Using simple expressions	61.5	67.7	$\chi^2 = 14.87$ $P < .05$
CCP 10	Speaking more slowly to gain time to think	61.5	50.6	$\chi^2 = 9.03$ $P < .05$
CCP 16	Referring to mobile phone dictionary or another type of document	60.6	55.7	$\chi^2 = 8.56$ $P < .05$
CCP 14	Asking the interlocutor to confirm that one's made oneself understood	60.1	48.5	$\chi^2 = 9.46$ $P < .05$
CCI 2	Sending continuation signals to show one's understanding	55.8	40.4	$\chi^2 = 25.31$ $P < .001$
CCP 11	Correcting the incorrect and inappropriate utterances by oneself	55.1	41.3	$\chi^2 = 15.83$ $P < .05$
CCI 1	Trying to enjoy the conversation	53.7	36.6	$\chi^2 = 27.75$ $P < .001$
CCP 3	Correcting one's own pronunciation, grammar and lexical mistakes	51.8	31.5	$\chi^2 = 31.04$ $P < .001$
CCP 1	Using synonym or antonym	51.5	34.0	$\chi^2 = 33.72$ $P < .001$
UIM 7	Appealing for assistance from other people around	48.1	37.0	$\chi^2 = 9.62$ $P < .05$
CCP 4	Speaking Chinese instead when one doesn't know how to say in English	47.8	46.0	$\chi^2 = 11.19$ $P < .05$
CCP 13	Thinking first of a sentence one already knows in English and then trying to change it to fit the situation	47.3	38.7	$\chi^2 = 14.27$ $P < .05$
UIM 5	Asking the interlocutor to give an example	47.2	35.7	$\chi^2 = 8.88$ $P < .05$
CCP 19	Making use of expressions found in some sources of media	44.7	33.2	$\chi^2 = 11.93$ $P < .05$
CCI 4	Feeling all right if the conversation does not go smoothly by keeping talking	43.9	30.2	$\chi^2 = 22.02$ $P < .001$
CCP 18	Appealing for assistance from other people around	40.2	32.3	$\chi^2 = 8.57$ $P < .05$
CCI 3	Feeling all right for taking risks while speaking	38.3	20.4	$\chi^2 = 33.76$ $P < .001$
CCP 9	Repeating what the interlocutor has just said	37.1	28.1	$\chi^2 = 8.6$ $P < .05$

The results from the Chi-square tests in Table 5 showed that tourism-oriented EFL learners with positive attitude reported significantly higher use of 23 strategies than the negative attitude learners did. It meant that 23 out of 35 communication strategies across the CSQ and AESEL questionnaires varied significantly according to the attitude towards English speaking and English language. This variable was found to have the strongest relationships with students' choices of strategy use, with a larger proportion of significant variations in students' use of individual strategies. It was obvious that there was a significantly greater percentage of tourism-oriented EFL learners with positive attitude reported employing more strategies than the negative attitudes learners did.

- Variation according to the students' exposure to oral communication in English

Table 6: Variation in Frequency of Students' Use of Individual CSs regarding Exposure to Oral Communication in English

Individual Communication Strategies		% of high use (3 and 4)		Observed χ^2 $P < .05$
		Non-limited Exposure	Limited Exposure	
CCI 2	Sending continuation signals to show one's understanding	60.8	48.7	$\chi^2 = 13.2$ $P < .05$
CCI 1	Trying to enjoy the conversation	58.5	46.1	$\chi^2 = 8.64$ $P < .05$
CCP 6	Using nonverbal language such as body language	56.3	48.4	$\chi^2 = 11.37$ $P < .05$
CCP 1	Using synonym or antonym	54.0	44.4	$\chi^2 = 9.38$ $P < .05$
CCI 3	Feeling all right for taking risks while speaking	41.5	30.9	$\chi^2 = 7.92$ $P < .05$
CCP 17	Drawing a picture	27.8	16.5	$\chi^2 = 12.60$

				P < .05
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The results from the Chi-square tests in Table 6 revealed that there were six individual strategies varying significantly according to this variable. There were three CCP items and three CCI items. It demonstrated that the students with non-limited exposure to English employed six individual strategies more frequently than those whose exposure to English was limited in the classroom did. It showed that the students with non-limited exposure to English found it easier to use strategies for coping with communication problems (CCP) as well as for carrying on the conversation as intended (CCI).

To conclude, the findings revealed that significant variations were found according to the variable of attitude towards English speaking and English language, showing greater percentage of CCs use in all the categories of CCP, UIM and CCI. Significant variations were also found in the CCI category according to exposure to oral communication in English, as well as in some individual items of CSs of CCP and CCI categories in relation to exposure to oral communication in English, however, minor significant difference was found in the students' overall reported strategy use in relation to the variable of exposure to oral communication in English.

IV. DISCUSSIONS

The present study was intended to explore the use of communication strategies in relation to attitude towards English speaking English language and exposure to oral communication in English among tourism-oriented EFL learners in the universities in Southwest China for improving their communication. The results mentioned above were discussed as follows:

A. Use of CSs and students' attitude towards English speaking and English language

The findings of this present study for the communication strategy use and the attitude towards English speaking and English language revealed that great significant variations had been found in the overall strategy use, in all the categories of CCP, UIM and CCI as well as the 23 individual items among the total 35 items. It showed that tourism-oriented EFL learners with positive attitudes reported significantly higher use of 23 strategies than the negative attitudes learners did. It meant that 23 out of total 35 communication strategies varied significantly according to the attitude towards English speaking and English language, and this variable had the strongest relationships with students' choices of strategy use, with a larger proportion of significant variations in students' use of individual strategies across the strategy inventory found to be related to their attitude towards English speaking and English language. It was obvious that a significantly greater percentage of the positive attitudes tourism-oriented EFL learners reported employing more strategies than the negative attitudes learners did. The tourism-oriented EFL learners with positive attitude surely did their best to know more about the strategies which could help them better communicate because they valued much about English for their future career. This might be a reasonable justification for the more frequent use of CSs by the participants holding positive attitude in this study.

Furthermore, at the individual level, most of the individual items consisted of self-reliant achievement strategies. Some possible factors might contribute to the reasons why this variable affected the communication strategy use so much in the positive way. The first possible hypothesized factor was motivation which was used to cause the differences in students' CS use related to their Attitude towards English Speaking and English Language. Gardner (1985) regarded attitudes as components of motivation in language learning. Besides, the research of Gardner and MacIntyre (1993) seemed congruent with what Oxford and Nyikos (1989, p. 294) concluded: "The degree of expressed motivation to learn the language was the most powerful influence on strategy choice." Oxford and Shearin (1994) declared that it is of utmost importance to understand students' motivation which directly affects the strategy use. In addition, the findings of the present study showed that more students held positive attitudes towards not only English speaking but English language as well and they had high motivation in communicating orally in this language, employing CSs use including functional practice strategies, such as 'extracurricular effort to communicate in the target language'; and conversational input elicitation strategies, such as 'asking for pronunciation correction', 'requesting slower speech', and 'guessing what the interlocutor will say', more often than did the less motivated students (Oxford and Nyikos, 1989), which was consistent with what Tamada (1996) found that differences in motivation orientation (instrumental or integrative) significantly influenced the use of language learning strategies.

Based on the findings of the present study, the effects of attitude on the choice of the strategy use were found to be significant. Students with positive attitude used CCs more frequently than those who held negative attitude, which was supported by the same result found in some similar studies (Bui and Intaraprasert, 2013) as well as the findings of Oxford and Nyikos (1989), with respect to students' use of strategies, highly motivated students reported employing CSs including functional practice strategies, such as 'extracurricular effort to communicate in the target language'; and conversational input elicitation strategies, such as 'asking for pronunciation correction', 'requesting slower speech', and 'guessing what the interlocutor will say', more often than the less motivated students did.

Another factor which might explain the significant variation was the students' language proficiency level after observing the types of CSs used more often by the students of higher language proficiency ability. This revealed that the students who had a good command of English language were more confident in communication (Chen, 2005; Huang and Van Naerssen, 1987). They could communicate orally by using verbally, e.g., synonyms and antonyms linguistically as well as nonverbally, e.g., body language. Therefore, the factor of their language proficiency level had been evidenced to relate to learners' CS use in empirical studies conducted by different researchers, namely Huang and Van Naerssen (1987), Margolis (2001), Wannaruk (2003), Weerarak (2003), Nakatani (2006), Lam (2010) and Bui & Intaraprasert, (2013).

One more possible factor for the variations of individual CS use in students with different attitude towards English speaking and English language would be encouragement. The characteristics of the research subjects indicated that a significantly greater proportion of positive attitude students' obtaining more encouragement than the other people. The encouragement can happen in class or after class. Students who obtained encouragement easily became positive attitude towards English speaking and the English language. This finding was consistent with what Dörnyei (1995) suggested that communication strategies need to be taught and he also suggests procedures for strategy training. Dörnyei argued that teachers should raise students' awareness, encourage them to take risks, and provide them with models and opportunities to use communication strategies. Undoubtedly, the students would make marvelous progress with the language use if they were encouraged to try to take risks and used communicative strategies or to manipulate available language without being afraid of making errors.

In conclusion, the three hypothesized factors of motivation, language proficiency level and encouragement were used to explain the existence of significant variations in the students' use of CSs and attitude towards English speaking and English language.

B. Use of CCs and exposure to oral communication in English

The findings of this present study showed that there were no significant variations either in the overall strategy use or in the CCP and UIM categories in terms of students' employment of communication strategies related to exposure to oral communication in English. However, the significant variations in the CCI category had been found according to exposure to oral communication in English, the students with non-limited exposure to oral communication in English reported more frequently than those whose exposure was limited to oral communication in English. Based on the individual items of communication strategies, the students reported their strategy use verbally or nonverbally to solve communication problems better than the ones who lacked exposure to the target language. The findings in the CCI category were also consistent with what Norton and Toohey (2001) pointed out that the success of good language learners, especially in communication, depends very much on the degree and quality of exposure to variety of conversations in their communities. It showed that language learners who were exposed to the target language or had conversational interaction in the actual situations tended to be more flexible and successful in using communication strategies.

The possible factor which may explain the significant difference for the CCI category and the six individual items, such as 'Using synonym or antonym (CCP 1)' or 'Using nonverbal language such as body language (CCP 6)' was that the students with non-limited exposure to oral communication in English were much more motivated by the non-limited exposure to classroom English. It revealed that they might experience the sense of achievement after the interaction in English with people and become motivated. The result was consistent with what Ushioda (2008, p. 25) states, "...motivation develops through social participation and interaction." This meant that the more exposure to oral communication in foreign language of learners, the more opportunities for them to become motivated in language learning. Oxford and Nyikos (1989) found that the more motivated students used learning strategies of all kinds, including functional practice strategies and conversational input elicitation strategies, more often than the less motivated students did. Accordingly, it meant that language learners who had more variety in their exposure to oral communication in English are likely to be more motivated to learn languages leading in turn to a high and wide range of strategy use in their oral communication.

In summary, the two hypothesized factors which were more exposure led to success and flexibility of language using and motivated for social interaction might contribute to the high CSs use by students who were not limited their exposure to oral communication in English.

V. CONCLUSION

This present study aimed at investigating the use of communication strategies by tourism-oriented EFL learners to improve and maintain their communication. The Communication Strategy Questionnaire and Attitude towards English Speaking and English Language Questionnaire were employed to collect the data in six universities in Southwest China. The statistical methods such as frequencies, ANOVA, and Chi-square were adopted for data analysis. The findings of this study were discussed according to three levels of the investigation related to attitude towards English speaking and English language and exposure to oral communication in English: the overall CS use level, the CS category level, and the individual CS level. In terms of attitude towards English speaking and English language, the results revealed that significant variations and greater percentage of CSs use were found in all the three levels of students' reported CSs use and importance of attitude was proved again in the use of CSs in the present study. Regarding exposure to oral communication in English, interestingly, the finding showed that significant variations were found in the CCI category level and the individual CS level, revealing that more exposure to the target, more confident and much easier the students may found. This present study implied that the tourism-oriented EFL learners should be instructed on the basis of motivation and encouraged to have more exposure to the target language. Moreover, some further study should be conducted in relation to other variables, for example, tourism-oriented EFL learners' personality and CS instruction, etc., to investigate the further understanding about the use of communication strategies.

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Schools in Difficulty: Identification, Issues and Strategies for Improvement

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Abstract- This article outlines the findings from a study that investigated the nature, composition and culture of schools operating in difficult contexts in three regions in Russia. This research study aimed to identify the external and internal causes of persistent underperformance in schools that operate in difficult and challenging social contexts. The prime purpose of the study was to identify the external and internal factors that contributed to lower achievement. The article outlines the main findings from the empirical study and concludes by offering suggestions about the type of interventions that could assist schools in securing higher achievement, even in the most challenging contexts.

I. INTRODUCTION

Inequality in educational opportunity in Russia has risen sharply in the last few years. This inevitably raises concerns about social equity but also the country's long term economic prosperity. The task of providing quality education and equal access for all children – regardless of the social, economic and cultural standing of their families – is crucial for economic growth. Recent research has shown that acquiring social capital, which is interpreted as the duration of education and the quality of academic results along with the acquisition of social competencies²⁰, leads to better life chances and greater individual productivity. It is also clear from the research evidence that²¹ the negative effects of social disadvantage upon subsequent academic achievement can be overturned, under the right conditions. Evidence reinforces that the quality of education is a powerful force that can secure better outcomes, irrespective of a child's starting point²². The large corpus of research within the

school effectiveness and improvement field has repeatedly shown that highly effective schools can disrupt the connection between disadvantage and underachievement and can improve the life chances of each student, regardless of individual capabilities and family context²³.

This optimistic view is particularly important for schools in poorer areas where the majority of students come from disadvantaged families as it implies that poverty need not result in poor attainment and achievement²⁴. Until recently, the relationship between disadvantage and underachievement, which many countries have understood and long experienced, was relatively unknown in Russia. Soviet pedagogy had developed very effective mechanisms for supporting children from families with low cultural capital²⁵ and making them equal. A system of positive discrimination and strict meritocracy was created to support capable and hard-working students to succeed. However, in the post-Soviet era, this system of positive discrimination was largely dismantled and the culture of supporting children with socio-economic capital was replaced by a culture of fulfilling specific family needs²⁶.

Since 2000, comparative international assessments of educational achievement (e.g. PIRLS, PISA, TIMSS) have demonstrated significant discrepancies in the relative performance of Russian students depending upon the economic and educational resources of their parents²⁷. The socio-economic status of students and the educational level of their parents combine to be the leading predictor and indicator of a student's subsequent achievement. This is supported by data from the

[Economic Review](#), American Economic Association, vol. 61(2), p. 280-88

²³ Chapman C, Armstrong, P, Harris, A Muijs, D. Reynolds, D and Sammons P. (2012) *School Effectiveness and Improvement Research: Challenging the Orthodoxy?* London Routledge

²⁴ Eric A. Hanushek & John F. Kain & Steven G. Rivkin, 2001. "[Why Public Schools Lose Teachers](#)," [NBER Working Papers](#) 8599, National Bureau of Economic Research, Inc

²⁵ I. Froumin, *Introduction to the theory and practice of democratic education* – Krasnoyarsk, 1998

²⁶ I. Froumin, *The cook's children*, "Ogonyok", NN24-26, M., 1992

²⁷ The main results of the international research, "Learning to read and reading comprehension." Analytical Report, Moscow, 2007. Key Findings of the international studies of educational achievement of students in PISA-2006. Analytical Report, Moscow, 2007.

Tyumeneva Y.A. Comparative evaluation of factors leading to success in PIRLS: a secondary analysis of data from PIRLS 2006 from the Russian sample, *Voprosy Obrazovanie* No 1, 2009.

²⁰ Eliot A. Jamison & Dean T. Jamison & Eric A. Hanushek, 2006. "[The Effects of Education Quality on Income Growth and Mortality Decline](#)," [NBER Working Papers](#) 12652, National Bureau of Economic Research, Inc.

Eric A. Hanushek & Ludger Woessmann, 2008. "[The Role of Cognitive Skills in Economic Development](#)," [Journal of Economic Literature](#), American Economic Association, vol. 46(3), pages 607-68.

²¹ For example, see: Heckman, J. (2007) *Beyond Pre-K. Rethinking the Conventional Wisdom on Educational Intervention* [Education Week](#), #11

²² Hanushek, Eric, 1971. "[Teacher Characteristics and Gains in Student Achievement: Estimation Using Micro Data](#)," [American](#)

Universal State Exam (USE) that shows how graduates of more affluent city schools achieve higher scores in Russian, computer science and English²⁸. As a consequence, these students will have better chances to continue their education and will be more competitive on the job market, as these skills are still in high demand.

So what are the implications from the current evidence about the underperformance of certain groups of students in Russia? Is it the case that Russian schools are no longer proficient in raising the aspirations of children from families with low social and cultural capital? The data shows that if students from lower income families were equally distributed across all schools, and if all schools were equally effective, it would still mean that social and cultural status would remain powerful determinants of underachievement. However, while cultural and social factors are influential, the fact remains that the quality of schooling can significantly reduce the impact of poverty on subsequent educational attainment.

In 2002 a World Bank's project "Reform of the Education System" was based on the simple but powerful idea that schools are different from one another, not just in their results, but in the quality of education they provide as well. In other words, there is significant variation in the quality of education across schools. This study concluded that the following barriers to achievement were commonplace:

the dependence of a child's possibilities on the social status of his or her parents and their education, on the family's economic standing, on the fact that the child happened to grow up in a village or in a city, in proximity or far from a good school... The children from a humble upbringing are pushed into the "cheap" schools. There is an actual worsening level of education for these young people... This is a sore spot. This is where inequality arises and is then cemented; it starts here and continues through generations – reproduction and entrenchment of social differentiation²⁹.

A large scale analysis of USE results confirmed this conclusion and highlighted that graduates of gymnasiums and lyceums performed better than those who graduated from public schools³⁰. Moreover, the research found that graduates of public schools take fewer elective exams and are thus much less focused on receiving a higher education than are students with higher socio-economic status³¹. In the regions, we found that

28V. Sobkin, D. Adamchuk. Y. Kolomiets. I. Likhanov. A. Ivanova. Sociological research on USE results. Presentation. 2009.

G. Kovalena. Universal State Exam in the system of evaluating education quality. Presentation. ISMO RAO. 2009.

29 D.Vakhstain, D. Konstantiovsky, D. Kurakin. Between two waves of monitoring (2007-2008). Trends in education development: 20 years of reform, and now what? Moscow, Universitetskaya Kniga, 2009, pp 164-165.

30 FIPI Results of the Universal State Exam (May-June 2007, May-June 2008), Moscow, 2007, 2008.

31 V Sobkin, D. Adamchuk, Y. Kolomiets, I Likhanov, A. Ivanova. Social study of USE results, Presentation at the academic seminar of the HSE Institute of Educational Studies "Research and developments in the sphere of education", Moscow, 2010.

87% of students with low USE scores were concentrated in 18% of schools in which very few students acquired a high score. A deeper analysis of quality indicators supports the hypothesis that there are groups of schools in Russia with consistently weak educational results (a more detailed analysis of the grouping of schools by level of academic results is provided below).

Our research explored the social composition and cultural potential (of the family) of the children studying at these schools and confirmed the children from the poorest layers and marginalized groups of society attended these schools. Consequently, this study aimed to identify a set of external and internal causes of persistently deteriorating academic results at schools that operate in difficult social contexts, and to develop strategies based on our findings to overcome this inequality.

The following hypotheses guided the work of the research team from the Moscow Higher School of Economics:

- i. The external causes of consistent school underperformance reside in the socio-economic factors that affect the school context;
- j. The internal causes of consistent school underperformance reside in the quality of administration, teaching and school culture;
- k. The model of "effective schools"³² which has guided many international school improvement programmes could potentially be used to ameliorate the underperformance.

II. PROJECT METHODOLOGY

The research methodology was based on the model of effective schools identified in the literature and a field study was conducted to identify potential deficits in such aspects of schooling as:

- administration;
- teaching;
- school culture.

A comprehensive set of data collection methods was developed and subsequently deployed which included methods of sociological research and pedagogical evaluation:

- semi-structured interviews with the administration, teachers and parents of the selected schools;
- classroom observation and evaluations of the quality of teaching;
- student surveys;
- analysis of school records;
- analysis of the quality of the educational process.

³² Mortimore Peter. The road to improvement. Reflections on school effectiveness. – Swets&Zeitlin Publishers, 1998.

The study took place in three regions of Russia that differ significantly in terms of geography, demographics and socio-economic characteristics. A statistical analysis was undertaken based upon data from around 1,500 educational institutions in these three regions. The sample for the field research comprised 22 schools that all operate in difficult social contexts but divided by academic achievement into two groups: strong and weak. It is important to now explain these terms as they will be used throughout the article.

Consistently weak schools are those that have demonstrated consistently worse academic performance than other schools over a sustained period (i.e. one school falls into the weak category for three years in a row).

Consistently strong schools are those that demonstrated consistently high academic results in all categories for three consecutive years. As previously mentioned, we analyzed education performance using a range of indicators and to assign types we used an SPSS two-step cluster analysis which allowed us to include in our analysis both continuous and discrete variables, and to effectively work with large amounts of data. For the next step of defining the difference between the two categories of consistently strong and weak schools, we employed an analysis of variance. To identify variances, an analysis was performed on a host of variables that characterize schools. These were broken up into several concepts:

- II. Finance
- III. Material and technical support
- IV. Staffing
- V. Special training
- VI. Social context

This analysis helped the research team to understand what types of problems are common for schools with consistently

weak results and to ascertain whether underperformance is caused by internal school issues or are more related specific to students and their families.

III. RESULTS

The empirical results are presented by region with the findings from the largest of the regions outlined initially. This was based on the most comprehensive database of more than 1,000 educational institutions. In forming a model of a successful school based on results in this region, four groups of schools were identified. The smallest group comprised statistical outliers (i.e. schools that did not fit into any of the other three statistical clusters). For the most part, every school in this group is a special case that should be examined separately. There is little point in looking at central trends for them, as the dispersion within the group is extremely high. Nonetheless, averages for this group are provided to present the full picture. Schools were separated into clusters based on the following concepts (groups of indicators):

- V. USE results;
- VI. results of administrative testing (AT);
- VII. student performance indicators;
- VIII. GPA breakdown.

The size of the clusters over three years is presented below in Table 1. It is important to note that the number of weak schools in the first two clusters increased sharply in 2010. In other words, despite the general trend of *improving USE results* (an increase in average score and decrease in the number of failing scores), the number of schools that demonstrated *below-average results increased*.

Table 1. Size of groups, 2008-2010.

Cluster	2008	2009	2010
Outliers	7%	3%	1%
Weak schools	29%	26%	36%
Problems with USE	25%	24%	30%
Strong schools	21%	18%	17%
No data	18%	29%	16%

Table 2 shows detailed characteristics of the clusters in 2010. Considering the profile of clusters in one year is sufficient to understand the differences between them. The average value in other years depends on general trends, and the differences between clusters remain the same.

Table 2. Cluster profiles, 2010.

Characteristic	Schools with performance problems	Schools with problems the USE	Schools with on Strong schools	Outliers
Average USE score in Russian	60	55	65	51

Average USE score in math
Share of unsatisfactory USE scores in Russian
Share of unsatisfactory USE scores in math
Difference between highest and lowest USE scores in Russian
Difference between highest and lowest USE scores in math
Share of students that scored 4 or 5 on administrative tests in Russian
Share of students that scored 2 on administrative tests in Russian
Share of students that scored 4 or 5 on administrative tests in math
Share of students that scored 2 on administrative tests in math
Share of students with 4 or 5 in primary school
Share of students with 4 or 5 in secondary school
Share of students with 4 or 5 in high school
Share of students that repeat grades in primary school
Share of students that repeat grades in secondary school
Share of secondary school graduates that receive diplomas without a single score of 3
Share of high school graduates that receive diplomas without a single score of 3

44	40	51	34
0.5%	1%	0.1%	14%
1%	2%	0.3%	23%
40	29	42	31
46	34	51	35
5%	6%	7%	10%
0.6%	0.2%	0.2%	1.3%
6%	7%	8%	9%
0.5%	0.2%	0.1%	1.0%
41%	43%	53%	36%
32%	33%	45%	30%
32%	32%	47%	32%
0.7%	0.3%	0.1%	3.5%
0.6%	0.2%	0.1%	2.7%
24%	28%	37%	25%
32%	33%	49%	27%

External variables

Type of school

Public high school
Public high school with in-depth study of a particular subject
Gymnasium
Lyceum
Share of schools with very few students

78%	89%	29%	93%
10%	6%	18%	0%
8%	2%	33%	7%
4%	3%	20%	0%
2%	7%	0%	43%

Type of locality

City
Village
Number of students

76%	50%	89%	21%
24%	50%	11%	79%
538	348	731	183

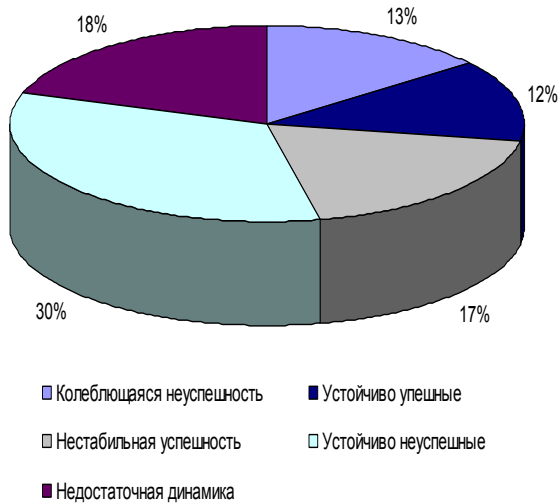
We named cluster 1 -“*Schools with performance problems*”. This has been the largest cluster for three consecutive years. Schools in this category demonstrate below-average results in all indicators except for the USE. Three quarters of these are urban schools, usually with a large number of students (538 on average), but there are a few very small schools (2%). Most are public schools, but there is a rather large share of gymnasiums and lyceums. There are fewer schools in the second cluster, “*Schools with problems on the USE*”. The schools are also smaller in size (348 students on average) and there are more very small schools (7%). Half of the schools in this group are located in rural settings, and 89% of schools in the cluster are public schools. The main difference between this cluster and the first is in *USE results*, which are much lower here than in the other two groups. The average USE score is 40 in math and 55 in Russian. Although the share of 2s is average here, low scores still dominate and there are almost no high scores and there is little variance in the scores. The low level of achievement is

confirmed by the low share of students that receive 4s and 5s in secondary and high school, and students without a single 3 in the GPA breakdown of their diploma.

The third cluster is “*Strong schools*”. These demonstrate above-average results across the board. They are the largest schools with an average number of students of 731. There are no very small schools in this cluster, and most are located in cities (89%). Public schools account for just 29% of this cluster, while 33% of schools are gymnasiums, 18% are schools with in-depth study of a particular subject, and 20% are lyceums.

The next stage of the analysis was to identify consistently strong and weak schools. For this, clustering was reproduced for 2008 and 2009, and clusters of schools were compared for the three consecutive years.

Chart 1. Breakdown of schools by dynamics of success



Fluctuating weak
Unstable strong
Not enough data
Consistently strong
No trend

Consistently weak schools (30%) in this case are those that encountered the same problems in various years (from year to year, they end up in the same cluster). In Chart 2, we see that this group has a similar number of schools with poor academic performance and problems on AT (52%) and schools with problems on the USE (48%). **Fluctuating weak** schools (13%) demonstrate different problems in different years. Nonetheless, some of the problems inherent in the weak cluster are present in these schools every year.

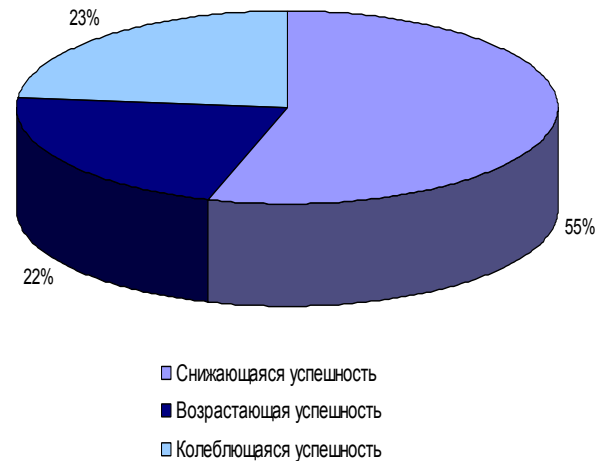
Consistently strong schools (12%) demonstrate unwaveringly good results in all variables. **Fluctuating strong** schools (17%) are those that had strong results in some year (or years), but had problems on some indicators. We identified several trends of strong schools (Graph 3): declining success, increasing success and fluctuating success. The largest share in this group is comprised of schools with declining success (55%), i.e. schools that demonstrated good results in one or two years, but that then declined to fall into one of the weak clusters. Schools with increasing success (22%) started out with below-average results, but then improved to be pushed into the group of strong schools. A **lack of trend** indicates that it was impossible to put the school into one of the clusters for two or even three years in a row due to a lack of data in the indicators being examined.

Graph 2. Breakdown of consistently weak schools



Poor performance
Problems with USE

Graph 3. Trends in the group of fluctuating strong schools



Declining success
Increasing success
Fluctuating success

The leading trend is declining success. Overall, the dynamics of academic success suggest that a sufficiently large proportion of schools are weak – either consistently or sporadically.

It is worth taking a separate look at the educational institutions that find themselves in the most precarious situations. In our statistical analysis, we identified schools that were responsible for more than 60% of unsatisfactory scores on the

USE in this region, and then defined the “most disadvantaged” (i.e. those at which students received unsatisfactory scores on the USE in Russian and math over three years). These schools account for 1% of all educational institutions in the region. Their indicators differ significantly from the average of the group of weak schools discussed above. The “most disadvantaged” combine problems on the USE with poor academic results: the number of students with 2s and the overall average score is lower than in the “schools with problems on the USE” group, and the proportion of students with grades of 4 and 5 is below the

average of the “schools with performance problems” group. In other words, the issue of poor academic results is systemic for these schools.

For comparison, we then looked at the most successful region among those we studied. A statistical analysis of 200 schools’ results on the USE in this region shows three distinct types of educational institutions: schools with high, average and low results.

Table 3. Size of groups, 2007-2010

Cluster	2007	2008	2009	2010
Average results	35%	30%	29%	39%
High results	36%	35%	36%	31%
Low results	12%	17%	14%	5%
No data	17%	19%	21%	25%

Only in 2010 did the number of weak schools decrease and the number of average schools increase. This improvement was due to positive trends in USE results, or, more precisely, a sharp drop in the number of unsatisfactory scores. It is safe to assume that more complete data on various academic indicators would paint a more ambiguous picture. Unfortunately, the quality of available data in this region made it impossible to consider a number of important indicators.

Table 4 shows a detailed breakdown of clusters of schools in the region in 2010. Considering the profiles of clusters in one year is sufficient to understand the differences between them. The average value in other years depends on general trends, and the differences between clusters remain the same.

Table 4. Cluster profiles, 2010

Characteristic	Low results	Average results	High results
Average USE score in Russian	52	58	65
Average USE score in math	33	41	51
Highest USE score in Russian	75	73	86
Highest USE score in math	56	61	74
Lowest USE score in Russian	36	44	49
Lowest USE score in math	11	25	28
Share of unsatisfactory USE scores in Russian	12%	0.1%	0%
Share of unsatisfactory USE scores in math	11%	0.2%	0%
Type of school			
<i>Public high school</i>	92%	99%	76%
<i>Public high school with in-depth study of a particular subject</i>	8%	0%	13%
<i>Gymnasiums</i>	0%	1%	6%
<i>Lyceums</i>	0%	0%	5%
Share of ungraded schools	9%	32%	4%
Type of locality			
<i>City</i>	58%	49%	78%
<i>Village</i>	42%	51%	23%
Number of students	234	292	563

Schools with low results had the lowest scores across all indicators included in the analysis. The *average scores on Russian and math* for these schools were 52 and 33, respectively.

The *highest score on Russian* (75) was better than at schools with average results, but well below that of the third group. The lowest score in both subjects was significantly below that in the

other two groups, the lowest score in math being less than half that for average schools. The *share of unsatisfactory scores* on the USE for both subjects was much higher at 12% for Russian and 11% for math.

This group includes the smallest schools with an average number of students of 234. But the percentage of very small schools is average (9%), though this number has increased in some years. The split between rural and urban schools again differs in each year, but the overall ratio between them for the cluster is more or less even. The vast majority of schools in the group are public secondary schools.

IV. CONTEXTUAL ANALYSIS

In the next stage of the study, we attempted to answer the question of what causes a steady decline in results for one school and the continued success of another. We examined the differences between groups of consistently weak and consistently strong schools. This involved a dispersion analysis of the social aspects of schools and various indicators of their operation. We started by looking at a school's staffing, analyzed based on data from over 1,000 schools in the first region.

In the group of **strong schools**, the share of *teachers with the highest qualifications* (55%) and the share of schools that have *special education teachers* (36%) are much higher than in the other two groups. At the same time, these schools have a lower share of teachers of the first (22%) and second (15%) level of qualification, and young teachers (3%). Overall, the staff in this class of schools can be considered to be of a higher quality.

The group of schools with problems on the USE differs from this position greatly. In these schools, the share of teachers with higher education (84%) and of the highest qualifications (34%) is much lower. Moreover, there are fewer educational psychologists (51%) and special education teachers (6%).

As expected, the most significant parameter on which schools differ from one another is characteristics of their **population**. We analyzed the impact of features of the student body on schools' academic results based on information in the social composition of educational institutions, collected in two of the three researched regions. Analyzing this data uncovered significant variation between clusters of schools. Schools with low results scored much higher on the indicators "*share of students for whom Russian is not their native language*" and "*share of families in which one (the only) or both parents are unemployed*", and much lower on the indicator "*relative number of families in which both parents have college degrees*". The cluster of strong schools scored much higher on the indicator "*relative number of families in which both parents have college degrees*", and lower on the indicators "*relative share of single-parent families*" and "*share of families in which one (the only) or both parents are unemployed*". The research found that students in the strongest schools are more likely than those at weak schools to live in well-furnished apartments (88% versus 45%) and are less likely to live in private sector accommodation (8% versus 38%).

In summary, that data analysis allowed us to reach the following conclusions:

- Schools with consistently high results have the most favorable social contexts.
- Schools with consistently low results have the highest percentage of non-native Russian speaking students.
- Schools with weak academic results have more students whose parents are out of work and do not have college degrees.

As far as staff and other school resources are concerned, the analysis showed that the schools that have a more challenging student population also have:

- Less qualified staff.
- Fewer Library resources.
- Less funds for equipment.
- Lower share of the budget spent on teacher salaries.

In the next stage of the study we focused on the conditions that contributed to high or low academic performance in all the schools we studied. The following is a summary of the main findings.

V. CONDITIONS THAT INFLUENCE SCHOOL PERFORMANCE

Our analysis showed a fall in enrollment in almost all low performing schools over the last three years. This is more likely to be a consequence of schools losing out to the competition, which is accompanied by negative selection – stronger students leave for better schools and weaker and problem students enter, which further weighs on the school's academic results. In this difficult situation, problems with staff inevitably arise. We found that in underperforming schools there was a lack of highly qualified teachers, most being pre-retirement age, and, in most cases, a lack of motivation among teachers to improve outcomes.

The schools we studied (excluding the largest ones) did not have the necessary specialists to support the needs of the student body. In certain cases only had the budget to pay one or a part-time special education teacher, but this money was often split between regular teachers. In isolated rural schools, there is a significantly limited choice of specialists and they are hard to replace if they leave. Moreover, these schools' negative reputations make it hard for them to attract qualified specialists.

The analysis showed that the parents of this student population, as a rule, do not allow the schools to use their resources to help deal with operational and developmental issues (in particular, we saw no examples of parents playing an active role in school boards or even parent committees). There were very few cases of teachers being asked to work as tutors. Schools are generally operating under conditions in which there is no general interest in education from the side of parents. Most are not involved in the educational process and while there is a minority that has the resources they often "vote with their feet".

Our analysis led us to conclude that the organization of the educational process in the underperforming schools and the lack of resources were two important reasons for their failure. For the vast majority of students in all the educational institutions we studied, school is the only place of education therefore it is critically important that their time at school is optimized. But additional educational experiences that these schools offer

students after regular classroom hours are over are often limited to sports and art classes (no more than two or three, usually). This is true for all the underperforming schools we studied. In addition, there were no regular classes for the most interested students or elective subjects, nor was there permanent extra-curricular study or tutoring for weaker students. By teaching students from disadvantaged families, the school often takes on the function of family care and nurturing of students thus playing the role of guardian and mentor. Very frequently, this fact alone restricts a school's ability to give students a chance to succeed and compete, as they are concentrating on nurturing rather than learning.

To summarize, it is important to underline that the main cause of underperformance is the fact that the schools are located in challenging social contexts and as a result they encounter more

problem students, do not have the necessary resources to deal with the range of problems they face. However we encountered schools that are under the same challenging conditions as others and working with just as complicated a student population but that demonstrate much better results and successfully compete with schools that operate in more advantageous environments. So why are these schools successful?

VI. EFFECTIVE SCHOOLS IN CHALLENGING CONTEXTS

The table below shows data on the characteristics of the student population and staff of three schools that we studied in three different regions.

Table 5. Contextual characteristics of schools with strong results

Educational institution	Number of students	% Single-parent families	% Parents with college degrees	% Families with many children	% Working-class families	% Poor and socially unprotected families	% Families from the risk group	% Teachers with the highest qualifications
School #1	235	26	14	9	58	30	4.5	16
School #2	134	27.5	12.5	6	51	50.5	4.4	38.8
School #3	289	40	8	6	60	23	1.6	21

These schools have successfully coped with the difficulties of educating the most challenging students from disadvantaged, poorly educated families even though they have a low number of teachers with the highest qualifications. These schools all hold high positions in the rankings based on the USE

results, have fared well in academic competitions, including high-level ones, and are actively involved in project activities. The table below shows USE results from these schools.

Table 6. USE results of schools in the study

School	Average score in Russian		Average score in math	
	2009	2010	2009	2010
School #1	65	67.5	44	53
Average score in the region	58	60	44	43
School #2	64	68	50	55
Average score in the region	58.6	60	41.6	44
School #3	68.8	58.5	54.5	40.7
Average score in the region	59.4	59.3	44	41.5

The results, with just one exception (School #3, 2010 USE) are significantly higher than the average for the region in which the school is located. As our field research shows that a "chance at success in life" is the result of a goal-oriented and consistent educational strategy that determines and directs all aspects of

school life and the actions of each teacher. We suggest that there are three basic elements of this strategy.

The first is the absolute **priority of high educational achievement and high expectations of teachers** for all their students. Understanding that students are often not well prepared

for school, have problems studying and do not receive support at home, teachers in these schools make every effort to develop their academic motivation, put them on the path to reach their academic potential, and support their interests and activity in education. To facilitate this, schools are actively involved in projects and academic research, starting with first grade and related to themes that are accessible to students: the history of their families, the school's neighboring environment, territorial issues. In a number of schools, these research projects are conducted at a very high level, students participating in regional and national competitions and conferences, schools building partnerships with universities and research institutes in the capital of their region and nearby cities (schools in Karelia, for example, work with institutes in St. Petersburg). We again highlight that this kind of work is becoming a necessary element of the school improvement, regardless of the region, whether the school is located in a city or village, or even the number of students.

Along with such projects, schools are **carefully building lines of support for their students** who need help. Students are given the chance after school to prepare for the USE (which is especially important, as parents cannot always provide this help) and they get additional assistance from teachers on subjects that are particularly difficult for them. The most interested and able children take additional classes to do more difficult work and to prepare them for academic competitions. These classes, as well as art and sports, are available to students of all levels and grades. Schools often do not have the own materials and staff for these services so they work in partnership with local art centers and libraries, and nearby sport and music schools. Close cooperation and collaboration with parents, as well as openness to other educational institutions is another major reason for their success. Teachers willingly hold open classes, workshops and seminars for students from other educational institutions, participate in regional and federal teacher competitions, and take students to inter-scholastic events. To put it another way, they have an open-door policy, which gives them impetus to develop.

These effective schools in challenging circumstances stand out due to their **positive culture**, based on cooperation, collective responsibility, professional collaboration, shared decision-making and the common goal shared by everyone in the school community that every child can succeed. New teachers that come to the school receive help from the administration and their colleagues, and get a personal mentor that supports them throughout their first year at the school. All forms of meaningful collaboration between students and teachers are encouraged including inter-grad and inter-subject group projects, interdisciplinary lessons, integrated classes that unite children studying in general education and special education programs.

Essentially, the schools that succeed against the odds in very difficult circumstances reflect the model of effective schools that is widely known internationally³³. This school effectiveness model has been used to develop and implement the most successful programs of school improvement that we analyzed to

inform our research³⁴. These programmes include the High Improving the Quality for All and High Reliability Schools programs in the UK³⁵, projects initiated in the state of Georgia³⁶, and those developed by a consortium of schools in Chicago³⁷. An analysis of the relative effectiveness of such programmes and their relative impact also informed the research³⁸.

VII. CONCLUSIONS

The findings from our study have allowed us to reach the following conclusions:

- Schools with strong results tend to operate in an advantageous social context and have adequate staff and financial resources. These are most frequently urban schools, a large share of them being gymnasiums and lyceums.
- Schools operating under less favorable social conditions and with minimal staff and material resources have a much lower chance of being successful. Some of the schools that can be considered the most disadvantaged consistently demonstrate poor academic results.
- There are regional features that determine the share of weak schools but in all regions, the number of consistently weak schools includes urban and rural educational institutions, the vast majority of which are public schools.
- The most common characteristic of schools with consistently poor academic results is a challenging student population (children whose parents are out of work and uneducated, who display deviant behavior, and who are non-native Russian speakers) and limited resources (staff and funding).
- Schools operating in difficult social contexts however can provide their students with a high level of education so that their academic achievements are in line with the more advantageously situated educational institutions, as long as they employ consistent and systematic educational strategies that ensure effective operation.
- Becoming a more effective school requires extraordinary effort from school staff and should be

33 Robert J. Marzano What Works in Schools: Translating Research into Action, 2003, Mortimore Peter. The road to improvement. Reflections on school effectiveness. – Swets&Zeitliner Publishers, 1998.

34 C.Corallo, D.McDonald Wat Works with Low-performing Schools, 2001 de AEL.

35 www.highreliability.co.uk

36 School Improvement Fieldbook A Guide for Advancing Student Achievement in Georgia Schools Georgia Department of Education K. Cox, State Superintendent of Schools Revised December 19, 2008

37 Anthony S. Bryk [Organizing Schools for Improvement: Lessons From Chicago](#), 2009

38 Alma Harris Equity and diversity: building community Improving schools in challenging circumstances Institute of Education • University of London, 2008.

accompanied by appropriate support at the municipal and regional level.

Most importantly, the main conclusion is that when evaluating the quality of a school's performance, the context in which it functions must be taken into account. To do this effectively, one possible option is to group schools into clusters based on several contextual characteristics (primarily socio-economic features, the student population, available resources, geographical aspects) and to define measures of effectiveness schools within a given cluster. A potential next step could then be to develop contextual specific programmes of school improvement that support schools where students at most at risk of underperforming i.e. those operating in the most difficult social contexts. This support would need to be regular and accompanied by additional resources to compensate the schools for operating in high degrees of challenge. In addition, in the most urgent cases, when schools start to see deteriorating academic results, it would be advisable to ensure that programs are put in place to help them switch to an effective mode of operation (i.e. school improvement programs) that are comprehensive, intensive and quick to implement.

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Impact of Service Quality on Customers' Satisfaction: A Study from Service Sector especially Private Colleges of Faisalabad, Punjab, Pakistan

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Abstract- This paper is concentrated on quality of services offered by colleges so that those colleges can compete their rivals and seek satisfaction from students. In whole of the world especially Pakistan's focus is concentrated on spreading education. For education enhancement, role of Private Colleges is extremely admissible. Competition of Colleges is also crucial point for each of college in term of number of students. It is accepted that colleges who are providing quality of services, their students are satisfied and in this way commitment with colleges is increased which results in reputation of college. Dimensions of quality of service include tangible, empathy, reliability, responsiveness and assurance. Youngsters were randomly selected for the purpose of studies that are from Inter level to Master level of education. Results of study show that service quality is found to be very important factor for satisfaction of customers. All of perspectives of service quality are found to be positively correlated while one of those factors that are empathy shows negative relationship with service quality and with satisfaction of customers and it is advice for future researcher not to research on this variable. Main participation of this research in whole of the world is that it identifies the main factors of service quality which ultimately affect the satisfaction of customers. This paper will help top management of organizations and institutes to make strategies better for enhancing quality of service rendered to customers so that satisfaction customers' level can be increased. It is also observed if management of organization is conscious about quality of service then the customers' satisfaction can be increased which leads to customers' loyalty and at the end customers will be committed with those organizations.

Index Terms- Service Quality, Customers' satisfaction, Private Colleges

I. INTRODUCTION

Every organization wants to strive for excellence. Many factors contribute for excellence of any organization. In current era, organization's ultimate goal is to generate profit. Colleges are also included in organizations. Students are the main factor for success of any college. When students' satisfaction is more they obliged more and as a result of it students of that college will be increased. Now students and their parents are very wise for selecting college so that students learn more for facing all of world troubles come in their life and lead a life like ruler of the world. Because through education we learn how to tackle the problems in our life. Colleges which are providing more quality of services their students are increased and also fame of college will be increased which results not in only repute but their profit margins are raising rapidly. For attracting new students are become crucial point for colleges. Quality is main factor for attracting new customers for manufacturing as well as service sector. This research is only for service sector peculiarly education especially colleges so variables which are proved as perspectives of SERVQUAL are taken. Five perspectives of SERVQUAL are identified by (Parasuraman et al.1988) which are tangible, empathy, assurance, responsiveness and reliability. Colleges which are agreed to increase students should have to focus on quality of services offered. In the words of Sattari et al, organizations which pay more attention to customers as offering service quality survive as a center of excellence. Many studies were conducted on satisfaction of customers but up till now no study is conducted in education especially colleges. So this study elaborates satisfaction of students with colleges in Faisalabad, Punjab, Pakistan. There is more competition among colleges and these couldn't cooperate on one component which represent merit component among different colleges. This study is used to check the relationship between components of quality of services and satisfaction of customer.

II. LITERATURE REVIEW

2.1 Service quality

In service sector especially colleges thinking about service quality has considered as a premeditated problem. Service quality defined as "it is a form of behavior that relates to satisfaction but not equivalent to it which results as a balance of prospect with performance" (Bolton and Drew, 1991; Cronin Jr. and Taylor, 1992; Parasuraman, Zeithaml and Berry, 1988; Shepherd, 1999). Precisely,

SERVQUAL can be described as “thinking-minus-hopes” through depth support of service quality (Parasuraman, Zeithaml and Berry, 1991). Other researchers defined quality as “it is a degree to which any service fulfills customer’s requirements or hopes (Dotchin & Oakland, 1994; Lewis & Mitchell, 1990). It is also thought as “it is the thinking of customer about inadequacy or supremacy of services (Zeithaml, Berry, & Parasuraman, 1990). From customers’ point of view, five factors of SERVQUAL are found by Sureshchandar, Rajendran, and Anantharaman (2003). Those are:

- a) Foundation service
- b) Service delivery as a Human element
- c) Non-human element
- d) Service Tangibles
- e) Societal dependability

In the early hours, researchers has been elaborated SERVQUAL as “ It is an outline of manner which comes due to the difference between customers’ hopes about any service received and thinking about service being received (Parasuraman, Zeithaml, & Berry, 1988). As a view of Grönroos (1983), SERVQUAL consists of two elements – practical quality (“what” is proceed) and efficient quality (“how” is proceed). As a conventional approach, consumers’ expected service quality is difference between actual performances and hopes (Grönroos, 1984; Parasuraman et al., 1988). Commonly measures used for dealing this factor are SERVPERF and SERVQUAL (Zeithmal et al., 1993; Cronin and Taylor, 1992), both are used to identify different perspectives in most analysis of banking sector (Oppewal and Vriens, 2000; Bahía and its aptitude for organize purpose to expand them (Subramaniam and Youndt, 2005; Santos-Rodrigues et al., 2010). So, intangibles can differentiate those values which are offered to different customers. Rational capital form can be taken into consideration for thinking about factors determining quality, satisfaction and image. Definition of rational capital is as “it is the series of subtle resources which directly shows in financial statement of any firm, creation of exact value or can be do in upcoming (Ding and Li, 2010). As a result of concept studied in detail by Alama et al. (2006), rational capital is the combination of four elements: human, relational, organizational and technological capital. These factors are explained by Bueno et al. (2008) as follows:

Human capital: It is a capital of human characteristic and accepts both contemporary abilities (awareness, skills and behavior) and the capabilities of teams and individuals for learning and conception.

Technological capital: It is hi-tech intangibles which are indulged in doing the functions and tricks for production processes or rendering of services for any firm. It also consists of endeavors for examine, improvement and modernism, industrial personal qualities of technological, logical and business possessions (Bueno et al, 2008).

Organizational capital: A series of casual and official intangibles which makes process of any organization. Elements of organizational capital are activities, traditions and compositions.

Relational capital: It is the link build by any firm with agents within its environment. Environment includes customers, suppliers, associate members, competitors, the general public, institutions etc. All of elements of rational capital are explained in these elusive factors.

1. Attention to customers: It is the part of human capital. It includes effectiveness and efficiency of college employees when serving to the present students. It also includes convenience, liability and proficiency.

2. Organizational efficiency: It is the part of capital of any firm. It is related to efficiency in procedure of college e.g. simple and takes less time for permission about services demanded by customers, take care of customers within appropriate time.

3. Web efficiency: It is the division of technological capital. It is related to efficiency of web podium, online service and steadiness of availability of web pages of college. The degree of easy to use and security of web page is also include in it.

4. Personalization: It is the part of relational capital of a firm. It consists of choice of services of college for fulfilling customer’s needs by providing some special payback to current students. It also includes promotional paybacks any college offers as alliances with other college e.g. better points or any other service provide as to interest of customers. Personalization can also be defined as “any service adapted to fulfill demands of individual customer” (Ball et al., 2006; Vesanen, 2007). Form also consists of these factors:

Physical equipment: It refers to material transportation and equipment which make it possible to provide appropriate concentration to students at college.

SERVQUAL is affected by four factors of which three are intangible including attention to customer, organizational efficiency and web efficiency but one is physical equipment that’s called tangible. All these factors have affected the picture identified by customers which has indirect effect on satisfaction and direct effect on loyalty. As a concept of intangible elements of human capital and from banking experts on service quality attention of customers have image which urge confidence. Bitner and Hubert (1994) think about service quality as “a customer thinking about superiority of the performance of services.”

2.2 Service Quality Perspectives

Five perspectives of service quality have been identified by Parasuraman et al. (1988). These are empathy, reliability, responsiveness, assurance and tangibles which connect particular service character with hopes of customers.

- (a) **Tangibles** – corporal impression of human resources, conveniences and equipments
- (b) **Empathy** – more attention towards things individually and concern about them
- (c) **Assurance** - employee’s awareness and politeness and their potential to deliver faith and self-belief
- (d) **Reliability** – potential of institute, organization and employees to carry out service in promised and correct way

(e) **Responsiveness** – willingness of employees to help customers when they needed and deliver quick service to them. Asubonteng, McClery and Swan (1996) discussed in their research that service quality scope is changed from one industry to another industry. As an example, Kettinger and Lee (1994) found four perspectives in their study about quality of information system that have not material perspective. Cronin and Taylor (1992) identified one-factor depth as a combination of five factor s' measure introduced by Parasurama et al., (1988). After inspection of all of evidence it can be concluded that definition of SERVQUAL provided by Sureshchandar et al. (2003) is as which is provided by Parasuraman et al., (1988). For this research, I have used five perspectives of SERVQUAL provided by Parasuarman et al., (1988).

2.3 Customers' Satisfaction

Customers' satisfaction is defined through different perspectives (Egert and Ulaga, 2002; Srijumpa et al., 2007). It is considered as "the feeling of welfare resulted from experience of use" (Lévy and Varela, 2006). At another phase, customer satisfaction is the response of completion of consumers' needs. It is considered as a service characteristics or service itself which gives a happy fulfillment of consumption-related factors (Zeithaml and Bitner, 2000). As discussed by ACSI (American Customer Satisfaction Index) form in Fornell et al's (1996) that "customer satisfaction is greater quality-pull than price-pull and value-pull." From the translation of many researchers it was observed that satisfaction is a sense of feeling which comes from a procedure of interpreting and judging what is received as a result of expectation as an inclusion of wishes and requirements coupled with the purchase and purchase choice (Armstrong & Kotler, 1996). From point of view of Wang, Lo and Yang (2004) cumulative satisfaction is used more as compared to definite satisfaction for evaluation of performance of any firm and attitude of customer. Focus of this paper is on cumulative satisfaction because on customers' satisfaction most of studies have done.

It is stated by Bitner and Zeithaml (2003) that "satisfaction is estimation of customers of a service or product either those fulfill their hopes and requirements. As defined by Boselie, Hesselink and Wiele (2002) satisfaction is an affective and positive form which comes as a result from the appreciation of all of aspects of working of party in relation with another. Two aspects of satisfaction of customers have been inspected by previous researchers: definite transaction satisfaction and cumulative satisfaction (Andreassen, 2000).

It is discussed by Giese and Cote (2000) as an evaluative concept that satisfaction is the analysis by consumer effectively. As a definition of (Oliver, 1993) it is the thinking of customer accomplishment of demands, objectives and requirements. In different areas, satisfaction of customer is mostly known and conventional concept. Different areas include economics, consumer research, marketing, economic psychology and welfare-economics. Literature of service management persuade that satisfaction of customer is conclusion of a thinking of customer about the value received in any links or transaction about SERVQUAL where service quality in terms of acquisition, cost of customer and price (Blanchard and Galloway, 1994; Heskett et al., 1990). It relates to hope value from links or transactions with combination of competing suppliers (Zeithaml et al., 1990).

Literature of service management argues that customers' satisfaction affects loyalty of customers which automatically influences profitability. Researcher for this theory include (Rust, et al. (1995); Schneider and Bowen (1995); Anderson and Fornell (1994); Heskett et al. (1994); Storbacka et al. (1994); Gummesson (1993); and Zeithaml et al. (1990) Reicheld and Sasser (1990); Heskett et al. (1990). Above mentioned researchers explain the relationship between profitability, satisfaction and loyalty. Examination of link as a result of calculating statistically by Nelson et al. (1992) who explain link between satisfaction and retention of customers in banking especially in retail banking Rust and Zahorik (1993).

2.4 Service quality and customers' satisfaction

Link between satisfactions of customers is provided by theoretical basic knowledge of SERVQUAL. SERVQUAL is now discussed as difference between thinking and hopes of service of customer. Literatures presented in past years criticized on model of service quality (Brown, Churchill Jr. and Peter, 1993; Buttle, 1996).

Firstly, proof about service quality disconfirmation prototype was little which evaluate service quality of customers (e.g. contrast between actual performance of service and hopes of service).

Secondly, SERVQUAL based on hopes-disconfirmation form which is improper as compared to behavioral for SERVQUAL. It is explained by Cronin Jr. and Taylor as "It is a hurdle to call service quality as a behavior."

Thirdly, SERVQUAL didn't attract the movements of changing hopes (Buttle, 1996). In measuring of SERVQUAL as an improper base was considered as "Hopes-minus-performance" (Cronin Jr. and Taylor, 1994). As a thinking of Teas (1993) that idea of hope of service quality should have to distinguish valued shortcoming (e.g. hopes as expected to measure service quality were not as much) thinking minus hopes measurement outline of SERVQUAL was deluded point of thinking about customers of service quality. So, he intimated that measure of eliminating the hopes could advance in value form of the SERVQUAL which is basically trust on the component of thinking. However, by arguments of Cronin for the betterment rely on only performance and measure of service quality when comparison is made to the "thinking minus hopes" measures (Cronin Jr. and Taylor, 1994).

III. CONCEPTUAL FRAMEWORK

3.1 Hypothesis for the research

H1: There is a positive and significant relationship between SERVQUAL and customers' satisfaction

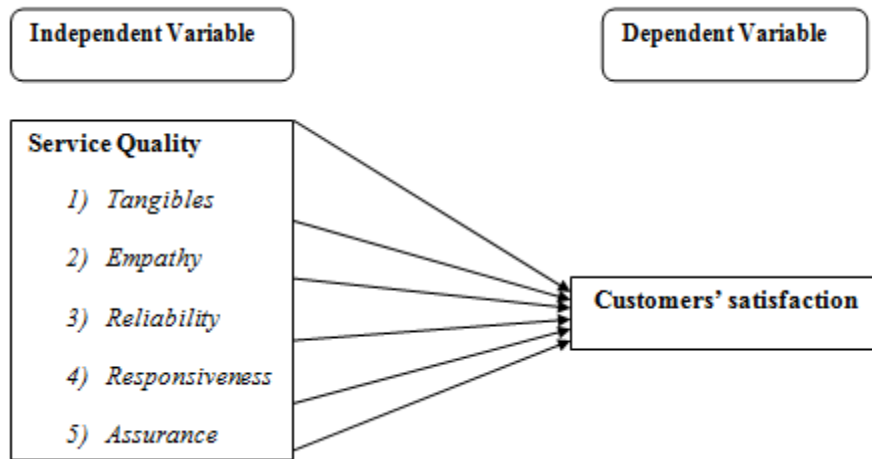
H2: There is a positive relationship between tangibles and customers' satisfaction

H3: Empathy is positively correlated with customers' satisfaction

H4: There is a positive relationship between assurance and customers' satisfaction

H5: Responsiveness is positively related with satisfaction of customers

H6: There is a positive and significant relationship between reliability and customers' satisfaction



IV. RESEARCH METHODOLOGY

4.1 Sample

Most of population of Pakistan is comprised of youth. In colleges all are youth students are admitted. This research is based on data taken from students of colleges. The reason for choosing students of colleges is that they are all wise and respond correctly as compared to others respondents. After taking results of this research colleges will be in position for adapting strategies suggested by researcher. All of youth students give more emphasis on quality provided by college. 185 youngsters were chosen from different colleges and questionnaires were administered personally. 150 questionnaires were return back with 81.08% response rate.

4.2 Instrument and measurement

For measuring dimensions of SERVQUAL, instrument was taken from research of Tung Lai (2004). Service quality includes tangibles, assurance, empathy, responsiveness and reliability. Instrument used for customers' satisfaction is taken from research work of (Yu et al. 2005) and (Syed Saad Andaleeb and Carolyn Conway, 2010). Questionnaire consists of 26 Question excluding demographic variables of respondents e.g. Gender, age, experience and qualification etc. Variable excluding demographic were measured on 5 point Likert scale.

4.3 Data Analysis

The survey research was started to check satisfaction of students with colleges of Faisalabad, Punjab, Pakistan. Primary data was gathered from students of different colleges. The data was entered in Microsoft Excel 2007 and analysis is done through using of SPSS Version 19.0.

V. RESULTS

Table 1 shows Mean and Standard Deviation for satisfaction, service quality and dimensions of service quality. 5 point Likert scale instrument was used which ranging from strongly agree to strongly disagree. Average score of SERVQUAL dimensions depicts that respondents are less satisfied with dimension empathy whereas with tangibles, assurance, responsiveness and reliability are more satisfied. The Mean Score of satisfaction shows that up to some extent people are satisfied with colleges' service quality.

For testing Correlation, Pearson's Co-efficient of Correlation is used. Table 2 shows relationship between satisfaction, Service quality and service quality dimensions. The results shows that SERVQUAL has positive and significant relationship with satisfaction ($r=0.570$, $p<0.01$). This peculiar judgment confirms Hypothesis H1 that SERVQUAL is positively correlated with customers' satisfaction. The dimension Tangible has a significant relationship with satisfaction of customer ($r=0.446$, $p<0.01$). This specific discovery confirms Hypothesis H2 which shows there is a positive relationship between satisfaction and tangibles. The dimension Empathy of SERVQUAL depicts a negative link with the customers' satisfaction ($r=-0.328$, $p<0.01$). This peculiar judgment not confirms Hypothesis H3 that Empathy is positively correlated with customers' satisfaction. Assurance, the dimension of service quality represent a significant and positive relationship with customers' satisfaction ($r=0.599$, $p<0.01$). This peculiar result confirms the H4 that assurance has significant and positive relation with satisfaction of customers. The dimension of SERVQUAL is also

responsiveness which represents a significant and positive relationship with satisfaction of customer ($r=0.431, p<0.01$). This specific kind of finding confirms the Hypothesis H5 that responsiveness, a dimension of SERVQUAL also has a significant and positive relationship with satisfaction of customers. There is a positive and significant relationship between reliability and customers' satisfaction ($r=0.570, p<0.01$). It has confirmed H6 that reliability has a positive and significant relationship with customers' satisfaction.

Regression analysis is also calculated to check whether SERVQUAL is an interpreter of satisfaction of customers or not. Results of regression are shown in Table 3.

Table 3 represent that there is a low percentage of variation due to variables studied for satisfaction. Satisfaction is elaborated by variable entered in equation ($R\text{-Squared} = 32.4\%$, $\text{Adjusted Rate Squared} = 32\%$). So, 32% variation is explained by SERVQUAL which is measured by 5 dimensions in satisfaction. Other score for it is given in Table 4.

VI. DISCUSSIONS

The given score depicts that students are up to some extent satisfied with quality of service provided by colleges. Assurance and tangible have greater score than other perspectives of SERVQUAL while empathy has lowest score. On the other hand, Correlation represent that four perspectives of SERVQUAL including tangibles, responsiveness, assurance and reliability are positively associated with satisfaction and one perspective which is empathy negatively linked with satisfaction. So in future there is no need to conduct research on variable Empathy. All of perspectives of SERVQUAL have a significant relationship with customers' satisfaction. The regression analysis shows that in satisfaction of customer 28% change comes due to service quality and its perspectives and other changes comes due to some other variables.

VII. FUTURE IMPLEMENTATION OF THE STUDY

This study is conducted only on service sector particularly education especially colleges. By broadening its scope other services must be included in this study. This study will provide commands to upper level management of colleges that they must follow and enhance quality of service by paying attention towards such kind of things. They have focused on all of perspectives of service quality i.e. Tangibles, responsiveness, reliability and assurance. If colleges want to improve then they have to make strategies keeping in mind the perspectives of quality of service so that receive productive results of the strategies. In this way, colleges compete others even become successor by focusing on perspectives of quality of service and such like factors.

VIII. LIMITATIONS OF THE STUDY

This research is limited up to only service sector especially colleges. Other service sector can also show different results.

APPENDIX

Descriptive Statistics

Table 1: Average Mean and S.D. for Service quality, its perspectives and Customer satisfaction

	Mean	Standard Deviation
SERVQUAL	2.3958	.32925
Tangibles	2.0350	.47153
Empathy	3.6173	.70012
Assurance	2.0805	.64086
Responsiveness	2.0683	.56006
Reliability	2.1787	.57889
Satisfaction	1.3200	.42851

Table 2: Relation among SERVQUAL, its perspectives and customer satisfaction

		SERVQUAL	Tangibles	Empathy	Assurance	Responsiveness	Reliability
Tangibles	Pearson Correlation	.683**					
	Sig. (2-tailed)	.000					
Empathy	Pearson Correlation	-.064**	-.313**				
	Sig. (2-tailed)	.436	.000				
Assurance	Pearson Correlation	.802**	.587**	-.379**			
	Sig. (2-tailed)	.000	.000	.000			
Responsiveness	Pearson Correlation	.776**	.455**	-.315**	.589**		
	Sig. (2-tailed)	.000	.000	.000	.000		

Reliability	Pearson Correlation	.722**	.411**	-.415**	.581**	.591**	
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
Satisfaction	Pearson Correlation	.570**	.446**	-.328**	.599**	.431**	.570**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table 3: Regression study (Satisfaction as dependent variable)

Regression	R Square	Adjusted R Square	Standard Error of the Estimate
.570	.324	.320	.35407

Table 4: Regression Analysis

Beta	Standard Error for Beta	T	Sig.
.743	.088	.570	.000

Dependent Variable (Satisfaction)

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A Survey of Architecture and Node deployment in Wireless Multimedia Sensor Network

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Abstract- Wireless Multimedia Sensor Networks (WMSNs) is networks of wirelessly interconnected devices comprising multimedia sensor nodes that are able to process real time multimedia content such as video and audio streams, still images, and scalar sensor data from the environment. We present the features of the environment in which the sensor networks may deploy. Node deployment in wireless multimedia sensor network is application dependent. It can be in deterministic or random fashion. In both the condition coverage of interested area is concerned.

Index Terms- Architecture, Coverage, Deployment, Wireless Multimedia Sensor Network

I. INTRODUCTION

Due to various challenging aspects of Wireless Multimedia Sensor Network ,it has drawn attention of research community in past few year. Further in due course various new application developed over large scale networks by small devices to gather and mine data after that transmit it to remote locations .These important outcomes in this field helped in various military and civil applications. Mostly deployed wireless sensor networks harvests information regarding scalar physical quantity like temperature, pressure, humidity, or location of objects. These applications has few limitations like delay, low bandwidth demands, expenses, network lifetime portability. So with enhanced interest Wireless Multimedia sensor network has been developed, comprising availability of inexpensive hardware such as CMOS cameras and microphones easily captures multimedia content from environment i.e., networks of wirelessly interconnected devices that allow retrieving video and audio streams, still images, and scalar sensor data. With rapid improvements and miniaturization in hardware, a single sensor device can be equipped with audio and visual information collection modules.

Wireless multimedia sensor networks improves existing sensor network applications with several new applications such as: Multimedia surveillance sensor networks, storage of potentially relevant activities, traffic avoidance, enforcement and control systems, advanced health care delivery, automated assistance for the elderly and family monitors, environmental monitoring, person locator services, industrial process control.

II. CHARACTERISTICS OF ENVIRONMENT

Dynamic environment where there maybe various types of sensor nodes in a single sensor network i.e. this type of environment is called heterogeneous environment in regard of software and

hardware features of sensor nodes. Miscellany comprises of sensing various parameters and then comparative study by combining those parameters gives results i.e processing real time multimedia content such as video and audio streams. Multimedia sensor nodes may be deployed in tough environment (in real world) which is dynamic and based over certain algorithm for multimedia sensor nodes execution. In network environment there is certain probability of failure at random times which causes to change network topology as well as range for transmission, reception, computation .So in due course continuous change in network topology causes computation and prediction complexity.

III. MULTIMEDIA SENSOR NETWORK ARCHITECTURES

In [5], the authors describes the biologically –inspired mechanism for sensor network architecture i.e. BiSNET which is based on the concept that bees act independently, influenced by local conditions and local interactions with other bees. A bee colony adapts to dynamic environmental conditions. The BiSNET run time operates a top of Tiny OS in each sensor node. It consists of a middleware platform and one or more agents. BiSNET models a platform as a hive and agents as bees.

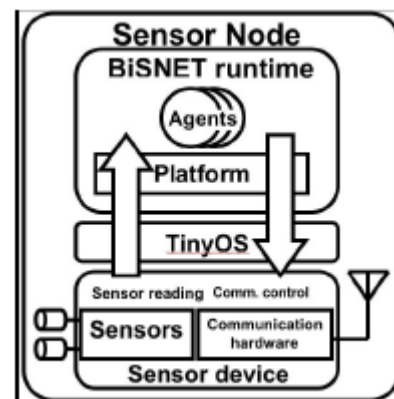


Fig. 1: BiSNET Architecture

Several biological principles named decentralization, autonomy, food gathering/storage and natural selection are used to design agents. Each agent reads sensor data, and discards or reports it to a base station. A platform runs on Tiny OS and hosts agents. Each platform manages the state of multimedia sensor node i.e. sleep, listen and broadcast and provides a set of runtime services that agents use to read sensor data and perform

behaviors. The authors of [19] propose an architecture based on the five OSI layers together with three management planes that go throughout the whole protocol stack (see Figure 2).

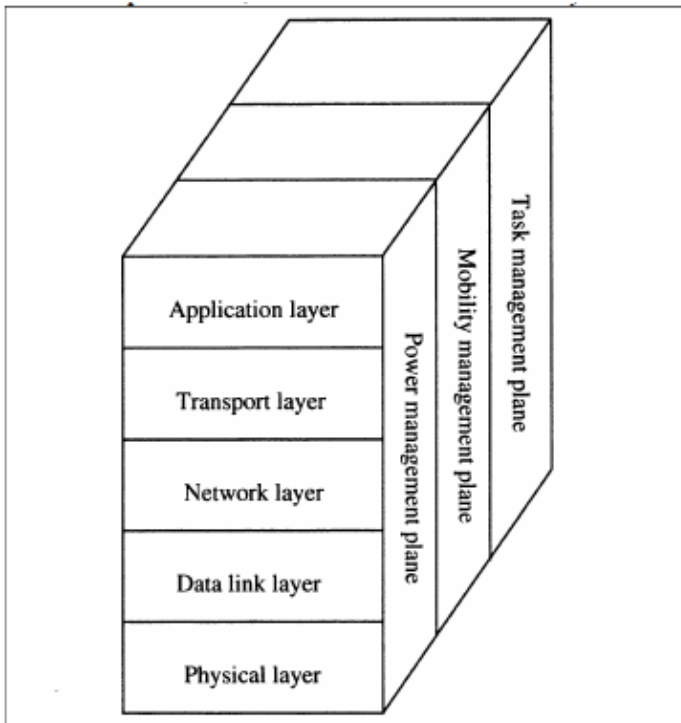


Fig.2: Protocol stack representation of the Architecture

IV. MULTIMEDIA SENSOR NODE DEPLOYMENT STRATEGIES

In a heterogeneous wireless multimedia sensor network, relay nodes (RN) are adopted to relay data packets from sensor nodes to the base station (BS). The deployment of the RNs can have a significant impact on connectivity and lifetime of a WMSN system. One strategy of uniform random deployment leads to the biased energy consumption rate problem. This problem leads to insufficient energy utilization and shortened network lifetime. To overcome this problem, two random deployment strategies have been studied, such as, the lifetime-oriented deployment and hybrid deployment. Potential-field-based approach for node deployment is deeply discussed in [11], in which nodes are treated as virtual particles, subject to virtual forces. These forces repel the nodes from each other and from obstacles, and ensure that an initial, compact configuration of nodes will quickly spread out to maximize the coverage area of the network. In addition to these repulsive forces, nodes are also subject to a viscous friction force. This force is used to ensure that the network will eventually reach the state of static equilibrium, i.e. all nodes will ultimately come to a complete stop. The viscous force does not, however, prevent the network from reacting to changes in the environment; if something is changed, the network will automatically reconfigure itself for the modified environment before returning once again to a static equilibrium. Thus, nodes move only when it is necessary to do so, saving a great deal of energy. A hybrid approach based on clustering in [13] is used for load balancing, where the 2-D mesh is partitioned into 1-D arrays

by row and by column. Two scans are used in sequence: one for all rows, followed by the other for all columns. Within each row and column, the scan operation is used to calculate the average load and then to determine the amount of overload and underload in clusters. Load is shifted from overloaded clusters to underload clusters in an optimal way to achieve a balanced state. Each cluster covers a small square area and is controlled by a clusterhead, which knows the information about the cluster's position in the 2-D mesh and the number of sensors in the cluster. Limited mobility-based approach is discussed in [14], where a sensor can flip (or hop) only once to a new location and the flip distance is bounded. In this framework, the problem is to determine the optimal way for flip-based sensors to maximize the coverage in the network. After detecting the coverage holes, the sensors move to new positions to prevent coverage holes. Such movement can be realized in practice by propellers that are powered by fuel, coiled springs that unwind for flipping. In this model, sensors can flip only once to a new location. Sensor node deployment method based on a centralized virtual force [15], which combines the idea of potential field and disk packing. Clusterhead communicates with all the other sensors, collects sensor information regarding position, calculates forces. The distance between two neighboring nodes when all nodes are uniformly distributed is defined as a threshold to discriminate attractive or repulsive force between two nodes. The force between two nodes is zero if their distance is equal to the threshold, attractive if less than and repulsive if greater than. The total force on a node is the sum of all the forces given by other sensors together with obstacles and preferential coverage in the area. In [16], three protocols are evaluated for sensor network to maximize the sensor coverage with less time, movement distance and message complexity. These protocols first discover the existence of coverage holes in the target area based on the sensing service required by the application. After discovering a coverage hole, the protocols calculate the target positions of these sensors, where they should move. Few protocols are based on the standard of moving sensors from densely deployed areas to sparsely deployed areas. In deterministic deployment, the location of each sensor is determined properly, which is used in a static environment. The stochastic deployment sensors are deployed in such a condition when information regarding the sensing area is not known in advance or it changes with time, so its deployment positions cannot be determined. In [18], a centralized deterministic sensor deployment method, DT-score is the basis. Given a fixed number of deployable sensors, DT-score aims to maximize the area coverage of sensing area with obstacles. In the first phase of DT-score, a contour-based deployment is used to eliminate the coverage holes near the boundary of sensing area and obstacles. In the second phase, a deployment method based on the Delaunay Triangulation is applied for uncovered regions. Before deploying a sensor, each candidate position generated from the current sensor configuration is scored by a probabilistic sensor detection model.

V. CLUSTERING CAUSING ENERGY CONSERVATION

A node clustering algorithm based on overlapping camera FoVs. Firstly, finding the intersection polygons of overlapping Field Of View (FOVs) and then calculating overlapped areas to

establish clusters and determine cluster membership. Then coordination among cluster members conserve energy with respect to un-clustered solutions. At a time one node of every cluster carry out its process and rest other nodes were kept in sleep mode, so in due course for the particular time slot only energy related to that working node consumes. When its energy decreases to perform required task then it awakes other node and so on for every node of the cluster this process continues, which prolongs network lifetime and conserves energy.

The coordination among multimedia nodes can considerably prevent wasting power avoiding redundant sensing, processing or sending similar multimedia data. Thus, it prolongs network lifetime particularly in dense networks that are usually deployed with a high number of low power, low resolution and inexpensive multimedia nodes in random manner. The proposed algorithm can work in both centralized and distributed architectures and is only executed at node deployment. We select a centralized manner to perform it regarding power efficiency and enduring a negligible overhead for WMSNs.

VI. CONCLUSION

In this paper we studied network architectures, deployment environment and existing node deployment strategies in wireless multimedia sensor network. We also surveyed over multiple perspectives of its usage in various environments with different suitable deployment strategies. A clustering method for multimedia wireless sensor networks is studied. Cluster-membership is decided based on FoV overlapping areas. The main objectives of this approach is to achieve capability of coordination among cluster nodes in sensing and processing tasks and also to develop energy conservation in the clustered multimedia nodes. There are still many challenges that need to be solved in multimedia sensor networks.

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Distributed Metadata Management Scheme in HDFS

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Abstract- A Hadoop Distributed File System (HDFS) is designed to store very large data sets reliably and to stream those data sets at high bandwidth to user applications. Metadata management is critical to distributed file system. In HDFS architecture, a single master server manages all metadata, while a number of data servers store file data. This architecture can't meet the exponentially increased storage demand in cloud computing, as the single master server may become a performance bottleneck. Comparative study of a metadata management scheme is done. There are three techniques sub-tree partitioning, hashing and consistent hashing of metadata management scheme. Out of these three schemes consistent hashing is the best technique which employs multiple NameNodes, and divides the metadata into "buckets" which can be dynamically migrated among NameNodes according to system workloads. To maintain reliability, metadata is replicated in different NameNodes with log replication technology, and Paxos algorithm is adopted to keep replication consistency.

Index Terms- Hadoop, HDFS, Distributed File System, Metadata Management, File Management System.

I. INTRODUCTION

With the rapid development of Internet, the amount of data is growing exponentially, and the large-scale data storage and processing has become a problem. Cloud computing is one of the most popular solutions to meet the demand. Cloud computing provides decreased cost of hardware resource and increased equipment utilization. Users can access all kinds of Internet services and virtual computing power through lightweight portable devices rather than traditional Pc. Cloud storage is a key issue for cloud computing, and metadata management plays a critical role in Cloud storage. Metadata is the data that describes the structure of a file system, such as hierarchical namespace, file and directory attributes and mapping of file to data chunks. Although the size of metadata is relatively small in the file system, metadata operations can take up over 50 percent of the whole file system operations. So the metadata management is critically important for file system performance.

There are various distributed file systems like PVFS (Parallel Virtual File System), Lustre, GFS (Google File System), HDFS (Hadoop Distributed File System). The Google File System (GFS) [1] and Hadoop Distributed File System (HDFS) [2] are the most common file system deployed in large scale distributed systems such as Face book, Google and Yahoo today.

PVFS [3] is an open source RAID-0 style parallel file system for clusters. It partitions a file into stripe units and distributes these stripes to disks in a round robin fashion. PVFS consists of one metadata server and several data servers. All data traffic of file content flows between clients and data server nodes in parallel without going through the metadata server. The fatal disadvantage of PVFS is that it does not provide any fault-tolerance in its current form. The failure of any single server node will affect the whole file system.

Lustre is a shared disk file system. Commonly used for large scale cluster computing. It is an open-standard based system with great modularity and compatibility with interconnects, networking components and storage hardware. Currently, it is only available for Linux.

Google file system (GFS) [1] is a scalable distributed file system that supports the heavy workload at the Google website and runs on a cluster with inexpensive commodity hardware. In GFS, a single master node is used to maintain the metadata and the traffic of high volume of actual file contents are diverted to bypass the master to achieve high performance and scalability. GFS takes an aggressive approach to provide fault tolerance, in which three copies of data are stored by default. GFS is tailored to meet the particular demands for Google's data processing and is not a general-purpose file system.

Hadoop is a Distributed parallel fault tolerant file system. It is designed to reliably store very large files across machines in a large cluster. It is inspired by the Google File System. Hadoop DFS stores each file as a sequence of blocks; all blocks in a file except the last block are the same size. Blocks belonging to a file are replicated for fault tolerance. The block size and replication factor are configurable per file. Files are "write once" and have strictly one writer at any time. Hadoop is a top-level Apache project being built and used by a global community of contributors, written in the Java programming language.

In a distributed system even if we decide to deploy dedicated high performance machines which are really costly, faults or disruptions are not frequent. So forerunners like Google decided to use commodity hardware which is ubiquitous and very cost effective, but to use such hardware they have to make a design choice of treating faults/ disruptions as regular situation and system should be able to recover from such failures. Hadoop developed on similar design choices to handle faults. So comparing lustre, pvfs which system assumes faults are infrequent and needs manual intervention to ensure continued services on other hand Hadoop turns out to be very robust and fault tolerant option. Hadoop ensures that few failures in the system won't disrupt continued service of data through automatic replication and transfer of responsibilities from failed machines to live machines

in Hadoop farm transparently. Though it's mentioned that GFS has same capabilities since it's not available to other companies those capabilities cannot be availed.

A. Introduction to Hadoop

Hadoop provides a distributed file system and a framework for the analysis and transformation of very large data sets using the Map Reduce paradigm. An important characteristic of Hadoop is the partitioning of data and computation across many (thousands) of hosts, and executing application computations in parallel close to their data.

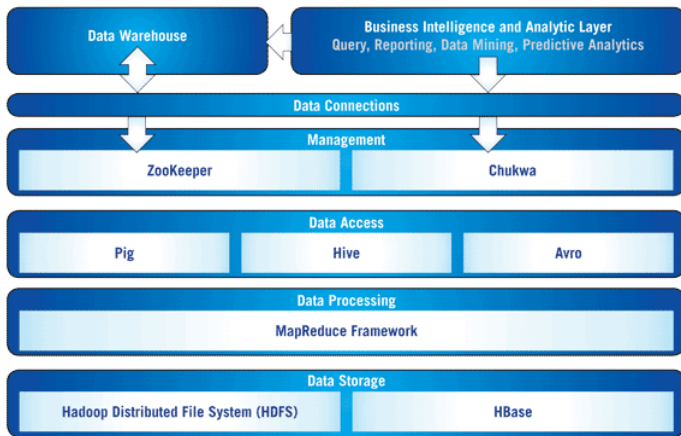


Figure 1: Hadoop System

The table 1 shows the components of hadoop. Hadoop is an Apache project; all components are available via the Apache open source license. Yahoo! has developed and contributed to 80% of the core of Hadoop (HDFS and MapReduce). HBase was originally developed at Powerset, now a department at Microsoft.

Table 1.Hadoop project components

HDFS	Distributed file system Subject of this paper!
MapReduce	Distributed computation framework
HBase	Column-oriented table service
Pig	Dataflow language and parallel execution framework
Hive	Data warehouse infrastructure
ZooKeeper	Distributed coordination service
Chukwa	System for collecting management data
Avro	Data serialization system

Hive was originated and developed at Facebook. Pig, Zookeeper, and Chukwa were originated and developed at Yahoo! Avro was originated at Yahoo! and is being co-developed with Cloudera. HDFS is the file system component of Hadoop. While the interface to HDFS is patterned after the UNIX file system, faithfulness to standards was sacrificed in favour of improved performance for the applications at hand.

B. Hadoop Distributed File System

The Hadoop Distributed File System (HDFS) [7] is a distributed file system designed to run on commodity hardware. It has many similarities with existing distributed file systems. However, the differences from other distributed file systems are significant. HDFS is highly fault-tolerant and is designed to be deployed on low-cost hardware. HDFS provides high throughput access to application data and is suitable for applications that have large data sets. HDFS was originally built as infrastructure for the Apache Nutch web search engine project.

HDFS stores file system metadata and application data separately. HDFS architecture consists of NameNode, DataNode, and HDFS Client. A HDFS Cluster may consist of thousands of DataNode and tens of thousands of HDFS clients per cluster, as each DataNode may execute multiple application tasks concurrently. The main features of HDFS are that, it is highly fault tolerance, suitable for applications with large data sets. The below figure 2 shows the Hadoop Distributed File System Architecture:

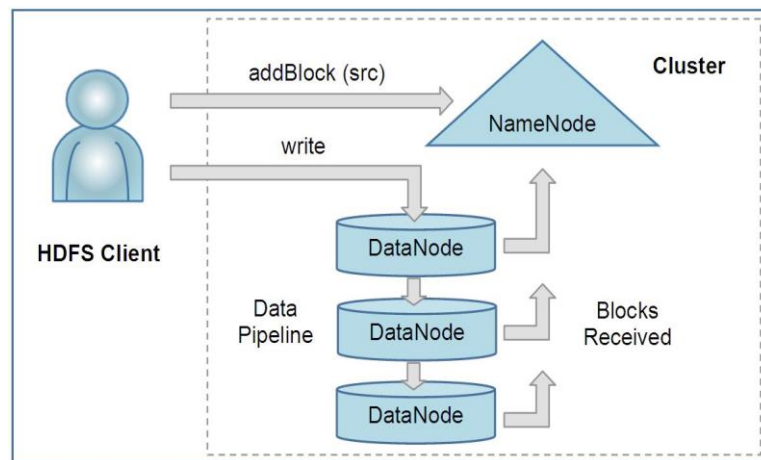


Figure 2: HDFS architecture

HDFS [2] is master/slave architecture and consist of single NameNode, a master server that manages the file system namespace and regulates access to files by clients. HDFS namespace is a hierarchy of files and directories. These files and directories which records attribute like permissions, modification, access time namespace and disk space quotas.

A file is split into one or more blocks and set of blocks are stored in DataNodes. [2] A DataNodes stores data in the files in its local system and it does have any knowledge about HDFS file system. It stores each block of HDFS data in a separate file.

HDFS cluster has a single name node that manages the file system namespace. The current limitation that a cluster can contain only a single name node results in the following issues:

1. Scalability: Name node maintains the entire file system metadata in memory. The size of the metadata is limited by the physical memory available on the node. This results in the following issues:

a. Scaling storage – while storage can be scaled by adding more data nodes/disks to the data nodes, since more storage results in more metadata, the total storage file system can handle is limited by the metadata size.

b. Scaling the namespace – the number of files and directories that can be created is limited by the memory on name node.

To address these issues one encourages larger block sizes, creating a smaller number of larger files and using tools like the hadoop archive (har).

2. Isolation: No isolation for a multi-tenant environment. An experimental client application that puts high load on the central name node can impact a production application.

3. Availability: While the design does not prevent building a failover mechanism, when a failure occurs the entire namespace and hence the entire cluster is down.

A single NameNode manages file system namespace, determines the mapping of file to blocks, and regulates access to files. In HDFS, all metadata is kept in the memory of the single NameNode, so it may become performance bottleneck as metadata number increases.

II. METADATA MANAGEMENT SCHEMES

To distribute metadata among multiple servers some techniques are used like Sub-Tree Partitioning, Hashing technique and Consistent Hashing.

A. Sub-Tree Partitioning

The **Sub Tree Partitioning** [4][6] is used in Ceph file system and Coda file system. The key design idea is that initially, the partition is performed by hashing directories near the root of the hierarchy, and when a server becomes heavily loaded, this busy server automatically migrates some subdirectories to other servers with fewer loads. It also proposes prefix caching to efficiently utilize available RAM on all servers to further improve the performance. This approach has three major disadvantages. First, it assumes that there is an accurate load measurement scheme available on each server and all servers periodically exchange the load information. Second, when an MS joins or leaves due to failure or recovery, all directories need to be rehashed to reflect the change in the server infrastructure, which, in fact, generates a prohibitively high overhead in a petabyte-scale storage system. Third, when the hot spots of metadata operations shift as the system evolves; frequent metadata migration in order to remove these hot spots may impose a large overhead and offset the benefits of load balancing.

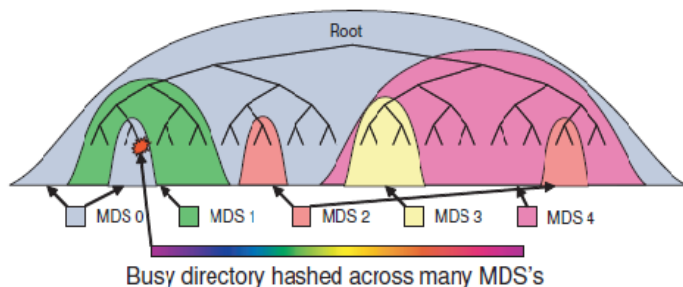


Figure 3: Sub-Tree Partitioning

In sub tree partitioning, namespace is divided into many directory sub trees, each of which is managed by individual metadata servers. This strategy provides a good locality because metadata in the same sub tree is assigned to the same metadata server, but metadata may not be evenly distributed, and the computing and

transferring of metadata may generate a high time and network overhead.

B. Hashing Technique

Hashing technique [10] is used in Lustre, zFs file system. Hashing technique uses a hash function on the path name to get metadata location. In this scheme, metadata can be distributed uniformly among cluster, but the directory locality feature is lost, and if the path is renamed, some metadata have to migrate. However, a serious problem arises when an upper directory is renamed or the total number of MSs Changes the hashing mapping needs to be re-implemented, and this requires all affected metadata to be migrated among MSs. Although the size of the metadata of a file is small, a large number of files may be involved. In particular, the metadata of all files has to be relocated if an MS joins or leaves. This could lead to both disk and network traffic surges and cause serious performance degradation. The hashing-based mapping approach can balance metadata workloads and inherently has fast metadata lookup operations, but it has slow directory operations such as listing the directory contents and renaming directories; in addition, when the total number of MSs Changes, rehashing all existing files generates a prohibitive migration overhead.

As the above mention two techniques has the main drawback that metadata are not evenly distributed in the system, to overcome these consistent hashing technique is used.

C. Consistent Hashing

Consistent hashing [9] is proposed hash method used in Amazon Dynamo. In basic consistent hashing, the output range of the hash function is treated as a ring. Not only the data is hashed, but also each node is hashed to a value in the ring. Each node is responsible for the data in the range between it and its predecessor node. In consistent hashing, the addition and removal of a node only affects its neighbor nodes. An optimization of consistent hashing is the introduction of "virtual node". Instead of mapping a physical node to a single point in the ring, each physical node is assigned to multiple positions, each of which is called a virtual node. With virtual node, data and workload is distributed over nodes more uniformly.

A single NameNode manages file system namespace, determines the mapping of file to blocks, and regulates access to files. In HDFS, all metadata is kept in the memory of the single NameNode, so it may become performance bottleneck as metadata number increases. So in HDFS, we changed the single NameNode architecture to multiple NameNodes, and the author has proposed a metadata management scheme.

1) System Design Architecture

The Figure 4 shows the architecture of metadata management system [9]. The system mainly consists of four components: Client, multiple NameNodes, NameNode Manager and Database. Client exposes interfaces to access metadata. To improve system performance, some recently used metadata will be cached in Client. NameNode is responsible for managing metadata and dealing with metadata request from Client.

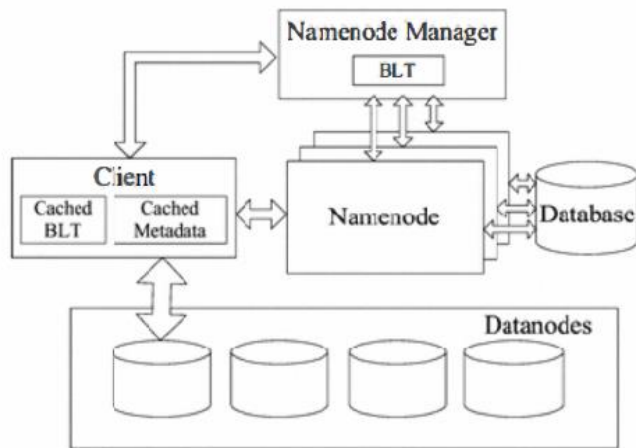


Figure 4: Metadata Management System

The metadata in this paper consists of directory metadata and file metadata. Directory metadata includes a hierarchical namespaces and directory attributes, and file metadata includes file attributes and the mapping from file to data blocks. Generally, a metadata is a tuple as below:

GLOBAL_ID	USER_ID	PARENT_GLOBAL_ID	NAME	BLOCK_PTR	OTHER_META
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Figure 5: Metadata format

GLOBAL_ID is the global unique identifier that is invariable once the path is created. USER_ID is the identifier of user that created the path. PARENT_GLOBAL_ID is the GLOBAL_ID of the parent directory of the path. OTHER_META saves other information, such as permission, last access time and update time. BLOCK_PTR is the pointer to the file data blocks. The updated metadata in NameNode is persisted into database periodically. NameNode Manager provides a route for Client to get the target NameNode. Besides, it manages the metadata distribution and load balancing among NameNodes by periodically receiving heartbeat message from NameNodes [9].

2) Metadata Partitioning

Consistent hashing ring is divided in Q equally sized parts and each is called "bucket". Metadata is partition using buckets and evenly distributed across NameNodes. Mapping of path's from metadata to bucket is like consistent hashing First hash USER_ID and PARENT_GLOBAL_ID of the path to yield its position p. Walk clockwise to find 1st bucket with position larger than p.

3) Metadata Access

To organize namespace hierarchy they have adopt hash table. The figure 5 shows the NameNode data structure. For example we want to access to path /A/B/C/filename

- Client gets user_id and global_id of path as Parent_Global_ID
- Computes the consistent hashing result
- Then client see the cached BLT to find out bucket_id and NameNode I

- Sends the request to NameNode i in form of <bucket_id, user_id, parent_global_id, filename> then that NameNode I see its bucket array by bucket_id.

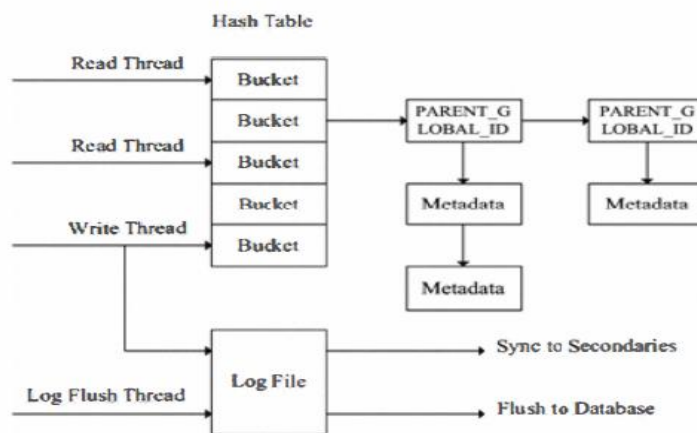


Figure 5: NameNode Data Structure

In the paper [9] they have also proposed the solution to metadata safety in memory. The solution is "Log Replication". As the metadata is periodically persisted into database, they have got the newest metadata by applying the latest log records on the last-persisted metadata in database. So they have just replicated the latest log records rather than in-memory metadata [9]. To avoid log records consensus problems between primary and secondary's, Paxos algorithm is used [9].

Failure detection is implemented by heartbeat mechanism. Failure handling includes metadata recovery, bucket re-contribution. In recovery all metadata managed by the failed primary is recovered. After the metadata in failed primary has been recovered, NameNode manager will contribute the buckets to other NameNode by modifying BLT.

A NameNode can be added to or removed from the cluster without system restarting, and the metadata can be redistributed to keep load balance.

III. COMPARISON OF METADATA MANAGEMENT TECHNIQUES

Since scalability is the main issue in HDFS and single NameNode has to operate all metadata operations; the entire load is on one single NameNode that can affect the efficiency, reliability and scalability of the system. Multiple NameNode are introduced in the architecture to distribute the load, but metadata distribution evenly among multiple NameNode is important.

Consistent hashing technique when compared with other two techniques we got the findings as shown in below table:

Table 2: Comparison of Techniques

	Consistent Hashing	Hashing	Sub-Tree partitioning
Performance	High	Low	Medium
Load Balancing	Yes	Yes	No
Reliability	High	Low	Low
Scalability	Highly Scalable	Moderately Scalable	Moderately Scalable

In Consistent Hashing technique the performance is high as compare to other two techniques; since the distribution of metadata and routing of metadata request is effectively done using consistent hashing which leads to improvement in system performance. In this technique the data bucket is divided into equal size which is further evenly distributed over the NameNodes which leads to efficient load balancing because of even distribution. Log method is used for storing and prefetching of metadata. As the logs are stored into bucket look up table which is stored at client cache and similarly replicated to NameNodes memory as well. Due to log replication fault-tolerance is increased which causes high reliability. Consistent hashing consist the insertion of metadata or removal of the same without disturbing the cluster and it also redistribute the load which leads to proper load balancing which increases scalability.

In Hashing technique the performance is low since hashing destroys the locality of metadata which causes the opportunity to prefetching and storing the metadata in bucket. The hashing-based mapping approach can balance metadata workloads and inherently has fast metadata lookup operations, but it has slow directory operations such as listing the directory contents and renaming directories. In addition, when the total number of MSs Changes, rehashing all existing files generates a prohibitive migration overhead. In hashing the hash function uses the search-key of the bucket. This search key is unique. Due to the uniqueness of search key in hashing dependency is generated which leads to low reliability.

In Sub-Tree partitioning the performance is medium compare to hashing technique. As sub-tree partitioning uses N-nary data structure in which the dependency is formed over root node and on parent node. Thus reliability decreases. We can say that compare to two techniques consistent hashing is better technique.

IV. CONCLUSION

We have seen the components of hadoop and the hadoop distributed file system in brief. As compare to other file system HDFS is a highly fault tolerance system. The main drawback of HDFS was its single NameNode which handles all metadata operations. In this the drawback is overcome by introducing multiple NameNodes in the system. The other problem arises is to

handle metadata operations among multiple metadata servers. In this paper we have compared three techniques Sub-Tree partitioning, hashing technique and consistent hashing. To distribute the metadata evenly among the metadata server they have adopted consistent hashing technique. As compare to other techniques consistent hashing evenly distributes load to the server and consumes less memory. BLT provides an efficient metadata retrieval mechanism for Client to find the target NameNode. To guarantee metadata availability under cluster failure, log replication technology with Paxos algorithm is adopted. In addition, system performance benefits from metadata caching and prefetching.

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An Effective Fraud Detection System Using Mining Technique

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Abstract- “Detection of fraud in e-commerce payment system” or “An effective fraud detection system using mining technique” is some more related to Mobile computing. Usage of credit card has increased. As we know credit card has become the most popular mode of payment. Customers can easily purchase goods through online. All amounts is credited or debited through credit card. Online banking is also provided for customers to enable them to easily debit, credit or transfer their amount. Whenever a new customer joins, the administrator check the details provided by the customer and send a mail to the customer giving permission for him/her to access the account. When we are thinking for purchasing some item online, then we’ve to aware of fraud as well. This Paper tells that during transaction, it detect fraud of card and alerts the customer regarding the fraud. The matter here is how we are able to know about the fraud, during the credit card transaction, it detect the fraud and the false alert is being minimized by using genetic algorithm. Genetic algorithms are the algorithms which aim at obtaining better solutions as time progresses. Sometimes we don’t know about the payment page is genuine or not and we submit all the card details, so by doing this the fraud have easily got all the information. We should always be alert while we are going to purchase some item online.

Index Terms- Genetic algorithm, Data mining, Neural Networks

I. INTRODUCTION

Credit card is becoming one of the most famous target for fraud but this is not the only one fraud that we are talking to reduce. The credit card fraud may happen in so many ways, which is depending on the various types of fraud. It encapsulates bankrupt fraud, counterfeit fraud, application fraud and behavioral fraud. If the person who is buying some item but he has no cash in hand then payment through credit card is one of the method of purchasing goods or services. Credit card is one of the easy and simple methods of offering credit to a consumer. As we know every credit card carries an identifying number for which we can use speeds shopping transactions. In the credit card business, fraud occurs when a lender is fooled by a borrower who’s offering to purchase some items and borrower easily believe that the borrower credit card account will provide payment for this purchase. Hence there is no payment will be done, and if the payment is done, then the credit card issuer will reclaim the amount which is paid by him. Today, as we know with the expansion of e-commerce, it is happening on the internet that most of the credit card fraud is conducted. Fraudsters have usually creating problem and affecting business which is

controlled by the criminals. Credit card fake is now a common problem in the society which should be avoided so that true customers can enjoy their shopping online. Our project is designed to allow only valid customers, so that malicious customers can be avoided.

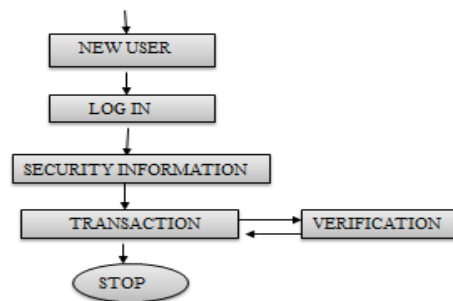


Fig1: Process of using card

II. RELATED WORK

Algorithms are often used as recommended for predictive methods as a means of detecting fraud. One of the algorithm that I’m going to use is based on Genetic programming in which order to establish logic rules which is capable of classifying credit card transactions into suspicious and non-suspicious classes. As we know credit card fraud is an act which is against the law and an act of criminal dishonesty. The purpose of this paper is to study State of the credit card industry, Different types of frauds, how fraudsters attempt to take advantage of loopholes, Impact of credit card fraud on card holders, merchants, issuers. While the exact amount of losses due to fraudulent activities on cards is unknown, according to one survey reports says that the figure for year 2002 probably exceeds \$2.5billion. Credit card fake is now a common problem in the society which should be avoided so that a genuine customers can enjoy their shopping online. Our project is designed to allow only valid customers, so that malicious customers can be avoided.

III. IMPLEMENTATION

The user login with the user id and password given to him. Whenever a new user registers, his personal details are verified with the bank database available and an email with his auto

generated user id and password is sent to his email id. So next time to login into the website he/she has to check his/her email for userid and password. Whenever a new product comes into the market the admin updates it in the database. The admin can also view all the products and also the customers. The admin has also provision to update the product stock and product rate. The user can buy any product provided in the website. The product will be delivered within three days. By this we can maintain the customer satisfaction. Every time when a customer buys products his/her credit card details are verified to check the amount. Whenever a customer buys product, his credit card is verified each time to see only valid user buys the product. The users are allowed to change their personal details whenever necessary.

A. Existing System

Whenever a new user registers, his personal details are not cross checked. Access is provided to him instantly. There is no credit card fake checking. This may allow any user to register and thus allowing malicious users too.

In the part of existing system the fraud is detected when the fraud is done that means the fraud is detected after the complaining of the card holder. So between these periods the card holder have already faced lots of trouble before the investigation finish. As we know in these days lots of online purchase are made so we don't know who is the person and how is using the card online, we can only capture the IP address for verification purpose. So there need a help from the cyber crime to investigate the fraud.

B. Proposed System

In proposed system, whenever a new user registers, his credit card details are cross checked and then only his user id is generated. This allows only correct users to login each time. At the same time credit card details are verified each time whenever a customer buys product. This verification enables only right users to buy products.

In proposed system have not required fraud signatures and is going to detect frauds by considering a cardholder's spending habit.

C. Genetic Algorithm

Genetic algorithms are evolutionary algorithms which aim at obtaining better solutions as time progresses. It has also been used in data mining mainly for variable selection and mostly coupled with other data mining algorithms. During the credit card transaction, the fraud is going to detect and the number of unexpected user alert is being minimized by using genetic algorithm.

- We are going to use the formula $y = ax^4 + bx^3 + cx^2 + dx + e$
- Our "genes" are a, b, c, d and e
- Our "chromosomes" is the array [a, b, c, d, e]
- Our evaluation function for one array is:
- For every actual data point (X, Y), (I'm using capital letter mean "actual data")
- Compute $\hat{y} = aX^4 + bX^3 + cX^2 + dX + e$
- Find the sum of $(Y - \hat{y})^2$ over all X

- The sum is Our measure of "badness" (larger numbers are worse)
 - Example: For [0, 0, 0, 2, 3] and the data points (1, 12) and (2, 22):
- $\hat{y} = 0X^4 + 0X^3 + 0X^2 + 2X + 3$ is $2 + 3 = 5$ when X is 1
- $\hat{y} = 0X^4 + 0X^3 + 0X^2 + 2X + 3$ is $4 + 3 = 7$ when X is 2
- $(12 - 5)^2 + (22 - 7)^2 = 72 + 152 = 274$
If these are the only two data points, the "badness" of [0, 0, 0, 2, 3] is 274

D. Neural Networks

Neural network is one of the algorithm that is to be used and often recommended for fraud detection. 'Dorrnsoro et al in 1997' has been developed one of the method which is technically accessible online fraud detection system, based on a neural network. However, the main constraint is that data need to be clustered by type of account. Data mining tools, such as 'Clementine' allow the use of neural network technologies, which have been used in credit card fraud.

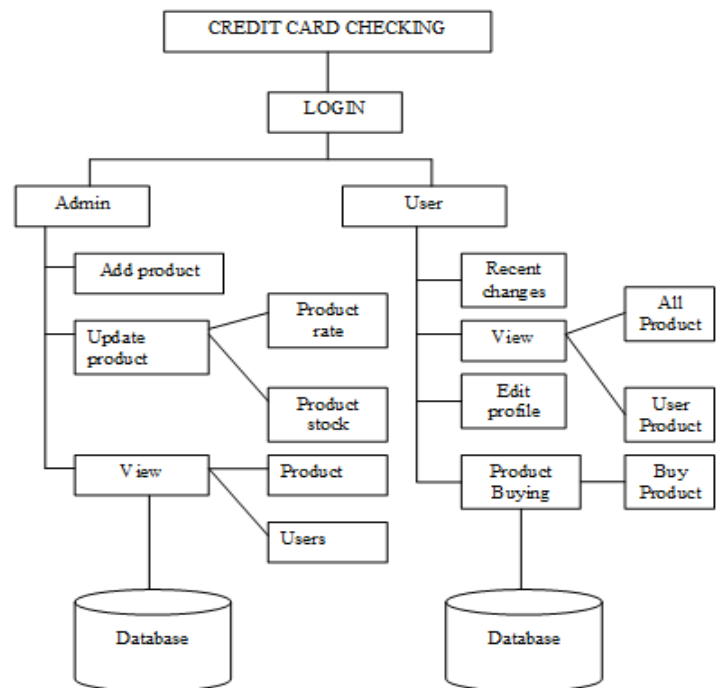


Fig2: System Flow diagram

IV. RESULTS AND DISCUSSION

The implementation of this application is shown in one system, it is prepared in Windows 7 OS with the help of .NET technology with C# language, HTML used for designing part, with the help of SQL query the result will come and we are

using mining techniques for the stored database for retrieving the actual and useful information.

C# is one of the families of languages Microsoft has designed to be part of its .NET framework. This paper gives a comprehensive introduction to C#. C# is part of the .NET Common Language Infrastructure (CLI). The CLI is a framework that enables the multiple .NET languages to talk to each other, and is specifically designed for strongly type's languages.

Table1: Below table shows the studies of investigation of different statistical techniques in credit card fraud

Study	Country	Method	Details
Bently et al. (2000)	UK	Genetic programming	Logic rules and scoring process
Bolton & Hand (2002)	UK	Clustering techniques	Peer group analysis and break point analysis
Quah & Sriganesh (2007)	Singapore	Neural networks	Self-Organizing Map (SOM) through real-time fraud detection system.
Zaslavsky & Strizhak (2006)	Ukraine	Neural networks	SOM, algorithm for detection of fraudulent operations in payment system

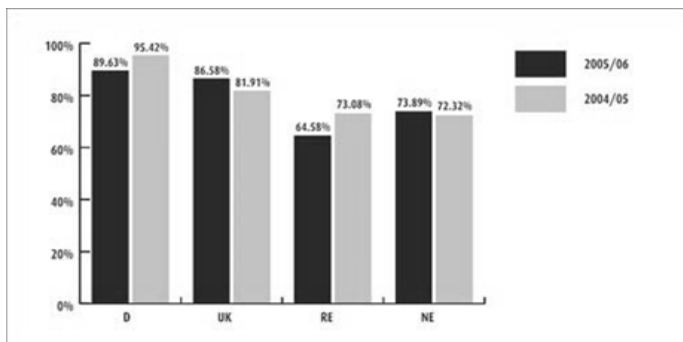


Fig3. Success rates for credit card transactions by consumer country, in all shops

Table2: Methods of Credit Card Fraud and their percentage of occurrence

Method	Percentage
Lost or Stolen card	48%
Identity theft	15%
Skimming (or cloning)	14%
Counterfeit card	12%
Mail intercept fraud	6%
Other	5%

V. CONCLUSION AND FUTURE WORK

As card business transactions increase, so global networking presents as many new opportunities for criminals as it does for businesses. While offering numerous advantages and opening up new channels for transaction business, the internet has also brought in increased probability of fraud in credit card transactions. The good news is that technology for preventing credit card frauds is also improving many folds with passage of time. Reducing cost of computing is helping in introducing complex systems, which can analyse a fraudulent transaction in a matter of fraction of a second. It is equally important to identify the right segment of transactions, which should be subject to review, as every transaction does not have the same amount of risk associated with it. The next step in this research paper is to focus upon the implementation of a 'suspicious' scorecard on a real data-set and its evaluation. The main tasks is to build scoring models to predict fraudulent behavior, taking into account in the fields of behavior that relate to the different types of credit card fraud identified in this paper, and to evaluate the associated ethical implications. The method proves accurate in deducting fraudulent transaction and minimizing the number of false alert. Genetic algorithm is a novel one in this literature in terms of application domain. If this algorithm is applied into bank credit card fraud detection system, the probability of fraud transactions can be predicted soon after credit card transactions. And a series of anti-fraud strategies can be adopted to prevent banks from great losses and reduce risks.

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Synthesis, Characterization and Antimicrobial Screening on New 1,5-Disubstituted Pyrazoline Derivatives Bearing P-Methoxy-M-Chloro Phenyl Moiety

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Abstract- A new series of 2-(ortho & para substituted phenoxy)-1-(3-(3-chloro-4-methoxyphenyl)-5-(substituted phenyl)-4,5-dihydropyrazol-1-yl)ethanone were synthesized. Ortho and para substituted phenol was refluxed with ethylchloroacetate in dry acetone in presence of anhydrous potassium carbonate to yield ethyl (ortho & para substituted phenoxy) acetate (1). The substituted ester on reaction with hydrazine hydrate yields 2-(ortho & para -substituted phenoxy) aceto-hydrazide (2). Chalcones (3a-3j) were prepared from the reaction between substituted aromatic aldehydes and 3-chloro-4-methoxy acetophenone in presence of a strong base. (2) On reaction with chalcones afforded the pyrazoline derivatives. The chemical structures of these compounds were confirmed by means of IR, ¹H NMR, mass spectral data and elemental analysis. Newly synthesized compounds were screened *in vitro* for their antimicrobial activity against varieties of gram positive and gram negative bacterial strains and fungi strains *Candida albicans* & *Aspergillus niger* at 100 µg/mL.

Index Terms- 3-Chloro-4-methoxy acetophenone, chalcones, pyrazolines, antimicrobial.

I. INTRODUCTION

Many heterocyclic compounds due to their specific activity are employed in the treatment of many infectious diseases. Their use in the treatment is attributed to their inherent toxicity to various pathogens. Among a wide range of heterocyclic compounds that have been explored for the development of pharmaceutically important molecules. Many compounds possessing pyrazoles and their reduced forms pyrazolines constitute an interesting class of heterocycles due to their synthetic versatility and effective biological activities such as anticancer¹, antioxidant², antibacterial³, antifungal⁴, antidepressant⁵⁻⁷, anti-inflammatory⁸, anticonvulsant⁹, antitumor¹⁰, analgesic¹¹, properties. Literature survey reveals several synthetic protocols for the synthesis of these compounds and the presence of this core in any molecule plays a key role in enhancing the activity. Phenyl ring containing halogen and methoxy groups have shown significant biological activities enhance the biological activities of heterocyclic derivatives drastically¹²⁻¹⁴. Keeping in view of the above interesting pharmacological features, in the present study the synthesis of chalcones of 1-(3-chloro-4-methoxyphenyl)-3-(substituted)prop-2-en-1-ones have been carried out according to Claisen-Schmidt

condensation of aromatic aldehydes with 3-chloro-4-methoxy acetophenone in presence of base and alcohol as solvent medium¹⁵. Ethyl 2-(substituted phenoxy)acetate 1(a-j) and 2-(substituted phenoxy) aceto hydrazide 2(a-j) were synthesized as reported in the literature¹⁶.

II. EXPERIMENTAL

All the reported melting points were taken in open capillaries and are uncorrected. Infrared spectra were measured on Shimadzu- FTIR-8400S spectrophotometer (cm⁻¹), using KBr disks. ¹H-NMR spectra were measured by Bruker amx 400MHz spectrometer, deuterated solvents such as dimethyl-sulphoxide (DMSO-d₆), methanol (CD₃OD) and also chloroform (CDCl₃) were used as solvents and the chemical shifts were quoted as δ-value relative to tetramethyl silane (TMS δ=0) as an internal standard. Mass spectra were recorded on LC-MS Shimadzu 2010A using dimethyl sulfoxide as solvent. C, H and N analysis were performed at Sophisticated Test & Instrumentation centre, Cochin university, Cochin, Kerala, India. The purity of the compounds was monitored by thin layer chromatography on silica gel plates and iodine was used as a visualizing agent.

General procedure for the synthesis of ethyl 2-(substituted phenoxy)acetate (1): To the substituted phenol (0.05mole) in dry acetone, ethylchloroacetate (0.05mole) was added and refluxed on water bath for 24hours in presence of potassium carbonate as catalyst. The reaction mixture was cooled and filtered, the excess solvent was distilled off to get phenoxy ester.

General procedure for the synthesis of aceto-hydrazide (2): To a solution of compound 1 (0.05mole) in ethanol (60ml), hydrazine hydrate (0.07 mole) was refluxed for 12 hours. The excess of solvent is distilled off and the solid thus separated was recrystallized from ethanol

General procedure for the synthesis of chalcones (3a-j): Appropriate aromatic aldehydes (0.01 mol) were stirred with 3-Chloro-4-methoxy acetophenone in ethanol in presence of 40% sodium hydroxide for 24 hours. The resultant reaction mixture was poured on to crushed ice and acidified with dilute HCl. The separated solid was filtered, dried and recrystallized from ethanol.

1-(3-chloro-4-methoxyphenyl)-3-phenylprop-2-en-1-one (3a)

IR (KBr, γ_{max} , cm⁻¹): 2924 (Ar-CH), 1691 (C=O), 1563 (C=C), 830 (Ar-H). ¹H NMR (400 MHz, CDCl₃, δ ppm); 7.99-7.01 (8H,

m, Ar-H), 7.04 (1H, d, CH), 7.41 (1H, d, CH), 3.73 (3H, s, OCH₃). MS (m/z): 273.4 (M⁺).

1-(3-chloro-4-methoxyphenyl)-3-(2,4-dichlorophenyl)prop-2-en-1-one (3b)

IR (KBr, γ_{\max} , cm⁻¹): 3024 (Ar-CH), 1698 (C=O), 1567 (C=C), 836 (Ar-H). ¹H NMR (400 MHz, CDCl₃, δ ppm); 7.75-7.10 (8H, m, Ar-H), 7.08 (1H, d, CH), 7.45 (1H, d, CH), 3.70 (3H, s, OCH₃). MS (m/z): 342.34 (M⁺).

3-(5-bromo-2-hydroxyphenyl)-1-(3-chloro-4-methoxyphenyl)prop-2-en-1-one (3c)

IR (KBr, γ_{\max} , cm⁻¹): 3028 (Ar-CH), 1712 (C=O), 1544 (C=C), 840 (Ar-H). ¹H NMR (400 MHz, CDCl₃, δ ppm); 7.78-7.03 (8H, m, Ar-H), 7.00 (1H, d, CH), 7.41 (1H, d, CH), 3.78 (3H, s, OCH₃). MS (m/z): 368.60 (M⁺).

1-(3-chloro-4-methoxyphenyl)-3-(4-methoxyphenyl)prop-2-en-1-one (3d)

IR (KBr, γ_{\max} , cm⁻¹): 2978 (Ar-CH), 1699 (C=O), 1566 (C=C), 832 (Ar-H). ¹H NMR (400 MHz, CDCl₃, δ ppm); 7.99-6.78 (8H, m, Ar-H), 7.01 (1H, d, CH), 7.41 (1H, d, CH), 3.81 (3H, s, OCH₃). MS (m/z): 303.57 (M⁺).

1-(3-chloro-4-methoxyphenyl)-3-(2-hydroxyphenyl)prop-2-en-1-one (3e)

IR (KBr, γ_{\max} , cm⁻¹): 2900 (Ar-CH), 1708 (C=O), 1563 (C=C), 830 (Ar-H). ¹H NMR (400 MHz, CDCl₃, δ ppm); 7.99-7.04 (8H, m, Ar-H), 7.07 (1H, d, CH), 7.48 (1H, d, CH), 3.78 (3H, s, OCH₃). MS (m/z): 289.52 (M⁺).

1-(3-chloro-4-methoxyphenyl)-3-(4-nitrophenyl)prop-2-en-1-one (3f)

IR (KBr, γ_{\max} , cm⁻¹): 3007 (Ar-CH), 1715 (C=O), 1560 (C=C), 831 (Ar-H). ¹H NMR (400 MHz, CDCl₃, δ ppm); 7.78-7.11 (8H, m, Ar-H), 7.05 (1H, d, CH), 7.44 (1H, d, CH), 3.78 (3H, s, OCH₃). MS (m/z): 318.37 (M⁺).

1-(3-chloro-4-methoxyphenyl)-3-(2-methoxynaphthalen-1-yl)prop-2-en-1-one (3g)

IR (KBr, γ_{\max} , cm⁻¹): 2935 (Ar-CH), 1707 (C=O), 1567 (C=C), 834 (Ar-H). ¹H NMR (400 MHz, CDCl₃, δ ppm); 7.86-7.05 (8H, m, Ar-H), 7.08 (1H, d, CH), 7.47 (1H, d, CH), 3.77 (3H, s, OCH₃). MS (m/z): 353.77 (M⁺).

1-(3-chloro-4-methoxyphenyl)-3-(4-chlorophenyl)prop-2-en-1-one (3h)

IR (KBr, γ_{\max} , cm⁻¹): 3001 (Ar-CH), 1710 (C=O), 1568 (C=C), 835 (Ar-H). ¹H NMR (400 MHz, CDCl₃, δ ppm); 7.55-7.01 (8H, m, Ar-H), 7.45 (1H, d, CH), 6.95 (1H, d, CH), 3.75 (3H, s, OCH₃). MS (m/z): 308.07 (M⁺).

1-(3-chloro-4-methoxyphenyl)-3-(4-hydroxyphenyl)prop-2-en-1-one (3i)

IR (KBr, γ_{\max} , cm⁻¹): 2995 (Ar-CH), 1697 (C=O), 1566 (C=C), 838 (Ar-H). ¹H NMR (400 MHz, CDCl₃, δ ppm); 7.68-7.09 (8H, m, Ar-H), 7.95 (1H, d, CH), 6.95 (1H, d, CH), 3.77 (3H, s, OCH₃). MS (m/z): 289.62 (M⁺).

1-(3-chloro-4-methoxyphenyl)-3-p-tolylprop-2-en-1-one (3j)

IR (KBr, γ_{\max} , cm⁻¹): 2970 (Ar-CH), 1696 (C=O), 1568 (C=C), 832 (Ar-H). ¹H NMR (400 MHz, CDCl₃, δ ppm); 7.90-6.90 (8H, m, Ar-H), 7.91 (1H, d, CH), 7.11 (1H, d, CH), 3.70 (3H, s, OCH₃). MS (m/z): 287.75 (M⁺).

General procedure for the synthesis of 2-(ortho & para substituted phenoxy)-1-(3-(3-chloro-4-methoxyphenyl)-5-(substituted phenyl)-4,5-dihydropyrazol-1-yl)ethanone (4a-j):

To a solution of chalcone (0.01 mol) in ethanol, acetohydrazide (0.01 mol) was added. The mixture was refluxed for 8-10 hours in presence of catalytic amount of glacial acetic acid and left overnight. The reaction mixture was poured onto crushed ice and the solid mass that separated out was filtered, washed with ethanol, dried and recrystallized from DMF

1-(3-(3-chloro-4-methoxyphenyl)-5-phenyl-4,5-dihydropyrazol-1-yl)-2-phenoxyethanone (4a)

IR (KBr, γ_{\max} , cm⁻¹): 3040 (Ar-CH), 1675 (C=O), 1590 (C=C), 1510 (N-N). ¹H NMR (400 MHz, CDCl₃, δ ppm); 8.27-7.67 (13H, m, Ar), 5.35-5.26 (1H, dd, H_x of pyrazoline), 4.70 (2H, s, OCH₂), 3.75 (3H, s, OCH₃), 3.53-3.48 (1H, dd, H_b of CH₂ of pyrazoline), 3.25-3.18 (1H, H_a of CH₂ of pyrazoline). MS (m/z): 433.29 (M⁺).

1-(3-(3-chloro-4-methoxyphenyl)-5-(2,4-dichlorophenyl)-4,5-dihydropyrazol-1-yl)-2-(2-chlorophenoxy)ethanone (4b)

IR (KBr, γ_{\max} , cm⁻¹): 3028 (Ar-CH), 1688 (C=O), 1546 (C=C), 1520 (N-N). ¹H NMR (400 MHz, CDCl₃, δ ppm); 8.27-7.67 (10H, m, Ar), 5.40-5.29 (1H, dd, H_x of pyrazoline), 4.50 (2H, s, OCH₂), 3.72 (3H, s, OCH₃), 3.55-3.50 (1H, dd, H_b of CH₂ of pyrazoline), 3.20-3.13 (1H, H_a of CH₂ of pyrazoline). MS (m/z): 537.13 (M⁺).

1-(5-(5-bromo-2-hydroxyphenyl)-3-(3-chloro-4-methoxyphenyl)-4,5-dihydropyrazol-1-yl)-2-(2,4,6-trichlorophenoxy)ethanone (4c)

IR (KBr, γ_{\max} , cm⁻¹): 3497 (OH), 3030 (Ar-CH), 1690 (C=O), 1548 (C=C), 1518 (N-N). ¹H NMR (400 MHz, CDCl₃, δ ppm); 10.20 (1H, s, OH), 8.30-7.67 (8H, m, Ar), 5.38-5.29 (1H, dd, H_x of pyrazoline), 4.59 (2H, s, OCH₂), 3.72 (3H, s, OCH₃), 3.51-3.46 (1H, dd, H_b of CH₂ of pyrazoline), 3.23-3.16 (1H, H_a of CH₂ of pyrazoline). MS (m/z): 632.07 (M⁺).

1-(3-(3-chloro-4-methoxyphenyl)-5-(4-methoxyphenyl)-4,5-dihydropyrazol-1-yl)-2-(4-hydroxyphenoxy)ethanone (4d)

IR (KBr, γ_{\max} , cm⁻¹): 3500 (OH), 3021 (Ar-CH), 1686 (C=O), 1588 (C=C), 1515 (N-N). ¹H NMR (400 MHz, CDCl₃, δ ppm); 9.83 (1H, s, OH), 8.27-7.67 (11H, m, Ar), 5.35-5.26 (1H, dd, H_x of pyrazoline), 4.56 (2H, s, OCH₂), 3.73 (3H, s, OCH₃), 3.72 (3H, s, OCH₃), 3.53-3.48 (1H, dd, H_b of CH₂ of pyrazoline), 3.25-3.18 (1H, H_a of CH₂ of pyrazoline). MS (m/z): 479.52 (M⁺).

1-(3-(3-chloro-4-methoxyphenyl)-5-(2-hydroxyphenyl)-4,5-dihydropyrazol-1-yl)-2-(4-nitrophenoxy)ethanone (4e)

IR (KBr, γ_{\max} , cm⁻¹): 3310 (OH), 3098 (Ar-CH), 1694 (C=O), 1535 (C=C), 1517 (N-N). ¹H NMR (400 MHz, CDCl₃, δ ppm); 10.01 (1H, s, OH), 8.00-7.67 (11H, m, Ar), 5.65-5.56 (1H, dd, H_x of pyrazoline), 4.50 (2H, s, OCH₂), 3.67 (3H, s, OCH₃), 3.55-3.50 (1H, dd, H_b of CH₂ of pyrazoline), 3.20-3.13 (1H, H_a of CH₂ of pyrazoline). MS (m/z): 494.19 (M⁺).

2-(4-bromophenoxy)-1-(3-(3-chloro-4-methoxyphenyl)-5-(4-nitrophenyl)-4,5-dihydropyrazol-1-yl)ethanone (4f)

IR (KBr, γ_{\max} , cm⁻¹): 3008 (Ar-CH), 1699 (C=O), 1583 (C=C), 1515 (N-N). ¹H NMR (400 MHz, CDCl₃, δ ppm); 7.57-6.67 (11H, m, Ar), 5.42-5.33 (1H, dd, H_x of pyrazoline), 4.36 (2H, s, OCH₂), 3.70 (3H, s, OCH₃), 3.50-3.45 (1H, dd, H_b of CH₂ of pyrazoline), 3.19-3.12 (1H, H_a of CH₂ of pyrazoline). MS (m/z): 557.39 (M⁺).

1-(3-(3-chloro-4-methoxyphenyl)-5-(2-methoxynaphthalen-1-yl)-4,5-dihydro pyrazol-1-yl)-2-(4-methoxyphenoxy)ethanone (4g)

IR (KBr, γ_{\max} , cm^{-1}): 3038 (Ar-CH), 1679 (C=O), 1590 (C=C), 1515(N-N). ^1H NMR (400 MHz, CDCl_3 , δ ppm); 8.27-6.83 (13H,m, Ar), 5.37-5.20 (1H,dd, Hx of pyrazoline), 4.50 (2H,s,OCH₂), 3.73(6H,s,OCH₃), 3.72(3H,s,OCH₃), 3.58-3.48 (1H,dd,Hb of CH₂ of pyrazoline), 3.20-3.14 (1H,Ha of CH₂ of pyrazoline). MS (m/z): 529.08 (M^+).

1-(3-(3-chloro-4-methoxyphenyl)-5-(4-chlorophenyl)-4,5-dihydropyrazol-1-yl)-2-(2,4-dichlorophenoxy)ethanone (4h)

IR (KBr, γ_{\max} , cm^{-1}): 3001 (Ar-CH), 1700 (C=O), 1590 (C=C), 1513(N-N). ^1H NMR (400 MHz, CDCl_3 , δ ppm); 8.11-7.13 (10H,m, Ar), 4.99-4.90 (1H,dd, Hx of pyrazoline), 4.83 (2H,s,OCH₂), 3.73(3H,s,OCH₃), 3.54-3.47 (1H,dd,Hb of CH₂ of pyrazoline), 3.25-3.18 (1H,Ha of CH₂ of pyrazoline). MS (m/z): 537.13 (M^+).

1-(3-(3-chloro-4-methoxyphenyl)-5-(4-hydroxyphenyl)-4,5-dihydropyrazol-1-yl)-2-(2-hydroxyphenoxy)ethanone (4i)

IR (KBr, γ_{\max} , cm^{-1}): 3498 (OH), 3040 (Ar-CH), 1682 (C=O), 1596 (C=C), 1513(N-N). ^1H NMR (400 MHz, CDCl_3 , δ ppm); 10.20 (2H,s,OH), 8.27-7.67 (11H,m, Ar), 5.35-5.26 (1H,dd, Hx of pyrazoline), 4.56 (2H,s,OCH₂), 3.73(3H,s,OCH₃), 3.53-3.48 (1H,dd,Hb of CH₂ of pyrazoline), 3.25-3.18 (1H,Ha of CH₂ of pyrazoline). MS (m/z): 465.17 (M^+).

1-(3-(3-chloro-4-methoxyphenyl)-5-p-tolyl-4,5-dihydropyrazol-1-yl)-2-(4-chlorophenoxy)ethanone (4j)

IR (KBr, γ_{\max} , cm^{-1}): 3066 (Ar-CH), 1682 (C=O), 1596 (C=C), 1513(N-N). ^1H NMR (400 MHz, CDCl_3 , δ ppm); 8.21-7.00 (11H,m, Ar), 5.45-5.36 (1H,dd, Hx of pyrazoline), 4.66 (2H,s,OCH₂), 3.77(3H,s,OCH₃), 3.53-3.48 (1H,dd,Hb of CH₂ of pyrazoline), 3.25-3.18 (1H,Ha of CH₂ of pyrazoline), 2.19 (3H,s,CH₃) MS (m/z): 482.17 (M^+).

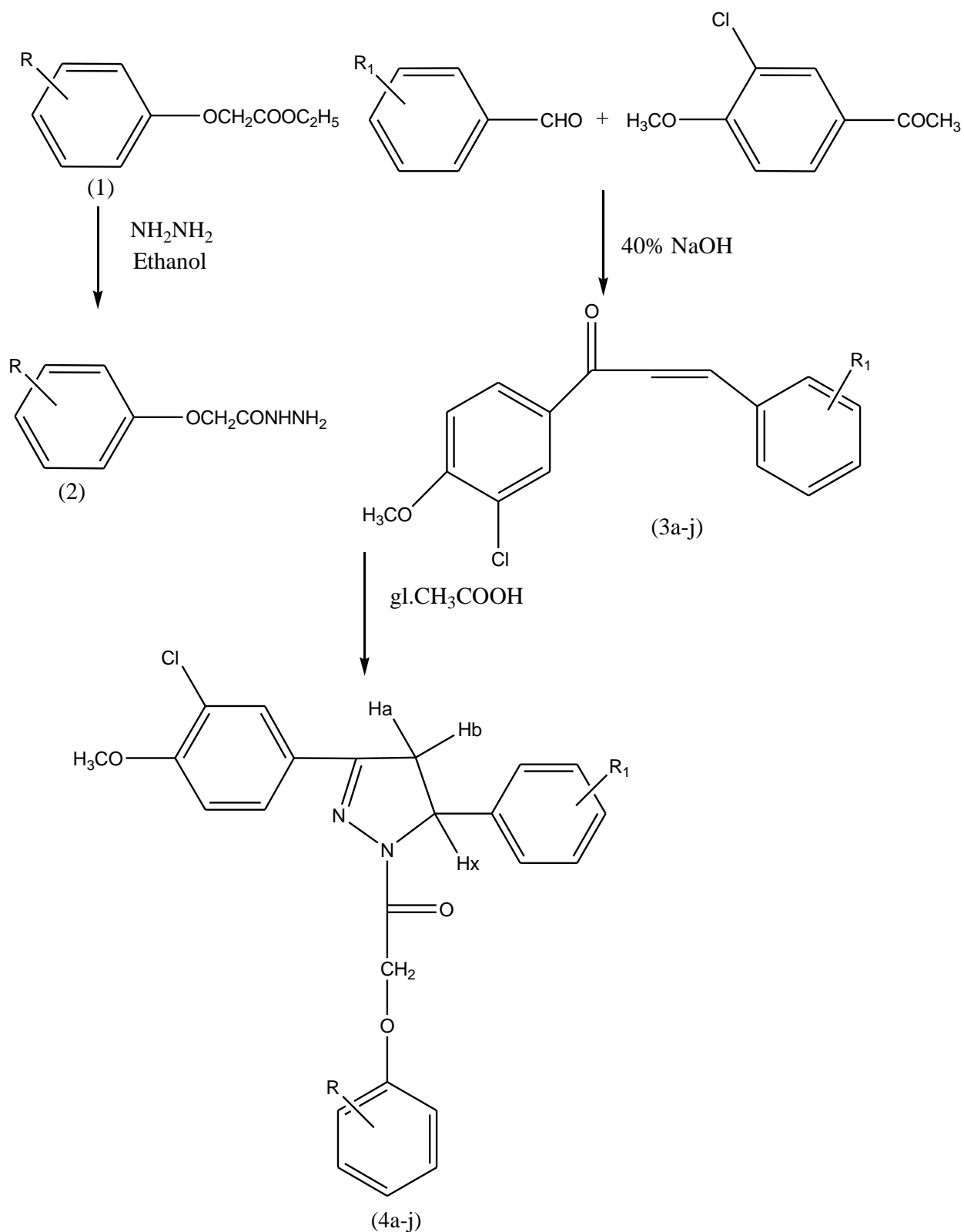


Table I: Physicochemical data of chalcone derivatives (3a-j).

Code	R_1	Molecular Formula	M.W	Melting Point($^{\circ}\text{C}$)	Rf	% yield
3a	-H(Phenyl)	$\text{C}_{16}\text{H}_{13}\text{ClO}_2$	272.72	152	0.87	84

3b	-2,4-Cl	C ₁₆ H ₁₁ Cl ₃ O ₂	341.61	174	0.65	80
3c	-5-Br,2- OH	C ₁₆ H ₁₂ BrClO ₃	367.62	186	0.72	90
3d	-4-OCH ₃	C ₁₇ H ₁₅ ClO ₃	302.75	140	0.81	78
3e	-2-OH	C ₁₆ H ₁₃ ClO ₃	288.72	176	0.56	86
3f	4-NO ₂	C ₁₆ H ₁₂ ClNO ₄	317.72	90	0.60	80
3g	-2-OCH ₃ -H(Naphthyl)	C ₂₁ H ₁₇ ClO ₃	352.81	191	0.59	88
3h	-4-Cl	C ₁₆ H ₁₂ Cl ₂ O ₂	307.17	158	0.74	68
3i	-4-OH	C ₁₆ H ₁₃ ClO ₃	288.72	138	0.68	79
3j	-4-CH ₃	C ₁₇ H ₁₅ ClO ₂	286.75	124	0.90	76

Table II: physicochemical data of pyrazoline derivatives (4a-j).

Code	R	R ₁	Molecular Formula	M.W	M.P (°C)	R _f	% yield	Element % cal (found)		
								C	H	N
4a	-H	-H(Phenyl)	C ₂₅ H ₂₁ ClN ₂ O ₃	432.89	192	0.57	72	69.30	4.85	6.46
								(69.27)	(4.87)	(6.43)
4b	-2-Cl	-2,4-Cl	C ₂₅ H ₁₈ Cl ₄ N ₂ O ₃	536.23	198	0.86	84	55.94	3.35	5.22
								(55.93)	(3.31)	(5.21)
4c	-2,4,6-Cl	-5-Br,2- OH	C ₂₅ H ₁₇ BrCl ₄ N ₂ O ₄	631.12	213	0.91	80	47.53	2.69	4.43
								(47.50)	(2.67)	(4.41)
4d	-4-OH	-4-OCH ₃	C ₂₆ H ₂₃ ClN ₂ O ₅	478.92	175	0.59	71	65.14	4.80	5.84
								(65.11)	(4.79)	(5.84)
4e	-4-NO ₂	-2-OH	C ₂₅ H ₂₀ ClN ₃ O ₆	493.89	206	0.68	74	60.74	4.04	8.50
								(60.73)	(4.02)	(8.49)
4f	-4-Br	4-NO ₂	C ₂₅ H ₁₉ BrClN ₃ O ₅	556.79	207	0.70	78	53.88	3.41	7.54
								(53.87)	(3.40)	(7.52)
4g	-4-OCH ₃	-2-OCH ₃ -H (Naphthyl)	C ₃₁ H ₂₉ ClN ₂ O ₅	528.98	218	0.81	87	70.32	5.48	5.29
								(70.30)	(5.46)	(5.27)
4h	-2,4-Cl	-4-Cl	C ₂₅ H ₁₈ Cl ₄ N ₂ O ₃	536.23	188	0.97	83	55.94	3.35	5.29
								(55.91)	(3.33)	(5.27)
4i	-2-OH	-4-OH	C ₂₅ H ₂₁ ClN ₂ O ₅	464.89	166	0.61	75	64.53	4.51	6.02
								(64.51)	(4.50)	(6.00)
4j	-4-Cl	-4-CH ₃	C ₂₆ H ₂₂ Cl ₂ N ₂ O ₃	481.37	144	0.78	73	64.81	4.57	5.81
								(64.78)	(4.56)	(5.80)

III. ANTIMICROBIAL ACTIVITY

In vitro antibacterial screening

All the newly synthesized compounds (4a-j) were screened in vitro for their antibacterial activity against *Bacillus subtilis*, and *Pseudomonas aeruginosa* by disc diffusion method¹⁹ was performed using Mueller.Hinton agar (Hi-Media) medium. Each compound was tested at a concentration at 100µg/mL in DMSO. The diameter of zone of inhibition was measured in mm after 24hours incubation at 37°C. The known compound ciprofloxacin

was used as standard drug for comparison study. The antibacterial screening data are recorded in Table III.

In vitro antifungal screening

The compounds (4a-j) were evaluated for their in vitro antifungal activity against *Candida albicans* and *Aspergillus nigar* using disc diffusion method²⁰ with sabouraud's dextrose agar (Hi-Media). Each compound was tested at a concentration of 100µg/mL in DMSO. The zone of inhibition (mm) was measured. The known compound Amphotericin B was used as

standard drug for comparison study. The antifungal screening data are recorded in Table III.

Table III: Antimicrobial activity data of pyrazoline derivatives 4(a-j).

Code.	Antibacterial activity Zone of inhibition (in mm)		Antifungal activity Zone of inhibition (in mm)	
	<i>Bacillus subtilis</i>	<i>Pseudomonas aeruginosa</i>	<i>Candida albicans</i>	<i>Aspergillus nigar</i>
4a	10	8	12	13
4b	13	12	23	10
4c	27	25	23	24
4d	12	11	13	15
4e	25	17	15	12
4f	26	19	16	16
4g	15	28	14	18
4h	11	12	23	15
4i	10	10	7	8
4j	8	7	9	10
Ciprofloxacin	37	38	-ve	-ve
Amphotericin B	-ve	-ve	35	36

IV. RESULTS AND DISCUSSION

All the reactions were carried out under prescribed laboratory conditions. The solvents and reagents used in synthetic work were of laboratory grade and were purified by distillation. The title compounds 2-(ortho & para substituted phenoxy)-1-(3-(3-chloro-4-methoxyphenyl)-5-(substituted phenyl)-4,5-dihydro pyrazol-1-yl)ethanone 4(a-j) were obtained by the cyclisation reaction shown by the mixture of 2-(ortho and para substituted phenoxy)acetohydrazide and 1-(3-chloro-4-methoxyphenyl)-3-(substituted phenyl)prop-2-en-1-one resulted in good yields (71-87%). All the synthesized pyrazoline derivatives were screened for antibacterial activity showing moderate to significant activity against bacterial strains i.e., *Bacillus subtilis* (Gram positive), *Pseudomonas aeruginosa* (Gram negative) and fungal strains i.e., *Candida albicans* and *Aspergillus nigar* using cup-plate method. Compound (4g) has shown significant activity against *Pseudomonas aeruginosa* due to the presence of substituted naphthyl group. From the above observations it is evident that the compounds that contain chloro, bromo and nitro groups have shown maximum activity against tested microorganisms. The ¹HNMR spectra of pyrazolines (4a-j) displayed three characteristic signals due to the diastereotopic proton^{17,18} (Ha, Hb and Hx). The Ha proton, was cis to Hx resonated upfield in the range δ 3.13-3.25 as doublet of doublet (dd, J=18.07 and 4.60Hz), while the Hb proton was trans to Hx resonated downfield in the range of δ 3.45-3.58 (dd, J=17.89 and

12.21Hz). The Hx proton which was vicinal to two methylene protons (Ha & Hb) was also observed as doublet of doublet at δ values ranging from 5.20-5.65 (dd, J=11.74 and 4.66Hz).

V. CONCLUSION

The present study is aimed to synthesize, characterize and also to evaluate the antimicrobial activity of some new chalcones and 1,5-disubstituted pyrazoline derivatives bearing p-methoxy-m-chloro phenyl moiety. All the synthesized pyrazoline derivatives have shown promising antimicrobial results and some are showing zone of inhibition (mm) very similar to the standard drug used. Investigations are in progress to explore the possible mechanism of action of the synthesized compounds.

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Aleukemic Variant of Mast Cell Leukemia- A Rare Phenomenon

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Abstract- Mast cell leukemia is a rare variant of mastocytosis, accounting for less than 1% of all mast cell disease and pose one of the greater challenges in the management of these patients, with a grave prognosis. Diagnosis of this neoplasm rests on the detection of abnormal mast cells in marrow and subsequent spill over to the peripheral blood. We report a case of aleukemic variant of mast cell leukemia in a pediatric patient, presenting with fever and chest pain for 10 days. The peripheral smear showed a picture of pancytopenia with abnormal/ atypical lymphoid cells. Bone marrow aspirate showed dense aggregates of atypical, hypogranular and partially degranulated mast cells expressing toluidine blue and CD117 positivity.

Index Terms- Mast cell, mastocytosis, aleukemic variant of Mast cell leukemia.

I. INTRODUCTION

WHO has updated the diagnostic criteria and classification of the mastocytosis; characterized by neoplastic proliferation of mast cells in one or more organs.¹ Mast cell leukemia is one such rare neoplasms which is identified by leukemic spread of mast cells, with frequent and multiple organ involvements such as liver, peritoneum, spleen, bone and bone marrow.² A detailed examination of the peripheral smear, bone marrow aspirate and biopsy is the utmost requirement for the diagnosis of mast cell leukemia as the threshold of > 20% mast cells in the bone marrow along with the features of aggressive systemic mastocytosis is the criteria. An "aleukemic" variant of mast cell leukemia is frequent. This diagnosis is made, if the number of circulating mast cells are less than 10%.¹ It has been referred to in the literature that in contrast to adults with systemic mastocytosis, definitive marrow involvement in children is less common.³ We present a unique dilemma in a pediatric age group.

II. CASE REPORT

A 15 year old male patient was brought to the hospital with history of fever and right- sided pricking type of chest pain

for 10 days. Fever was not associated with chills, but patient had cough with no hurried breathing or wheeze. Developmental milestones were appropriate for age. On physical examination, the heart rate, blood pressure and respiratory rate were within normal limits. Respiratory system examination showed a reduced air entry with stony dullness on percussion over the right hemithorax but no adventitious sounds were heard on auscultation. Per abdomen examination revealed an enlarged liver and splenomegaly 4 cms below right costal margin and 5 cms in splenic axis respectively.

III. INVESTIGATIONS

The coulter hemogram revealed pancytopenia (anemia, leukopenia and thrombocytopenia) with the following parameters: Hemoglobin- 7.1 g/dl, total WBC count- 2800 / μ L, platelets- 58000/ μ L. The peripheral smear confirmed the above findings, additionally showing occasional spherocytosis and 5 nucleated RBCs/100WBCs. The differential count showed mild left shift with 20% of atypical/abnormal lymphoid cells. Liver function test and renal function test were within normal limits. The patient did not have any skin lesion. With the above smear findings, an impression of leukoerythroblastic picture with an advice to perform bone marrow study was given.

Patient was also subjected for the contrast enhanced computed tomography (CECT) thorax, which revealed a well - defined large, lobulated and heterogenous hypodense lesion in the right hemithorax and anterior mediastinum showing heterogenous enhancement, cystic areas and few hyperdense areas.

Bone marrow aspirate showed cellular marrow particles with suppressed myelopoiesis and megakaryopoiesis with increased erythropoiesis. Dense aggregates and scattered atypical spindly mast cells (Figure 1) with hypogranular and degranulated forms were seen. The differential count of these mast cells accounted to be 34%.

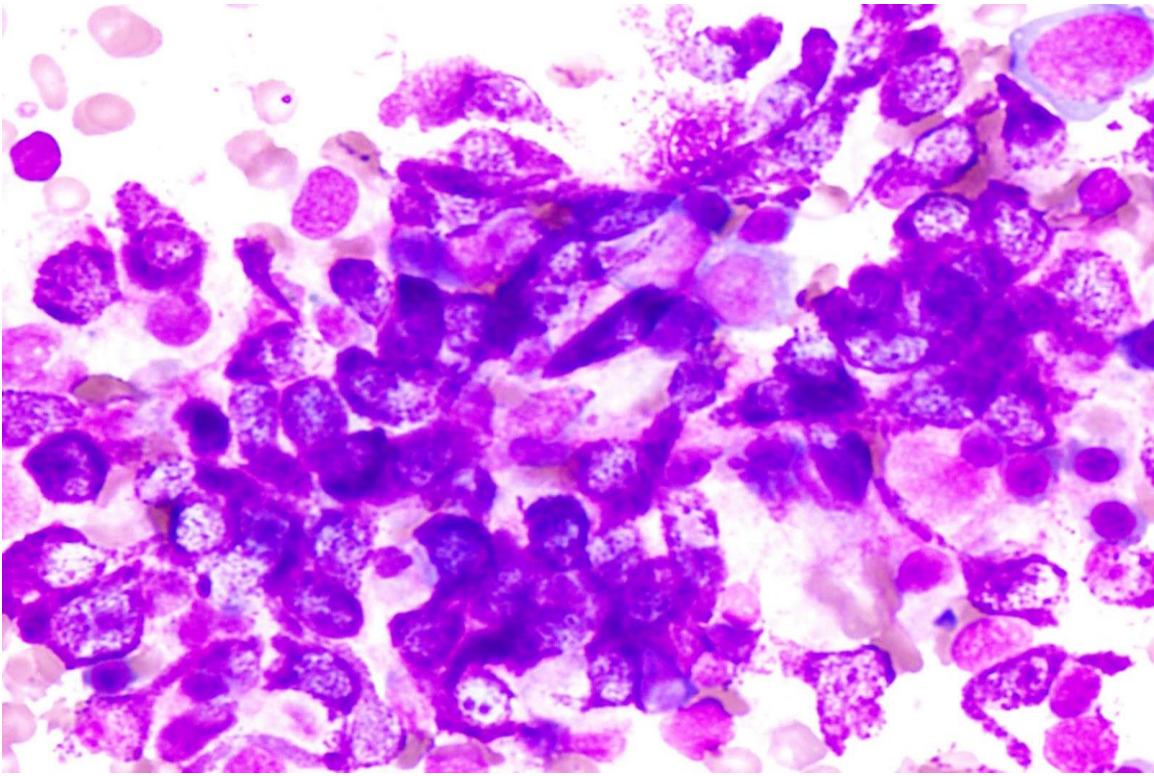


Figure 1: Dense aggregates and scattered atypical spindle mast cells with hypogranular and degranulated forms. (Leishman;x200)

Immunohistochemistry done on the bone marrow biopsy was positive for CD68 and CD117. Cytochemistry showed positivity with toluidine blue; showing metachromatic granules in the mast cells (Figure 2).

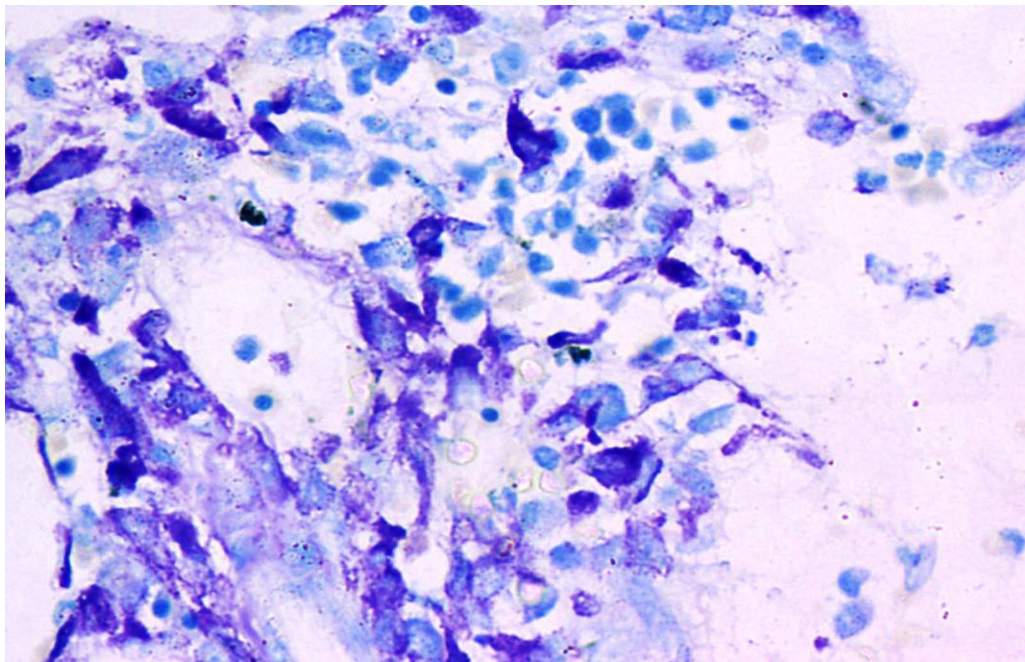


Figure2: Bone marrow biopsy sections showing aggregates of mast cells with metachromatic blue granules. (Toluidine Blue; x200).

In light of above morphological features and the available clinical data, the diagnosis of "aleukemic" variant of mast cell leukemia with C- Finding was given after referring various sources of literature. A request was made to biopsy the mediastinal mass to rule out an extracutaneous mastocytosis.

IV. DISCUSSION

Systemic mastocytosis is characterized by the proliferation of atypical mast cells in tissues, principally in the bone marrow (BM) and skin.⁴ According to the World Health Organization (WHO)¹, systemic mastocytosis is grouped into 4 major clinical variants: 1) indolent systemic mastocytosis; 2) systemic mastocytosis with an associated clonal, hematologic, non-mast cell lineage disease; 3) aggressive systemic mastocytosis; and 4) mast cell leukemia based on distinct clinicopathological features. Mast cell leukemia is regarded as rare form of aggressive systemic mastocytosis; accounting for less than 1% in prevalence. Georgin-Lavialle and co-workers described two distinct forms of presentation: *de novo* or secondary to previous mastocytosis and shares more clinicopathological aspects with systemic mastocytosis than with acute myeloid leukemia.² A lack of skin lesions has been described in cases of aggressive systemic mastocytosis and mast cell leukemia. However, bone marrow mastocytosis (BMM), a subvariant of indolent systemic mastocytosis was recognized by the 2008 WHO classification.¹ But when a diagnosis in absence of typical skin involvement is to be rendered, it presents a challenge for clinicians and pathologists alike. Some other common clinical conditions, such as unexplained anaphylaxis, osteoporosis of unknown etiology, etc pose as differential diagnoses. Moreover, indolent systemic mastocytosis without skin lesions has been frequently reported in patients with systemic allergic reaction to hymenoptera venom and raised basal tryptase.⁵

In a study by Sophie Georgin-Lavialle et al.², the median age of diagnosis of mast cell leukemia was 51.5 years with a female predominance (sex ratio (F/M) of 1.5). On physical examination, hepatomegaly and splenomegaly were the most frequent clinical signs. Gastrointestinal manifestations frequently included gastroduodenal ulcers (29%) which were often complicated by gastrointestinal hemorrhage (64%).² Gastroduodenal ulcers seem to be more frequently associated with the *KIT* D816V (12.5%) mutation than with other *KIT* mutations. Our case was a young male patient of 15 years of age.

According to a study by Robert I. Parker^{6,7}, almost 50% of pediatric patients with mast cell disease, have normal cellularity on bone marrow aspirate smears and more than 50% of them showed predominantly perivascular lesion on the bone marrow biopsy. The present case also showed marked increase in the cellularity with perivascular and paratrabeular clusters of mast cells on biopsy which were positive for various markers of mast cell.

In contrast to ISM (Indolent systemic mastocytosis), patients with ASM (Aggressive systemic mastocytosis) often presents without maculopapular skin lesion, whereas patients with MCL (mast cell leukemia) have characteristic rapidly progressive C- Finding.⁸ Irrespective of the clinical course, no curable therapy for ASM and MCL has become available till date. Rather, the primary goal for treatment is the amelioration of

symptoms and pharmacologic control of growth of neoplastic cells.

The role of cytogenetics in cases of ASM as well as MCL is very limited because of the paucity of analysis in this field. However, the proposal of role of trisomy 8 and 9 was brought forward by Lishner et al⁹, and a case report by Callera F,¹⁰ who showed positive detection of trisomies 9 and 8 by FISH (fluorescent in situ hybridization) in patients with systemic mastocytosis. On the contrary, Swolin B et al.¹¹ did not find these trisomies with FISH in patients with mastocytosis. So, there is need of more clinical research into the clinical consequences resulting from the occurrence of chromosomal abnormalities in patients with mast cell disease.

The present pediatric patient in this case report was not subjected to various tests and the biopsy from the lesion in the mediastinum as was referred to the specialized treatment centre for further management in view of the limited prognosis in these cases.

In summary, this case described herein illustrate the presentation of mast cell disease without any skin lesion with a mass in the mediastinum, hepatosplenomegaly with normal liver function test. Bone marrow showing marked infiltration of perivascular and paratrabeular region with neoplastic mast cell. A recognition of this rare entity is mandatory in order to avoid diagnostic dilemmas.

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On Direct Sum of Two Fuzzy Graphs

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Abstract- In this paper, the direct sum $G_1 \oplus G_2$ of two fuzzy graphs G_1 and G_2 is defined. It is proved that when two fuzzy graphs are effective then their direct sum need not be effective.

The degrees of the vertices in the direct sum $G_1 \oplus G_2$ of two fuzzy graphs G_1 and G_2 in terms of degrees of the vertices in the fuzzy graphs G_1 and G_2 are obtained. The lower and upper truncations of the direct sum of two fuzzy graphs are obtained. The regular property and connectedness of the direct sum of two fuzzy graphs are also studied.

Index Terms- Fuzzy Graph, Direct Sum, Effective Fuzzy Graph, Regular Fuzzy Graph, Connectedness, Upper and Lower Truncations.

I. INTRODUCTION

Fuzzy graph theory was introduced by Azriel Rosenfeld in 1975. The properties of fuzzy graphs have been studied by Azriel Rosenfeld[7]. Later on, Bhattacharya[6] gave some remarks on fuzzy graphs, and some operations on fuzzy graphs were introduced by Mordeson.J.N. and Peng.C.S.[3]. The conjunction of two fuzzy graphs was defined by Nagoor Gani.A and Radha.K.[4].

In this paper, the direct sum of two fuzzy graphs is defined.

The degree of a vertex in the direct sum $G_1 \oplus G_2$ of two fuzzy graphs G_1 and G_2 in terms of degrees of the vertices in the fuzzy graphs G_1 and G_2 is obtained. This has been illustrated through some examples. The regular properties of the direct sum of two fuzzy graphs have been studied. It is illustrated that the direct sum $G_1 \oplus G_2$ of two connected fuzzy graphs G_1 and G_2 need not be a connected fuzzy graph.

A fuzzy graph G is a pair of functions $G:(\sigma, \mu)$ where σ is a fuzzy subset of a non empty set V and μ is a symmetric fuzzy relation on σ . The underlying crisp graph of $G:(\sigma, \mu)$ is denoted by $G^*(V, E)$ where $E \subseteq V \times V$. Let $G:(\sigma, \mu)$ be a fuzzy graph.

The underlying crisp graph of $G:(\sigma, \mu)$ is denoted by $G^*(V, E)$ where $E \subseteq V \times V$. A fuzzy graph G is an effective fuzzy graph if $\mu(uv) = \sigma(u) \wedge \sigma(v)$ for all $uv \in E$. G is complete if $\mu(uv) = \sigma(u) \wedge \sigma(v)$ for all $u, v \in V$. Therefore G is a complete fuzzy graph if and only if G is an effective fuzzy graph and G^* is complete. (σ', μ') is a spanning fuzzy subgraph of (σ, μ) if $\sigma' = \sigma$ and $\mu' \subseteq \mu$, that is, if $\sigma'(u) = \sigma(u)$ for every $u \in V$ and $\mu'(e) \leq \mu(e)$ for every $e \in E$.

$$d_G(u) = \sum_{u \neq v} \mu(uv)$$

The degree of a vertex u is defined as

Since $\mu(uv) > 0$ for $uv \in E$ and $\mu(uv) = 0$ for $uv \notin E$, this can be

$$d_G(u) = \sum_{uv \in E} \mu(uv)$$

expressed as

Let $G:(\sigma, \mu)$ be a fuzzy graph on $G^*(V, E)$. If $d_G(v) = k$ for all $v \in V$, that is, if each vertex has same degree k , then G is said to be a regular fuzzy graph of degree k or a k -regular fuzzy graph.

Let $G:(\sigma, \mu)$ be a fuzzy graph on G^* . The total degree of a

$$td_G(u) = \sum_{uv \in E} \mu(uv) + \sigma(u)$$

vertex $u \in V$ is defined by

$= d_G(u) + \sigma(u)$. If each vertex of G has the same total degree k , then G is said to be a totally regular fuzzy graph of total degree k or a k -totally regular fuzzy graph.

The lower and upper truncations[2] of σ at level t , $0 < t \leq 1$, are the fuzzy subsets $\sigma^{(t)}$ and $\sigma^{(t)}$ defined respectively by ,

$$\sigma^{(t)}(u) = \begin{cases} \sigma(u), & \text{if } u \in \sigma^t \\ 0, & \text{if } u \notin \sigma^t \end{cases} \text{ and } \sigma^{(t)}(u) = \begin{cases} t, & \text{if } u \in \sigma^t \\ \sigma(u), & \text{if } u \notin \sigma^t \end{cases}$$

Let $G:(\sigma, \mu)$ be a fuzzy graph with underlying crisp graph $G^*(V, E)$. Take $V^{(t)} = \sigma^t$, $E^{(t)} = \mu^t$. Then $G^{(t)}:(\sigma^{(t)}, \mu^{(t)})$ is a fuzzy graph with underlying crisp graph $G^{(t)*}:(V^{(t)}, E^{(t)})$. This is called the lower truncation[5] of the fuzzy graph G at level t . Here $V^{(t)}$ and $E^{(t)}$ may be proper subsets of V and E respectively. Take $V^{(t)} = V$, $E^{(t)} = E$. Then $G^{(t)}:(\sigma^{(t)}, \mu^{(t)})$ is a fuzzy graph with underlying crisp graph $G^{(t)*}:(V^{(t)}, E^{(t)})$. This is called the upper truncation of the fuzzy graph G at level t .

II. DIRECT SUM

Let $G_1:(\sigma_1, \mu_1)$ and $G_2:(\sigma_2, \mu_2)$ denote two fuzzy graphs with underlying crisp graphs $G_1^*:(V_1, E_1)$ and $G_2^*:(V_2, E_2)$ respectively. Let $V = V_1 \cup V_2$ and let $E = \{uv / u, v \in V; uv \in E_1 \text{ or } uv \in E_2 \text{ but not both}\}$. Define $G:(\sigma, \mu)$ by

$$\sigma(u) = \begin{cases} \sigma_1(u), & \text{if } u \in V_1 \\ \sigma_2(u), & \text{if } u \in V_2 \\ \sigma_1(u) \vee \sigma_2(u), & \text{if } u \in V_1 \cup V_2 \end{cases} \text{ and } \mu(uv) = \begin{cases} \mu_1(uv), & \text{if } uv \in E_1 \\ \mu_2(uv), & \text{if } uv \in E_2 \end{cases}$$

Then if $uv \in E_1$, $\mu(uv) = \mu_1(uv) \leq \sigma_1(u) \wedge \sigma_1(v) \leq \sigma(u) \wedge \sigma(v)$, if $uv \in E_2$, $\mu(uv) = \mu_2(uv) \leq \sigma_2(u) \wedge \sigma_2(v) \leq \sigma(u) \wedge \sigma(v)$. Therefore (σ, μ) defines a fuzzy graph. This is called the direct sum of two fuzzy graphs.

2.1 Example

The following Fig.1 gives an example of the direct sum of two fuzzy graphs which have distinct edge sets.

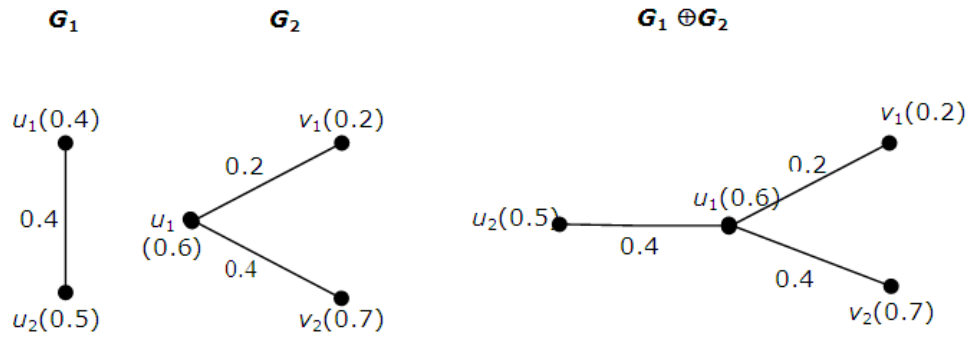


Figure 1: Direct sum of two fuzzy graphs with disjoint edge sets

2.2 Example

The following Fig.2 gives an example of the direct sum of two fuzzy graphs in which the edge sets are not disjoint.

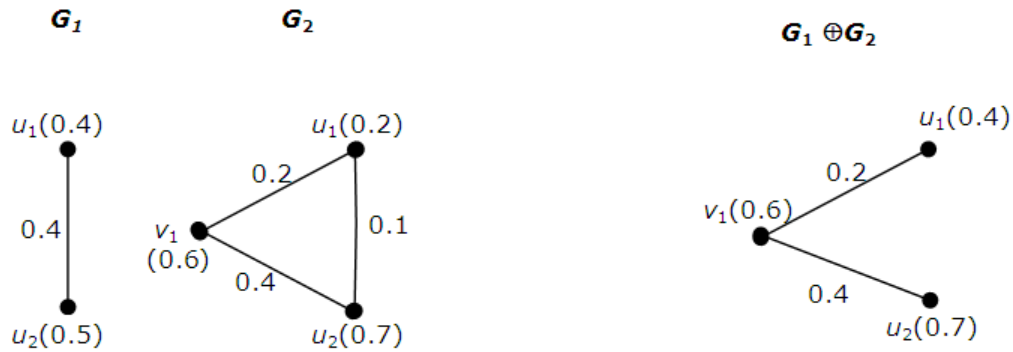


Figure 2: Direct sum of two fuzzy graphs with non-disjoint edge sets

2.3 Remark

If G_1 and G_2 are two effective fuzzy graphs, their direct sum $G_1 \oplus G_2$ need not be an effective fuzzy graph which can be seen from the example in Figure 3.

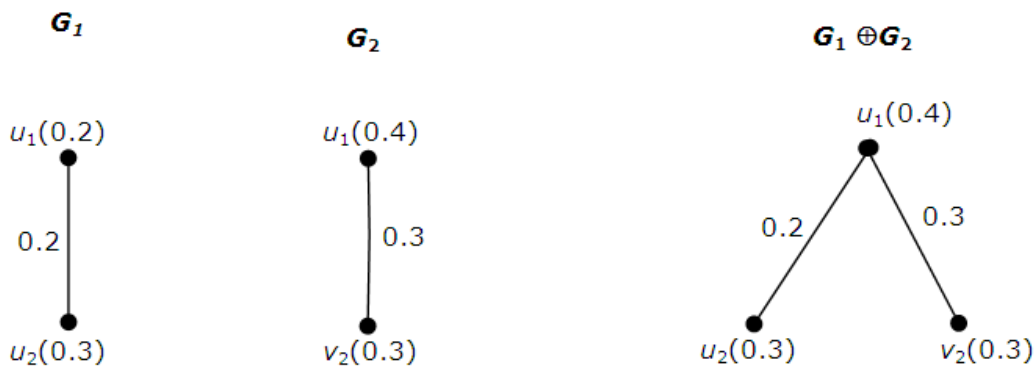


Figure 3: Direct sum of two effective fuzzy graphs

2.4 Theorem

If G_1 and G_2 are two effective fuzzy graphs such that no edge of $G_1 \oplus G_2$ has both ends in $V_1 \cap V_2$ and every edge uv of $G_1 \oplus G_2$ with one end $u \in V_1 \cap V_2$ and $uv \in E_1$ (or E_2) is such that $\sigma_1(u) \geq \sigma_1(v)$ [or $\sigma_2(u) \geq \sigma_2(v)$], then $G_1 \oplus G_2$ is an effective fuzzy graph.

Proof: Let uv be an edge of $G_1 \oplus G_2$. We have two cases to consider.

Case 1: $u, v \notin V_1 \cap V_2$.

Then $u, v \in V_1$ or V_2 but not both.

Suppose that $u, v \in V_1$. Then $uv \in E_1$.

Therefore $\sigma(u) = \sigma_1(u)$, $\sigma(v) = \sigma_1(v)$ and $\mu(uv) = \mu_1(uv)$.

Also since G_1 is an effective fuzzy graph, $\mu(uv) = \mu_1(uv) = \sigma_1(u) \wedge \sigma_1(v) = \sigma(u) \wedge \sigma(v)$.

The proof is similar if $u, v \in V_2$.

Case 2: $u \in V_1 \cap V_2, v \notin V_1 \cap V_2$. (or vice versa).

Without loss of generality, assume that $v \in V_1$.

Then $\sigma(v) = \sigma_1(v)$. By hypothesis, $\sigma_1(u) \geq \sigma_1(v)$.

Now $\sigma(u) = \sigma_1(u) \vee \sigma_2(u) \geq \sigma_1(u) \geq \sigma_1(v) = \sigma(v)$. So $\sigma(u) \wedge \sigma(v) = \sigma(v)$.

Hence $\mu(uv) = \mu_1(uv) = \sigma_1(u) \wedge \sigma_1(v) = \sigma_1(v) = \sigma(v) = \sigma(u) \wedge \sigma(v)$.

Therefore $G_1 \oplus G_2$ is an effective fuzzy graph.

III. TRUNCATIONS OF THE DIRECT SUM OF TWO FUZZY GRAPHS

3.1 Theorem

$(G_1 \oplus G_2)_{(t)}$ is a spanning fuzzy sub graph of $G_{1(t)} \oplus G_{2(t)}$.

Proof: First we prove that $(\sigma_1 \oplus \sigma_2)_{(t)} = \sigma_{1(t)} \oplus \sigma_{2(t)}$.

It follows from the definitions that if $u \in V_i, (\sigma_1 \oplus \sigma_2)_{(t)}(u) = \sigma_{i(t)}(u) = (\sigma_{1(t)} \oplus \sigma_{2(t)})(u), i = 1, 2$. Let $u \in V_1 \cap V_2$.

Without loss of generality, assume that $\sigma_1(u) \leq \sigma_2(u)$.

Then $(\sigma_1 \oplus \sigma_2)(u) = \sigma_2(u)$ gives $(\sigma_1 \oplus \sigma_2)_{(t)}(u) = \sigma_{2(t)}(u)$ (1)

Now we claim that $\sigma_1(u) \leq \sigma_2(u)$ implies $\sigma_{1(t)}(u) \leq \sigma_{2(t)}(u)$.

If $t \leq \sigma_1(u) \leq \sigma_2(u)$, then $\sigma_{1(t)}(u) = \sigma_1(u) \leq \sigma_2(u) = \sigma_{2(t)}(u)$.

If $\sigma_1(u) < t \leq \sigma_2(u)$, then $\sigma_{1(t)}(u) = 0 < \sigma_{2(t)}(u) = \sigma_2(u)$.

If $\sigma_1(u) \leq \sigma_2(u) < t$, then $\sigma_{1(t)}(u) = 0 = \sigma_{2(t)}(u)$.

Hence $\sigma_{1(t)}(u) \leq \sigma_{2(t)}(u)$. Therefore $(\sigma_{1(t)} \oplus \sigma_{2(t)})(u) = \sigma_{2(t)}(u)$ (2)

From (1) & (2), $(\sigma_1 \oplus \sigma_2)_{(t)}(u) = (\sigma_{1(t)} \oplus \sigma_{2(t)})(u)$. Hence $(\sigma_1 \oplus \sigma_2)_{(t)} = \sigma_{1(t)} \oplus \sigma_{2(t)}$.

Next we prove that $(\mu_1 \oplus \mu_2)_{(t)} \leq \mu_{1(t)} \oplus \mu_{2(t)}$. For this, we consider the following three cases:

Case 1: $uv \in E_1 \cap E_2$ with either $\mu_1(uv) \geq t$ or $\mu_2(uv) \geq t$ but not both.

Suppose that $\mu_1(uv) \geq t$. Then $\mu_2(uv) < t$. So $\mu_{1(t)}(uv) = \mu(uv)$ and $\mu_{2(t)}(uv) = 0$.

Hence the edge uv will be in $G_{1(t)} \oplus G_{2(t)}$ with $(\mu_{1(t)} \oplus \mu_{2(t)})(uv) = \mu(uv)$.

Since $uv \in E_1 \cap E_2, (\mu_1 \oplus \mu_2)(uv) = 0 \Rightarrow (\mu_1 \oplus \mu_2)_{(t)}(uv) = 0$.

Therefore $(\mu_1 \oplus \mu_2)_{(t)}(uv) < (\mu_{1(t)} \oplus \mu_{2(t)})(uv)$. The proof is similar if $\mu_2(uv) \geq t$.

Case 2: $uv \in E_1 \cap E_2$ with either $\mu_1(uv) < t, \mu_2(uv) < t$ or $\mu_1(uv) \geq t, \mu_2(uv) \geq t$.

Since $uv \in E_1 \cap E_2, (\mu_1 \oplus \mu_2)_{(t)}(uv) = 0$.

If $\mu_i(uv) < t$, then $\mu_{i(t)}(uv) = 0, i = 1, 2$. So $(\mu_{1(t)} \oplus \mu_{2(t)})(uv) = 0$.

If $\mu_i(uv) \geq t$, then $\mu_{i(t)}(uv) = \mu_i(uv) > 0, i = 1, 2$. So $(\mu_{1(t)} \oplus \mu_{2(t)})(uv) = 0$.

Hence $(\mu_1 \oplus \mu_2)_{(t)} = \mu_{1(t)} \oplus \mu_{2(t)}$.

Case 3: $uv \in E_1$ or $uv \in E_2$ but not both.

If $uv \in E_i, (\mu_1 \oplus \mu_2)(uv) = \mu_i(uv), i = 1, 2$. Hence $(\mu_1 \oplus \mu_2)_{(t)}(uv) = \mu_{i(t)}(uv) = (\mu_{1(t)} \oplus \mu_{2(t)})(uv)$.

From the above three cases, we get $(\mu_1 \oplus \mu_2)_{(t)} \leq \mu_{1(t)} \oplus \mu_{2(t)}$.

Hence $(G_1 \oplus G_2)_{(t)}$ is a spanning fuzzy sub graph of $G_{1(t)} \oplus G_{2(t)}$.

3.2 Remark:

From the proof of the above theorem, if for any $uv \in E_1 \cap E_2$, we have either $\mu_1(uv) < t, \mu_2(uv) < t$ or

$\mu_1(uv) \geq t, \mu_2(uv) \geq t$, then $(G_1 \oplus G_2)_{(t)} = G_{1(t)} \oplus G_{2(t)}$.

3.3 Theorem:

$(G_1 \oplus G_2)_{(t)} = G_{1(t)} \oplus G_{2(t)}$.

Proof: First we prove that $(\sigma_1 \oplus \sigma_2)_{(t)} = \sigma_{1(t)} \oplus \sigma_{2(t)}$.

It follows from the definitions that if $u \in V_i, (\sigma_1 \oplus \sigma_2)_{(t)}(u) = \sigma_{i(t)}(u) = (\sigma_{1(t)} \oplus \sigma_{2(t)})(u), i = 1, 2$.

Let $u \in V_1 \cap V_2$. Without loss of generality, assume that $\sigma_1(u) \leq \sigma_2(u)$.

Then proceeding as in the previous Theorem, that $(\sigma_1 \oplus \sigma_2)_{(t)}(u) = (\sigma_{1(t)} \oplus \sigma_{2(t)})(u)$.

Hence $(\sigma_1 \oplus \sigma_2)_{(t)}(u) = (\sigma_{1(t)} \oplus \sigma_{2(t)})(u)$.

Next we prove that $(\mu_1 \oplus \mu_2)_{(t)} = \mu_{1(t)} \oplus \mu_{2(t)}$.

For this, we consider the following two cases:

Case 1: $uv \in E_1 \cap E_2$.

Then $(\mu_1 \oplus \mu_2)(uv) = 0 \Rightarrow (\mu_1 \oplus \mu_2)_{(t)}(uv) = 0$. Since $\mu_i(uv) > 0, \mu_{i(t)}(uv) > 0, i = 1, 2$.

Therefore the edge uv will not be in $G_{1(t)} \oplus G_{2(t)}$. So $(\mu_{1(t)} \oplus \mu_{2(t)})(uv) = 0$.

Hence $(\mu_1 \oplus \mu_2)_{(t)}(uv) = (\mu_{1(t)} \oplus \mu_{2(t)})(uv)$.

Case 2: $uv \in E_1$ or $uv \in E_2$ but not both.

If $uv \in E_i, (\mu_1 \oplus \mu_2)_{(t)}(uv) = \mu_i(uv), i = 1, 2$.

Hence $(\mu_1 \oplus \mu_2)(uv) = \mu_1(t)(uv) = (\mu_{1(t)} \oplus \mu_{2(t)})(uv)$.
 From the above two cases, we get $(\mu_1 \oplus \mu_2)(uv) = (\mu_{1(t)} \oplus \mu_{2(t)})(uv)$.
 Hence : $(G_1 \oplus G_2)(t) = G_{1(t)} \oplus G_{2(t)}$.

IV. DEGREE OF A VERTEX IN THE DIRECT SUM

In this section we find the degrees of the vertices in the direct sum $G_1 \oplus G_2$ of two fuzzy graphs G_1 and G_2 in terms of degrees of the vertices in the fuzzy graphs G_1 and G_2 .

4.1 Theorem:

The degree of a vertex in $G_1 \oplus G_2 : (\sigma, \mu)$ in terms of the degrees of the vertices in $G_1(\sigma_1, \mu_1)$ and $G_2(\sigma_2, \mu_2)$ is given by,

$$d_{G_1 \oplus G_2}(u) = \begin{cases} d_{G_1}(u), & \text{if } u \in V_1 - V_2 \\ d_{G_2}(u), & \text{if } u \in V_2 - V_1 \\ d_{G_1}(u) + d_{G_2}(u), & \text{if } u \in V_1 \cap V_2 \text{ and } E_1 \cap E_2 = \phi \\ [d_{G_1}(u) + d_{G_2}(u)] - \sum_{uv \in E_1 \cap E_2} [\mu_1(uv) + \mu_2(uv)], & \text{if } u \in V_1 \cap V_2 \text{ and } E_1 \cap E_2 \neq \phi \end{cases}$$

Proof:

For any vertex in the direct sum $G_1 \oplus G_2 : (\sigma, \mu)$ we have three cases to consider.

Case (1)

Either $u \in V_1$ or $u \in V_2$ but not both. Then no edge incident at u lies in $E_1 \cap E_2$.

So $(\mu_1 \oplus \mu_2)(uv) = \begin{cases} \mu_1(uv) & \text{if } u \in V_1 \text{ (i.e) if } uv \in E_1 \\ \mu_2(uv) & \text{if } u \in V_2 \text{ (i.e) if } uv \in E_2 \end{cases}$

Hence if $u \in V_1$, then $d_{G_1 \oplus G_2}(u) = \sum_{uv \in E_1} \mu_1(uv) = d_{G_1}(u)$ and

if $u \in V_2$, then $d_{G_1 \oplus G_2}(u) = \sum_{uv \in E_2} \mu_2(uv) = d_{G_2}(u)$

Case (2)

$u \in V_1 \cap V_2$ but no edge incident at u lies in $E_1 \cap E_2$. Then any edge incident at u is either in E_1 or in E_2 but not in $E_1 \cap E_2$.

Also all these edges are included in $G_1 \oplus G_2 : (\sigma, \mu)$.

Hence the degree of u in $G_1 \oplus G_2 : (\sigma, \mu)$ is given by,

$$\begin{aligned} d_{G_1 \oplus G_2}(u) &= \sum_{uv \in E} (\mu_1 \oplus \mu_2)(uv) \\ &= \sum_{uv \in E_1} \mu_1(uv) + \sum_{uv \in E_2} \mu_2(uv) \\ &= [d_{G_1}(u) + d_{G_2}(u)] \end{aligned}$$

Case (3)

$u \in V_1 \cap V_2$ and some edges incident at u are in $E_1 \cap E_2$. By the definition, any edge in $E_1 \cap E_2$ will not be included in $G_1 \oplus G_2 : (\sigma, \mu)$. Then the degree of u in the direct sum $G_1 \oplus G_2 : (\sigma, \mu)$ is

$$\begin{aligned}
 d_{G_1 \oplus G_2}(u) &= \sum_{uv \in E} (\mu_1 \oplus \mu_2)(uv) \\
 &= \sum_{uv \in E_1 - E_2} \mu_1(uv) + \sum_{uv \in E_2 - E_1} \mu_2(uv) \\
 &= \sum_{uv \in E_1 - E_2} \mu_1(uv) + \sum_{uv \in E_2 - E_1} \mu_2(uv) + \sum_{uv \in E_1 \cap E_2} [\mu_1(uv) + \mu_2(uv)] - \sum_{uv \in E_1 \cap E_2} [\mu_1(uv) + \mu_2(uv)] \\
 &= \left\{ \sum_{uv \in E_1 - E_2} \mu_1(uv) + \sum_{uv \in E_1 \cap E_2} \mu_1(uv) \right\} + \left\{ \sum_{uv \in E_2 - E_1} \mu_2(uv) + \sum_{uv \in E_1 \cap E_2} \mu_2(uv) \right\} - \sum_{uv \in E_1 \cap E_2} [\mu_1(uv) + \mu_2(uv)] \\
 &= [d_{G_1}(u) + d_{G_2}(u)] - \sum_{uv \in E_1 \cap E_2} [\mu_1(uv) + \mu_2(uv)]
 \end{aligned}$$

From the above two cases we conclude that the degree of the vertex in $G_1 \oplus G_2$ in terms of the degrees of the vertices in $G_1:(\sigma_1, \mu_1)$ and $G_2:(\sigma_2, \mu_2)$ is obtained as follows:

$$d_{G_1 \oplus G_2}(u) = \begin{cases} d_{G_1}(u), & \text{if } u \in V_1 - V_2 \\ d_{G_2}(u), & \text{if } u \in V_2 - V_1 \\ d_{G_1}(u) + d_{G_2}(u), & \text{if } u \in V_1 \cap V_2 \text{ and } E_1 \cap E_2 = \phi \\ [d_{G_1}(u) + d_{G_2}(u)] - \sum_{uv \in E_1 \cap E_2} [\mu_1(uv) + \mu_2(uv)], & \text{if } u \in V_1 \cap V_2 \text{ and } E_1 \cap E_2 \neq \phi \end{cases}$$

Hence the theorem is proved.

4.2 Example:

Consider the two fuzzy graphs $G_1:(\sigma_1, \mu_1)$ and $G_2:(\sigma_2, \mu_2)$ in which the edge sets are disjoint and their sum $G_1 \oplus G_2 : (\sigma, \mu)$.

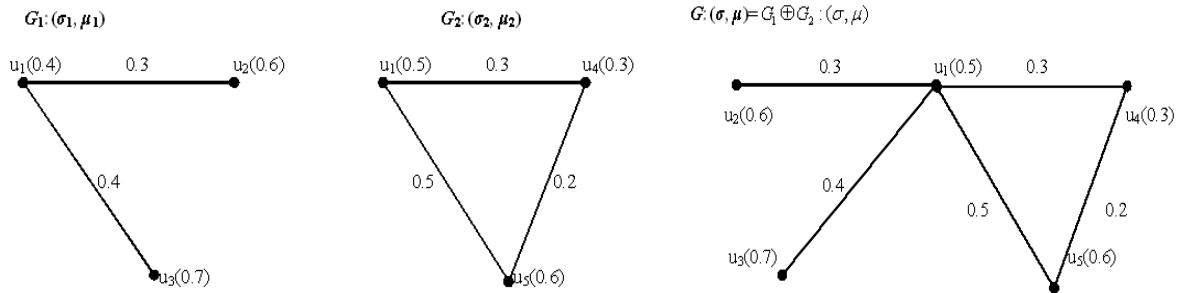


Figure 4: Degree of vertices in the Direct sum of two fuzzy graphs

The degrees of the vertices in the direct sum $G_1 \oplus G_2$ as follows:

$$\begin{aligned}
 d_{G_1 \oplus G_2}(u_1) &= 0.3 + 0.3 + 0.4 + 0.5 = 1.5; & d_{G_1 \oplus G_2}(u_2) &= 0.3; & d_{G_1 \oplus G_2}(u_3) &= 0.4; \\
 d_{G_1 \oplus G_2}(u_4) &= 0.3 + 0.2 = 0.5; & d_{G_1 \oplus G_2}(u_5) &= 0.5 + 0.2 = 0.7
 \end{aligned}$$

Now let us find the degrees of the vertices in the direct sum $G_1 \oplus G_2$ of two fuzzy graphs G_1 and G_2 in terms of degrees of the vertices in the fuzzy graphs G_1 and G_2 .

Since there is no edge in $E_1 \cap E_2$ and $u_1 \in V_1 \cap V_2$ the degree of u_1 in $G_1 \oplus G_2$ is exactly the sum of the degrees of u_1 in G_1 and G_2 . That is,

$$d_{G_1 \oplus G_2}(u_1) = d_{G_1}(u_1) + d_{G_2}(u_1) = (0.3 + 0.4) + (0.3 + 0.5) = 1.5$$

The vertices u_2 and u_3 are in V_1 only and not in V_2 . That is, $u_2, u_3 \in V_1 - V_2$. Hence the degrees of u_2 and u_3 in $G_1 \oplus G_2$ are equal to the degrees of u_2 and u_3 in G_1 . That is,

$$d_{G_1 \oplus G_2}(u_2) = d_{G_1}(u_2) = 0.3 \quad \text{and} \quad d_{G_1 \oplus G_2}(u_3) = d_{G_1}(u_3) = 0.4$$

Similarly, since $u_4, u_5 \in V_2 - V_1$, we have,

$$d_{G_1 \oplus G_2}(u_4) = d_{G_2}(u_4) = 0.5 \quad \text{and} \quad d_{G_1 \oplus G_2}(u_5) = d_{G_2}(u_5) = 0.7$$

4.3 Example:

Here is another example in which the edge sets are not disjoint.

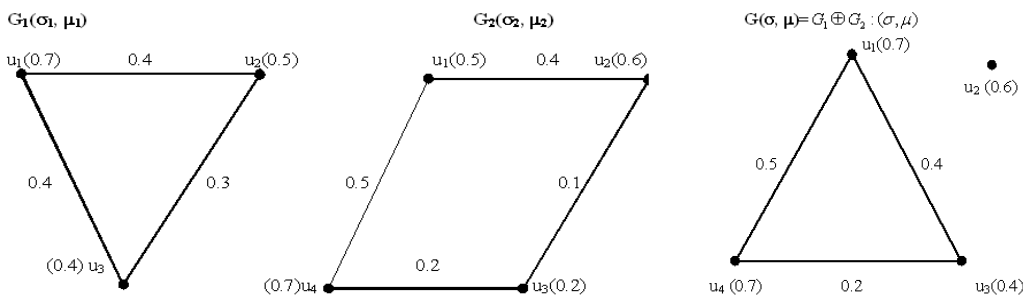


Figure 5: Degree of vertices in the Direct sum of two fuzzy graphs

Here, we have $E_1 \cap E_2 = \{u_1u_2, u_2u_3\}$.

From the graph of the direct sum $G_1 \oplus G_2 : (\sigma, \mu)$, we see that the degrees of the vertices of $G_1 \oplus G_2$ are:
 $\mu_{G_1 \oplus G_2}(u_1) = 0.4 + 0.5 = 0.9$; $\mu_{G_1 \oplus G_2}(u_3) = 0.2 + 0.4 = 0.6$; $\mu_{G_1 \oplus G_2}(u_4) = 0.2 + 0.5 = 0.7$.

Now we shall find the degrees of the vertices in $G_1 \oplus G_2$ in terms of the degrees of the vertices in $G_1 : (\sigma_1, \mu_1)$ and $G_2 : (\sigma_2, \mu_2)$.
 Since $E_1 \cap E_2 = \{u_1u_2, u_2u_3\}$ the edges u_1u_2, u_2u_3 are not in $G_1 \oplus G_2$. The vertex $u_4 \in V_2 - V_1$.

Hence by the previous case, the degree of u_4 in $G_1 \oplus G_2$ is that of u_4 in G_2 . That is,

$$d_{G_1 \oplus G_2}(u_4) = 0.5 + 0.2 = 0.7 = d_{G_2}(u_4)$$

Since

$$E_1 \cap E_2 \neq \emptyset$$

$$d_{G_1 \oplus G_2}(u_1) = [d_{G_1}(u_1) + d_{G_2}(u_1)] - \sum_{u_1u_i \in E_1 \cap E_2} [\mu_1(u_1u_i) + \mu_2(u_1u_i)]$$

$$= [d_{G_1}(u_1) + d_{G_2}(u_1)] - [\mu_1(u_1u_2) + \mu_2(u_1u_2)]$$

$$= [(0.4 + 0.4) + (0.5 + 0.4)] - [0.4 + 0.4]$$

$$= 0.5 + 0.4 = 0.9$$

Similarly, since $E_1 \cap E_2 \neq \emptyset$ and $u_3 \in V_1 \cap V_2$ the degree of u_3 is given by,

$$d_{G_1 \oplus G_2}(u_3) = [d_{G_1}(u_3) + d_{G_2}(u_3)] - \sum_{u_3u_i \in E_1 \cap E_2} [\mu_1(u_3u_i) + \mu_2(u_3u_i)]$$

$$= [d_{G_1}(u_3) + d_{G_2}(u_3)] - [\mu_1(u_3u_2) + \mu_2(u_3u_2)]$$

$$= [(0.4 + 0.3) + (0.2 + 0.1)] - [0.3 + 0.1]$$

$$= 0.2 + 0.4 = 0.6$$

V. DIRECT SUM OF TWO REGULAR FUZZY GRAPHS

If $G_1 : (\sigma_1, \mu_1)$ and $G_2 : (\sigma_2, \mu_2)$ are two regular fuzzy graphs then their direct sum $G_1 \oplus G_2 : (\sigma, \mu)$ need not be a regular fuzzy graph. It is illustrated with the following examples.

5.1 Example:

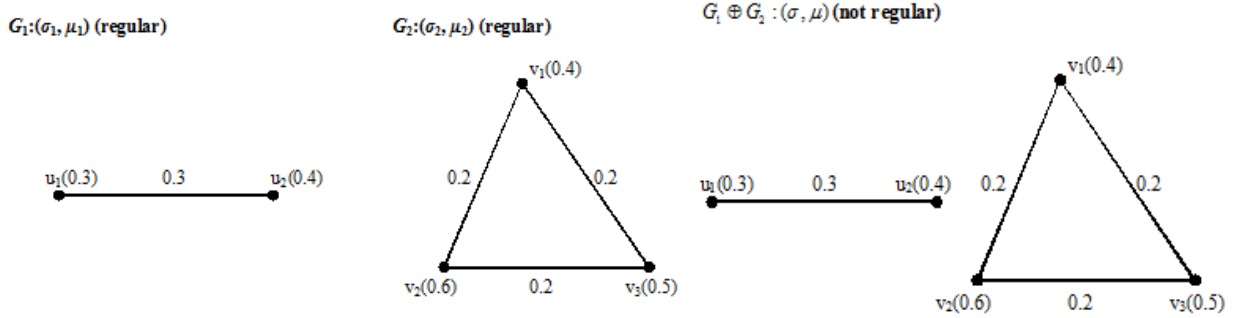


Figure 5: The Direct sum of two regular fuzzy graphs

5.2 Example:

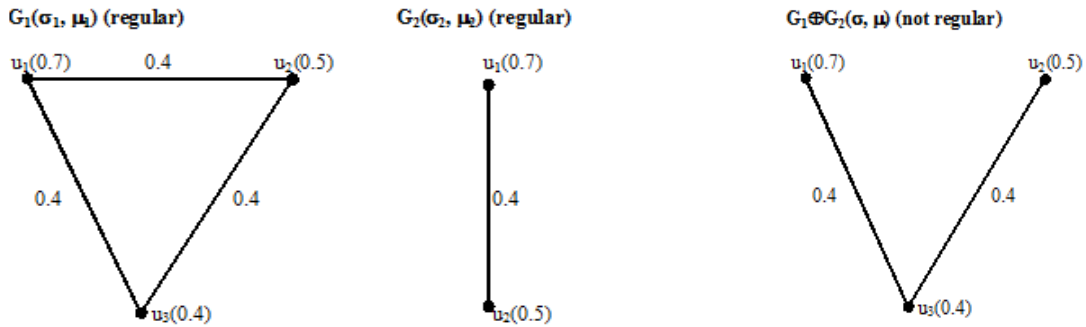


Figure 6: The Direct sum of two regular fuzzy graphs

5.3 Remark:

For the direct sum $G_1 \oplus G_2 : (\sigma, \mu)$ to be regular, $G_1 : (\sigma_1, \mu_1)$ and $G_2 : (\sigma_2, \mu_2)$ need not be regular fuzzy graphs. It is illustrated with the following examples.

5.4 Example:

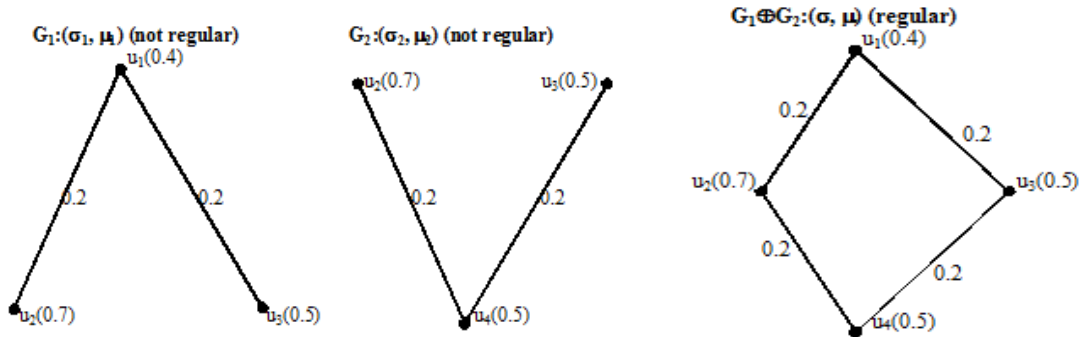


Figure 7: The Direct sum of two non-regular fuzzy graphs

5.5 Example:

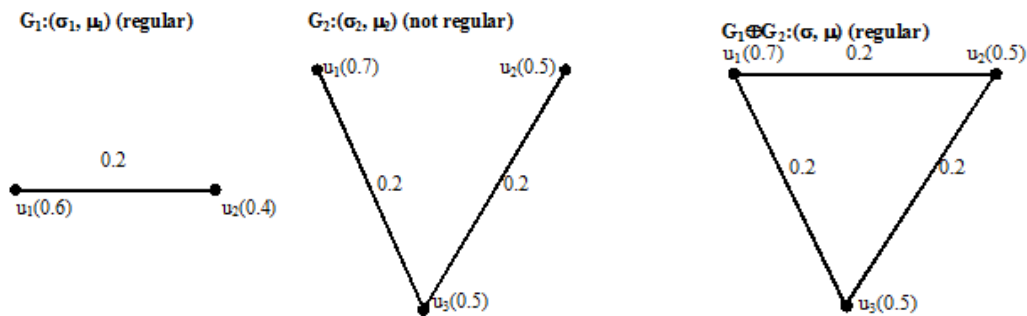


Figure 8: The Direct sum of a regular fuzzy graph and a non-regular fuzzy graph

5.6 Example:

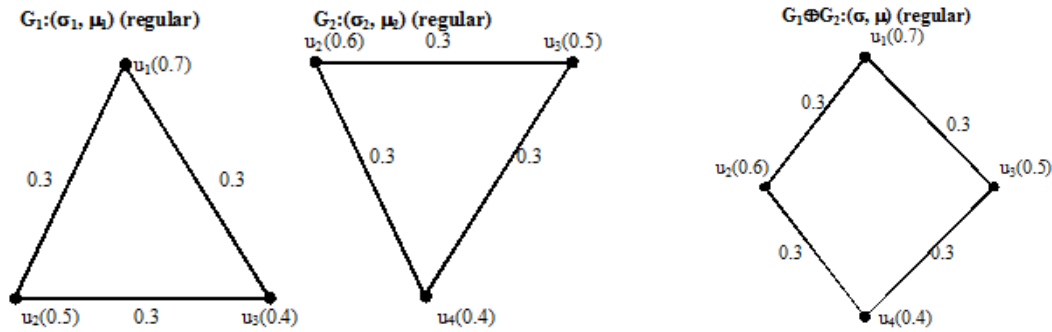


Figure 9: The Direct sum of two regular fuzzy graphs

From the above examples, we can see that there is no relationship between the regular property of the given fuzzy graphs and the direct sums of them. In the following result, we obtain the necessary and sufficient condition for the direct sum of two regular fuzzy graphs to be regular when $V_1 \cap V_2 = \phi$.

5.7 Theorem:

If $G_1:(\sigma_1, \mu_1)$ and $G_2:(\sigma_2, \mu_2)$ are regular fuzzy graphs with degrees k_1 and k_2 respectively and $V_1 \cap V_2 = \phi$ then $G_1 \oplus G_2 : (\sigma, \mu)$ is regular if and only if $k_1=k_2$.

Proof:

Let $G_1:(\sigma_1, \mu_1)$ be a k_1 -regular fuzzy graph with underlying crisp graph $G_1^*:(V_1, E_1)$ and let $G_2:(\sigma_2, \mu_2)$ be a k_2 -regular fuzzy graph with underlying crisp graph $G_2^*:(V_2, E_2)$ respectively such that $V_1 \cap V_2 = \phi$.

Assume that $G_1 \oplus G_2 : (\sigma, \mu)$ is regular.

We know that,

$$d_{G_1 \oplus G_2}(u) = \begin{cases} d_{G_1}(u), & \text{if } u \in V_1 - V_2 \\ d_{G_2}(u), & \text{if } u \in V_2 - V_1 \\ d_{G_1}(u) + d_{G_2}(u), & \text{if } u \in V_1 \cap V_2 \text{ and } E_1 \cap E_2 = \phi \\ [d_{G_1}(u) + d_{G_2}(u)] - \sum_{uv \in E_1 \cap E_2} [\mu_1(uv) + \mu_2(uv)], & \text{if } u \in V_1 \cap V_2 \text{ and } E_1 \cap E_2 \neq \phi \end{cases}$$

Since $V_1 \cap V_2 = \phi$,

$$d_{G_1 \oplus G_2}(u) = \begin{cases} d_{G_1}(u), & \text{if } u \in V_1 \\ d_{G_2}(u), & \text{if } u \in V_2 \end{cases}$$

$$d_{G_1 \oplus G_2}(u) = \begin{cases} k_1, & \text{if } u \in V_1 \\ k_2, & \text{if } u \in V_2 \end{cases}$$

Since $G_1 \oplus G_2 : (\sigma, \mu)$ is regular, $k_1=k_2$.

Conversely assume that $G_1:(\sigma_1, \mu_1)$ and $G_2:(\sigma_2, \mu_2)$ are k -regular fuzzy graphs such that $V_1 \cap V_2 = \phi$.

Then the degree of any vertex in the direct sum is given by,

$$d_{G_1 \oplus G_2}(u) = \begin{cases} d_{G_1}(u), & \text{if } u \in V_1 \\ d_{G_2}(u), & \text{if } u \in V_2 \end{cases}$$

$$d_{G_1 \oplus G_2}(u) = \begin{cases} k, & \text{if } u \in V_1 \\ k, & \text{if } u \in V_2 \end{cases}$$

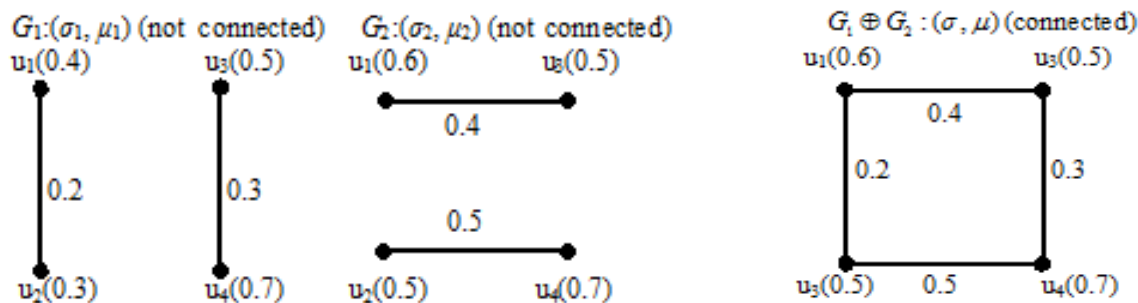
Therefore, $d_{G_1 \oplus G_2}(u) = k, \forall u \in V_1 \cup V_2$.

Hence $G_1 \oplus G_2 : (\sigma, \mu)$ is regular.

VI. DIRECT SUM OF CONNECTED FUZZY GRAPHS

If $G_1:(\sigma_1, \mu_1)$ and $G_2:(\sigma_2, \mu_2)$ are two connected fuzzy graphs then their direct sum $G_1 \oplus G_2 : (\sigma, \mu)$ need not be a connected fuzzy graph. It is illustrated with the following examples.

6.1Example:



6.2Theorem:

If $G_1:(\sigma_1, \mu_1)$ and $G_2:(\sigma_2, \mu_2)$ are two connected fuzzy graphs with underlying crisp graphs $G_1^*:(V_1, E_1)$ and $G_2^*:(V_2, E_2)$ respectively such that $E_1 \cap E_2 = \emptyset$ and $V_1 \cap V_2 \neq \emptyset$ then their direct sum $G_1 \oplus G_2 : (\sigma, \mu)$ is a connected fuzzy graph.

Proof:

Since $G_1:(\sigma_1, \mu_1)$ is a connected fuzzy graph, $\mu_1^\infty(u, v) > 0$ for all $(u, v) \in E_1$ and since $G_2:(\sigma_2, \mu_2)$ is a connected fuzzy graph, $\mu_2^\infty(u, v) > 0$ for all $(u, v) \in E_2$. Also $V_1 \cap V_2 \neq \emptyset$.

Therefore there exists at least one vertex which is in $V_1 \cap V_2$. But there is no edge in $E_1 \cap E_2$.

Hence there exists a path between any two vertices in the direct sum $G_1 \oplus G_2 : (\sigma, \mu)$ of $G_1:(\sigma_1, \mu_1)$ and $G_2:(\sigma_2, \mu_2)$.

That is $\mu_{G_1 \oplus G_2}^\infty(u, v) > 0$ for all $(u, v) \in E$. This implies that $G_1 \oplus G_2 : (\sigma, \mu)$ is connected.

6.3Remark:

If $G_1:(\sigma_1, \mu_1)$ and $G_2:(\sigma_2, \mu_2)$ are two connected fuzzy graphs with underlying crisp graphs $G_1^*:(V_1, E_1)$ and $G_2^*:(V_2, E_2)$ respectively such that $n(V_1 \cap V_2) = 1$ then their direct sum $G_1 \oplus G_2 : (\sigma, \mu)$ is a connected fuzzy graph.

VII. CONCLUSION

In this paper, the direct sum $G_1 \oplus G_2$ of two fuzzy graphs G_1 and G_2 is defined. A formula to find the degree of a vertex in the direct sum $G_1 \oplus G_2 : (\sigma, \mu)$ of two fuzzy graphs $G_1:(\sigma_1, \mu_1)$ and $G_2:(\sigma_2, \mu_2)$ in terms of the degrees of the vertices in $G_1:(\sigma_1, \mu_1)$ and $G_2:(\sigma_2, \mu_2)$ is obtained. This has been illustrated with examples. Also some of the characteristics of the direct sum of effective, regular and connected fuzzy graphs have been illustrated. Operation on fuzzy graph is a great tool to consider large fuzzy graph as a combination of small fuzzy graphs and to derive its properties from those of the small ones. A step in that direction is made through this paper.

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Design and Analysis of a Novel Multilevel Inverter Topology Suitable for Renewable Energy Sources Interfacing to AC Grid for High Power Applications

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Abstract- A novel topology for cascaded multilevel inverters which is suitable for renewable energy source interfacing to grid is proposed in this paper. The proposed topology significantly reduces the usage of number of dc voltage sources, switches, and power diodes as the number of output voltage levels increase. The world electrical energy consumption is rising and there is a steady increase of the demand on the power capacity, efficient production, distribution and utilization of electrical energy. The traditional power systems are changing, number of renewable energy sources such as wind turbines, photovoltaic generators, fuel cells, small hydro, wave generators, are being integrated into power systems at distribution level. The multilevel converters plays an essential part in the integration of the renewable energy sources. This paper reviews the application of multilevel converters in the integration of renewable energy sources. This new type of converters are suitable for high voltage and high power application due to their ability to synthesize waveforms with reduced harmonic distortion. Number of topologies have been introduced and widely studied ,amongst the CHB topology is the proper option from the point of view of modularity and simplicity of control. Main disadvantage of multilevel configuration is increase in number of power semiconductor switches and its complexity to design gate driver circuit individually, its cost and switching losses. Complexity of the system reduces reliability of the inverter. By reducing number of switches for the same levels of voltages these disadvantages can be reduced effectively This project presents a new technique for getting a synthesized multilevel output and also uses PWM control techniques for CHB topology, in this technique, the number of dc voltage sources, switches, and power diodes used for the dc to ac conversion is reduced. So this dc to ac conversion significantly reduces the initial cost. The modes of operation are outlined for 7-level inverter, as similar modes will be realized for higher levels. Simulations of seven level of the proposed inverter topology along with with experimental results are presented. MATLAB simulink environment is used to simulate the results.

Index Terms- Cascaded multilevel inverters,RES interfacing, harmonic distortion, reduced number of devices

I. INTRODUCTION

Multilevel voltage source inverter is recognized as an important alternative to the normal two level voltage

source inverter especially in high voltage application[1]. Using multilevel technique, the amplitude of the voltage is increased, stress in the switching devices is reduced and the overall harmonics profile is improved. Among the familiar topologies, the most popular one is cascaded multilevel inverter. It exhibits several attractive features such as simple circuit layout, less component counts, modular in structure and avoid unbalance capacitor voltage problem. However as the number of output level increases, the circuit becomes bulky due to the increase in the number of power devices. In this project, it is proposed to employ a new technique to obtain a multilevel output using less number of power semiconductor switches when compared to ordinary cascaded multilevel inverter, which is suitable for renewable energy source interfacing. Voltage source converters are also required for various industrial applications, smart grid technologies etc. Due to high power requirement in these applications, using one power semiconductor switch directly is not advisable. For high power and medium voltage applications multilevel converters are introduced [2]. Using multilevel converters renewable energy sources can be easily interfaced to the grid. Using several low voltage DC sources such as capacitors, batteries and renewable sources with series power semiconductor switches high power converter can be achieved. The rated voltage of the switches depends only upon the rating of DC voltage sources to which they are connected. These converters have several advantages over two level converters. Multilevel converters can generate the output voltages with low distortion and less dv/dt stresses. Small common mode voltage reduces the stress in the bearings of motor connected to multilevel converter. Input current with low distortions, range of the switching frequency are further advantages of multilevel converters. But due to large number of switches, each switch requires its related gate drive circuit increase cost and complexity. Major multilevel converter structures are Cascaded H bridge converter, Diode clamped converter, Capacitor clamped converter. Different pulse width modulation techniques developed such as sinusoidal pulse width modulation (SPWM), Selective harmonic elimination (SHE-PWM), space vector modulation (SVM) and so on[3]. In cascaded H bridge converter, depending on the number of voltage levels required, some single phase full bridges or H bridges are connected in series with individual separate DC source. Number of voltage levels is equal to $2n+1$ where n is the number of separate DC sources. In Diode clamped converter converter all of the three phases share a common DC bus, which minimize the capacitance requirements of the converter. Hence a back to back topology is possible.

Efficiency is high for fundamental frequency switching. But number of clamping diodes required is quadratic ally related to number of levels, which can be cumbersome for units with a high number of levels. Capacitor clamped or flying capacitor structure is similar to diode clamped converter except that instead of using clamped diodes, the inverter uses capacitors in their places. In this converter real and reactive power can be controlled. The large number of capacitors enables the inverter to ride through short duration outages and deep voltage sags. For real power transmission efficiency is poor in this converter. Control is complicated to track all the voltage levels of capacitors. Because of its fast response and autonomous control, the use of a multilevel converter to control the frequency and voltage output from renewable energy sources will provide significant advantages. These converters can also control the real and reactive power flow from a utility connected renewable energy source. Multilevel converters can control system dynamic behavior, also reduce power quality problems such as voltage harmonics and voltage imbalances. In case of PV system it's advantageous to use cascaded H bridge converter as each converter requires separate DC sources. Additional advantages are possible elimination of the DC/DC converters, significant reduction of the power drops caused by sun darkening and hence potential increase of efficiency and reliability. In case of wind generation, converting variable magnitude, variable frequency voltages generated from wind generator into fixed magnitude, fixed frequency voltages is more advantageous with multilevel converter to improve efficiency over a wide range of operating points and energy capture. Main disadvantage of multilevel configuration is increase in number of power semiconductor switches and its complexity to design gate driver circuit individually, its cost and switching losses. Complexity of the system reduces reliability of the inverter. By reducing number of switches for the same levels of voltages these disadvantages can be reduced effectively. A single-phase structure of an m-level cascaded inverter is illustrated in Figure 1. Each separate dc source (SDCS) is connected to a single-phase full-bridge, or H-bridge, inverter. Each inverter level can generate three different voltage outputs, $+V_{dc}$, 0, and $-V_{dc}$ by connecting the dc source to the ac output by different combinations of the four switches, S_1 , S_2 , S_3 , and S_4 . To obtain $+V_{dc}$, switches S_1 and S_4 are turned on, whereas $-V_{dc}$ can be obtained by turning on switches S_2 and S_3 . By turning on S_1 and S_2 or S_3 and S_4 , the output voltage is 0. The ac outputs of each of the different full-bridge inverter levels are connected in series such that the synthesized voltage waveform is the sum of the inverter outputs. The number of output phase voltage levels m in a cascade inverter is defined by $m = 2s+1$, where s is the number of separate dc sources.

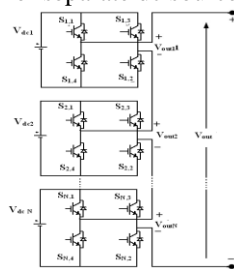


Fig1 Single-phase structure of a multilevel cascaded H-bridges inverter

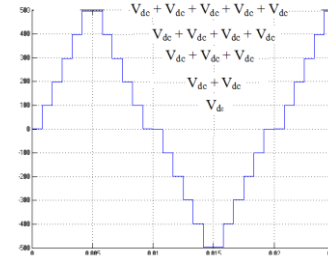


Fig 2 Output phase voltage waveform of an 11-level cascade inverter with 5 separate dc sources.

Cascaded inverters are ideal for connecting renewable energy sources with an ac grid, because of the need for separate dc sources, which is the case in applications such as photovoltaic's or fuel cells. Cascaded inverters have also been proposed for use as the main traction drive in electric vehicles, where several batteries or ultra capacitors are well suited to serve as SDCSs [4]. The cascaded inverter could also serve as a rectifier/charger for the batteries of an electric vehicle while the vehicle was connected to an ac supply as shown in Figure. Additionally, the cascade inverter can act as a rectifier in a vehicle that uses regenerative braking. The main advantages and disadvantages of multilevel cascaded H-bridge converters are as follows The number of possible output voltage levels is more than twice the number of dc sources ($m = 2s + 1$). The series of H-bridges makes for modularized layout and packaging. This will enable the manufacturing process to be done more quickly and cheaply.

II. NUMBER OF LEVELS AND VOLTAGE RATING OF ACTIVE DEVICES

A multilevel inverter, determining the number of levels will be one of the most important factors because this affects many of the other sizing factors and control techniques [5]. This margin can be incorporated into a design factor for the inverter. Because the dc link voltage and the voltage at the connection point can both vary, the design factor used in the rating selection process incorporates these elements as well as the small voltage drops that occur in the inverters during active device conduction. The product of the number of the active devices in series ($m-1$) and the voltage rating of the devices V_{dev} must then be such that

$$V_{device\ rating} \cdot (m - 1) \geq \sqrt{2} \cdot V_{nom} \cdot D_{design\ factor}$$

The minimum number of levels and the voltage rating of the active devices (IGBTs, GTOs, power MOSFETs, etc.) are inversely related to each other. More levels in the inverter will lower the required voltage device rating of individual devices; or looking at it another way, a higher voltage rating of the devices will enable a fewer minimum number of levels to be used. Increasing the number of levels does not affect the total voltage blocking capability of the active devices in each phase leg because lower device ratings can be used.

III. PROPOSED MULTILEVEL CONVERTER TOPOLOGY

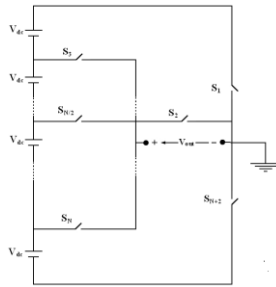


Fig 3: schematic of a Proposed multilevel converter topology

The number of required switches against required voltage levels is a very important element in the design. To provide a large number of output levels without increasing the number of bridges, a new power circuit topology and a suitable method to determine the dc voltage sources level for symmetrical and asymmetrical multilevel converter are proposed. The proposed circuit also provides decreased voltage stress on the switch by the series configuration of the applied bidirectional switches. The proposed converter consists of less number of switches when compared to the other familiar topologies. The initial cost reduces because of the switch reduction. So, it looks attractive and an apt one for industrial applications. The block diagram of the proposed multilevel inverter is shown in the the general circuit diagram of the proposed multilevel inverter is shown in the figure 2. The switches are arranged in the manner as shown in the figure. For the proposed topology, we just need to add only one switch for every increase in levels. So initial cost get reduced. Let us see operation in the next subdivision in detail for the seven-level inverter. The proposed multilevel inverter for seven levels is shown figure 3. The inverter consists of seven MOSFET switches and three separate DC sources with a load. By switching the MOSFETS at the appropriate firing angles, we can obtain the seven level output voltage. MOSFET is preferred because of its fast switching nature. The advantage of the new topology the reduction in the number of switches and hence the initial cost, Controlling becomes easier. Losses become less due to the elimination of the harmonics. Overall weight reduces because of the usage of less number of components

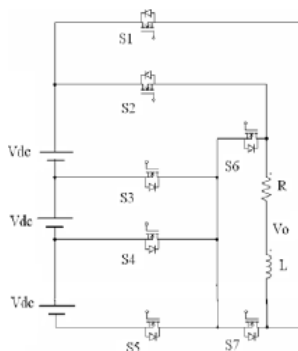


Figure 4. Circuit Diagram of a basic Seven Level Proposed Multilevel Inverter

IV. SIMULATION RESULTS

Simulation results of the proposed converter for seven levels using MATLAB/simulink. The PWM technique is used for pulse generation. The MOSFET switches are used because of its fast switching capability. The input supply for each DC source is 100V. The load used is a R-L load. The output waveform is phase voltage and it comprises seven levels. The PWM technique is used to produce the control signal . The MATLAB simulation circuit for the proposed inverter which comprises only seven MOSFET switches for producing seven levels is shown in the figure 4. The MATLAB circuit used for generating gate pulse using PWM technique is shown in the figure 6. The pulse generated by the circuit shown in the figure 10. The output waveform of the proposed inverter for seven levels with PWM technique is shown in the figure 9. The pulse is generated using comparison between constant DC voltage and power supply .The comparison is done using operational amplifiers. For the first pulse we give a DC voltage of lesser amplitude and moderate amplitude for the second pulse. Likewise we have to increase the amplitude to reduce the pulse width. The PWM technique is used to obtain a good harmonic spectrum. The gating pulse is generated from the above mentioned process and given separately to the respective MOSFETs. The supply is given through three separate DC sources. The R-L load is used for the simulation purpose. The simulation results show that the circuit is operating properly. The output waveform has three levels in the positive side and three levels in the negative side and a zero level. Totally there are seven levels. Thus the proposed multilevel inverter for seven levels is successfully simulated. And the results are shown below in sequential manner.

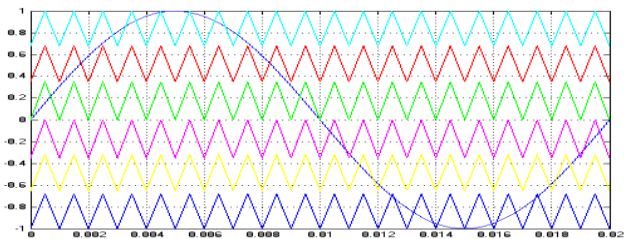


Fig 5: Triangular wave comparison with sine wave for the 7-level converter

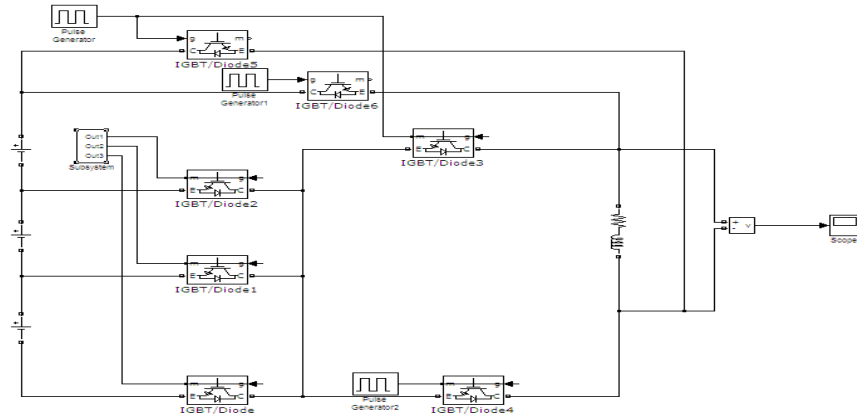


Fig 6: Proposed Multilevel Inverter for Seven Levels

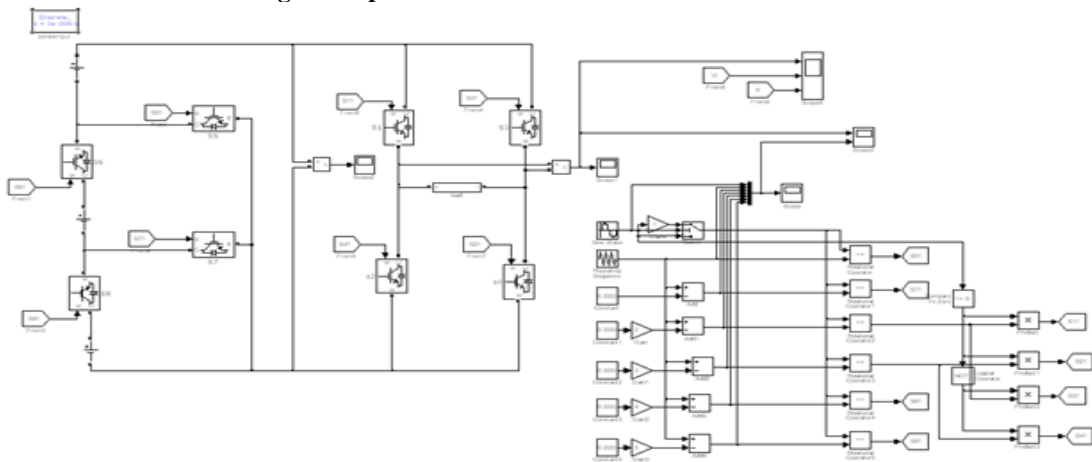


Fig 7 Simulink model of a prposed multilevel Converter

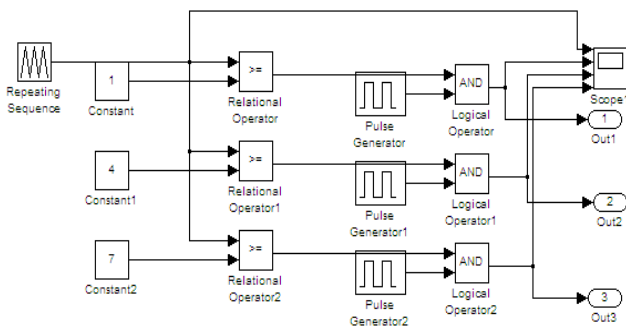


Fig 8: Gate Pulse Generation Circuit With PWM Technique

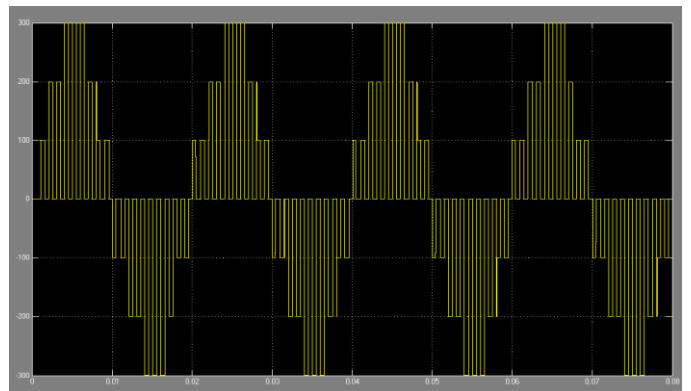


Fig 9 :Output Voltage Waveform Using PWM Technique

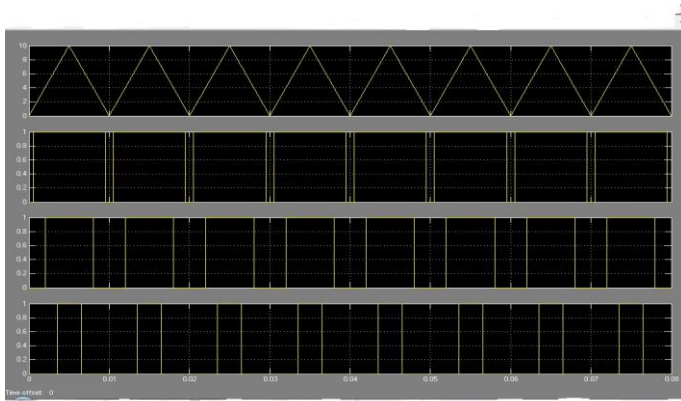


Fig 10 : Pulses Generated Using PWM Technique

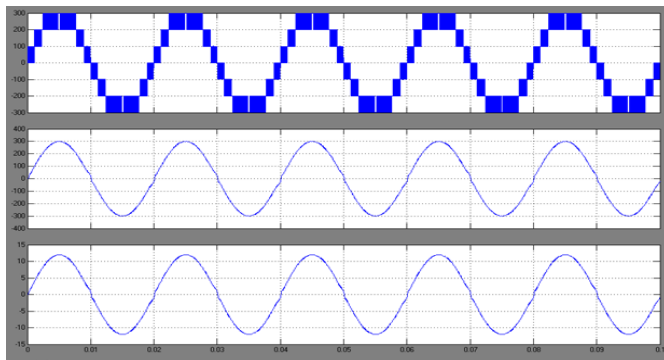


Fig 11: Input voltage, load voltage and load current

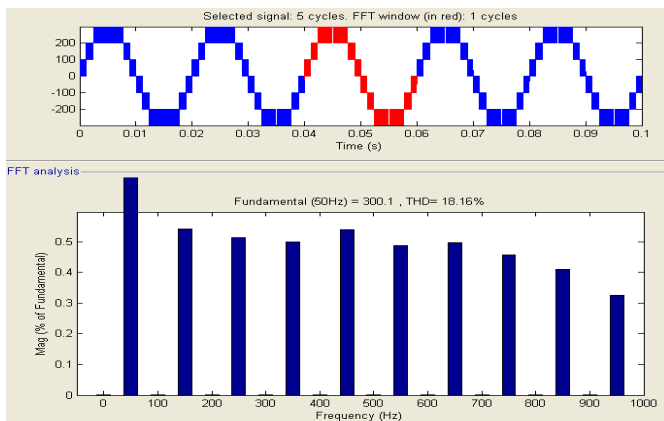


Fig 12: Input Voltage THD Response 18.16%

V. CONCLUSION

A novel multilevel converter topology development is presented in this paper. The simulation of the seven-level multilevel inverter is successfully done using pulse width modulation technique for the proposed multilevel converter. The proposed topology significantly reduces the usage of number of dc voltage sources, switches, IGBTs, and power diodes as the number of output voltage levels increase. When we increase the levels, the number of switches used is very less compared to the other topology. The most important and useful feature of the system proposed is that it is convenient for expanding and increasing the number of output levels, simply without using any

bidirectional switches. The proposed method results in the reduction of the number of switches, losses and cost of the converter. Based on the presented switching algorithm, the multilevel converter generates near-sinusoidal output voltage and as a result, has very low harmonic content.. The proposed topology provides more flexibility to designers and can generate more voltage levels without losing any level and shows lower THD characteristics.. Simulation results shows that the proposed converter topology generates a high-quality output voltage waveform with lower order THD of output voltage and current and hence which is suitable for renewable energy sources interfacing to ac grid.

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The effect of aging on cognitive function in a South Indian Population

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Abstract- Although it is known that there is a change in cognitive function with aging, different views exist on the extent, type of cognitive function involved, age of onset and the factors affecting it. We undertook this preliminary study with an aim of determining the effect of aging on cognitive function in a normal non-demented South Indian population. A simple bedside screening test, the Mini-Mental State Examination (MMSE) was administered to 50 controls aged 20-50 years (Group I), 50 normal non-demented subjects aged 60-75 years (Group II) and 50 subjects aged above 75 years (Group III) of both sexes. It was found that there was a significant difference ($p = 0.02$) between the MMSE scores of controls (28.12 ± 1.22) versus that of the subjects (27.43 ± 1.88) and that there was a significant difference ($p = 0.003$) only in the orientation subset which tests recent memory, with the controls having a mean \pm SD of 9.90 ± 0.30 and the subjects having a score of 9.63 ± 0.60 . Education had an effect on the MMSE scores. Males had higher scores in the attention and calculation subset and hypertensive subjects had significant differences in the language subset. Limitations of this study include possible inclusion of subjects who are not truly disease free; use of a simple screening test in view of the general literacy level and socio-economic status of the population studied and the fact that the results of this study may not therefore be representative.

Index Terms- Aging, cognitive function, Mini-Mental State Examination (MMSE), normal

I. INTRODUCTION

Our society is an aging society where people are living longer. Cognition refers to the thinking processes through which knowledge is gained, stored, manipulated and expressed and cognitive functions include attention, language, memory, constructional ability and higher cognitive functions like calculation. Attention and memory have been found to be the two cognitive functions that are affected the most by aging, although variations exist in age-related cognitive functions in different individuals and domains in terms of susceptibility to the effects of aging.¹ Researchers however have consistently noted several 'normal' cognitive changes with aging like slowing of reaction time, deterioration of fluid intelligence and impairment in certain aspects of short term memory.² However, Salthouse states that assumptions that the effects of aging on cognition are small and limited to memory, begin later in life only in some individuals have been proven to be incorrect in his research-he found that

scores in vocabulary test were higher with increased age until about the mid-50s, after which they remained stable or declined slightly and similar negative trends were noted in speed, reasoning and memory.³ He however found that age-related effects were apparent before age 50. A longitudinal study of cognitive decline over ten years involving results from the Whitehall II prospective cohort study showed that cognitive decline occurs at all ages between 45 and 70, even among those aged 45-49 at baseline.⁴

The Mini-Mental State Examination (MMSE)⁵ is a widely used, simple, bedside screening test for assessing global cognitive function.⁶ The results of a 5-year longitudinal study of the MMSE score in 2,537 non-demented French subjects aged 65 years and older showed that the MMSE score declines very slightly in non-demented subjects, and suggested that the cognitive processes involved are spared by the aging process.⁷ These researchers state however that they could not rule out the possibility that some MMSE sub-scores may improve with time while others decline.

Other studies have found that MMSE scores are affected by age, education^{6,8} and cultural background.⁶ Magazinger et al have even proposed the use of age- and education- specific equations and a shorter version of the MMSE to predict performance.⁹ In addition, socio-economic status also has an effect.¹⁰ However the patient's sex has not been found to have an effect on MMSE scores^{11,12}, though race and functional status did have an effect.¹¹ Baseline systolic and diastolic blood pressure have been found to be positively and significantly associated with baseline MMSE scores in a community based Swedish cohort study.¹³ Another study initiated after other researchers found mid-life high blood pressure levels are related to late cognitive decline did not find a linear association of blood pressure with cognitive decline although the relationship was thought to be more complex.¹⁴ In a 11 year follow up study of four successive age cohorts, interestingly, a significant impact of the generation factor was found leading the investigators to conclude that cognitive performance depends not only on aging but also on generation specific factors.¹⁵

In view of the findings of the above studies, the present study was done in order to determine the cognitive changes if any that occur with aging in a normal non-demented South Indian population using the Mini-Mental State Examination (MMSE).

II. AIM

The aim of our study was to determine the effect of aging on cognitive function of a normal non-demented South Indian population, using the Mini-Mental State Examination (MMSE) and to determine the effect of factors like sex, educational status, systolic blood pressure, diastolic blood pressure and co-existing systemic hypertension on cognitive function scores.

III. MATERIALS AND METHODS

This study was done in the Institute of Physiology and Experimental Medicine, Madras Medical College, Chennai and the Department of Geriatric Medicine of Government General Hospital, Chennai after the due permission and consent was obtained. 50 controls aged 20-50 years (Group I), 50 subjects aged 60-75 years (Group II) and 50 subjects aged above 75 years (Group III) of both sexes with a minimum 6th standard education took part in the study. Individuals with history or clinical evidence of neurological diseases including dementia, stroke, transient ischaemic attacks, depression, Parkinsonism, epilepsy, head injury, brain tumors or brain surgery and individuals with un-corrected visual or auditory defects were excluded.

Screening of the subjects and controls consisting of history and clinical examination was done and data recorded. Systolic and diastolic blood pressure was measured in the right upper limb using a sphygmomanometer in the sitting posture after a ten minute rest.

The Folstein Mini-Mental State Examination (MMSE),⁵ which is the most widely used bedside screening measure for global cognitive functioning⁶ was administered in the same systematic manner to all the subjects and the controls. The MMSE has a maximum score of 30 points. 5 points are for the question on orientation to time, 5 for orientation to place, 5 for attention, 3 for registration of three items, 3 for recall of the three items after five minutes, 2 for naming objects, 1 for repeating a phrase, 3 for following a three stage command, 1 for following a printed command, 1 for writing a sentence and 1 for copying a diagram. Orientation to time and space is given a total of 10 points and is the most thoroughly tested area in the MMSE. Naming objects, repeating a phrase, following a 3 stage command and a written command and finally writing test different aspects of language and are given 8 points totally. Immediate memory or registration is tested by asking the subject to repeat all three unrelated words said by the examiner and recall or short term memory is tested by asking the subject to recall the same three unrelated words after 5 minutes, each carrying 3 marks. As a test of attention and calculation, the subject is asked to serially subtract 7 from 100 or to spell world backwards to test attention. Visual, spatial and constructional abilities are tested together in the MMSE by asking the subject to copy a figure of intersecting pentagons. In general, scores below 24 are taken as indicating cognitive impairment. However, there is a grey area of scores of 24 to 28 where generally adjustment needs to be made for age, education and socio-economic status.

Based on the clear scoring instructions of the MMSE, scores were given to each of the 100 subjects and the 50 controls. Means and standard deviations were determined for each group using SPSS and comparison of the MMSE scores of subjects and

controls and then separately of all three groups was done using ANOVA and Bonferroni method. The same procedure of comparison was followed for the subset scores also. Finally, the effect of sex, educational status, systolic blood pressure, diastolic blood pressure and co-existing systemic hypertension on the MMSE cognitive function scores was determined using logistic regression.

IV. RESULTS

Analysis of the MMSE score of controls (Group I) and subjects (Group II+ Group III) showed that there was a significant difference in scores (Table 1).

Table 1 - Comparison of the Mini-Mental State Examination (MMSE) scores of controls (Group I) & subjects (Group II + Group III)

Group I (n = 50)	Group II & Group III (n = 100)	p Value
28.12 ± 1.22	27.43 ± 1.88	0.02

Results are expressed as mean and standard deviation of the total MMSE scores, the maximum score being 30. p < 0.05 = significant

Although the MMSE score of controls (Group I) versus Group II was not significant, the comparison of the MMSE score of controls (Group I) versus Group III and Group II versus Group III was found to be very highly significant and significant respectively (Table 2).

Table 2 - Comparison of the Mini-Mental State Examination (MMSE) scores of the three groups

Group I	Group II	Group III	Category	p Value
28.12 ± 1.22	27.94 ± 1.43	26.92 ± 2.13	I vs II	1.000
			I vs III	0.001
			II vs III	0.007

Results are expressed as mean and standard deviation of the total MMSE scores, the maximum score being 30. p > 0.05 = not significant, p < 0.05 = significant, p < 0.001 = highly significant.

Comparison of the MMSE subset score of Group I versus Group II + Group III showed a significant difference ($p=0.003$) only in the Orientation subset with Group I having a mean \pm SD of 9.90 ± 0.30 and Group II + Group III having a score of 9.63 ± 0.60 out of the possible maximum score of 10.

Comparison of the MMSE subset scores of the 3 groups is shown in Table 3 in the Appendix. Analysis of the frequency distribution of MMSE score of the controls (Group I) and subjects (Group II + Group III) using class intervals of ≤ 23 , 24-28 and 29-30 was not significant, with a p value of 0.223.

Results of analysis of the influence of various factors on the MMSE score showed that education did have an effect on the score. Males had higher scores on the attention and calculation subsets. There was no relationship between MMSE scores and systolic and diastolic blood pressure measured concurrently, although there was a significant difference in the language subset in subjects with history of hypertension.

V. DISCUSSION

The present study done to assess the effect of aging on cognitive function showed that the Mini-Mental State Examination (MMSE) scores were affected with aging, with there being a significant difference in the MMSE score of controls and subjects. This is in agreement with the findings of other studies^{6,8,9}, but differs from the 5-year longitudinal study of the MMSE on aging⁷ which suggested that the cognitive processes involved are spared by the process of aging. However there appears to be evidence of only a late decline in cognitive function in the subjects of our study as comparison of score of controls (Group I) versus Group III subjects aged above 75 years was very highly significant while there was no significant difference in MMSE score of controls (Group I) versus Group II who were aged 60-75 years. These findings are to be compared with those of the Whitehall II study⁴, that unlike other studies found that cognitive decline occurs at all ages between 45 and 70, even among those aged 45-49 at baseline.

Even though there was a significant difference in MMSE scores of controls and subjects, further analysis of the MMSE subset scores in the three groups was done keeping in mind the findings of the 5-year longitudinal study of the MMSE score in non-demented French subjects aged 65 years and the researcher's statement that they could not rule out the possibility that some subset scores could improve while others decline.⁷ Our study revealed that subjects showed significant decline only in the orientation subset of the MMSE that tests recent memory. These results are to be taken in the context that orientation is the most thoroughly addressed area in the MMSE and accounts for one third of the total MMSE score. It has also been found that the MMSE is not sensitive for discriminating between age-related cognitive change, mild cognitive impairment and early dementia.¹⁶

In our study, there was no significant difference in performance of controls and subjects in the registration (immediate memory), 5 minute recall (that tests short term auditory memory) and language subsets of the MMSE. The lack

of significant difference in 5 minute recall scores does not agree with the findings of previous researchers who found impairment in short term memory with aging.^{1,2} Language processing has been stated to be generally unaffected with age, although processing speed may become slower¹, which could explain the findings of our study. It is also important to remember that the language subset of the MMSE tests only naming, repetition, reading, auditory comprehension and writing.

An interesting finding of our study was that subjects aged 60-75 years of Group II had the highest scores in the attention and calculation subset (Table 3 in Appendix) and although the difference between the controls (Group I) and them was not significant, the difference between them and Group III aged above 75 years was significant. The probable reason for this high score in calculation could reflect childhood training and lack of dependences on calculators or could be the result of greater exposure to simple mental calculations in day to day life. In the visual-constructional ability subset it was found that there were significant changes between Group I and Group III and also between Group I and Group III.

Like other studies^{6,8}, our study also showed that education had an effect on the MMSE scores, even though we had taken care to only enroll subjects with a minimum 6th standard education. Our finding that males had higher scores in the attention and calculation subset of the MMSE which differs from other studies that did not find any effect of sex on MMSE scores^{11,12} could be explained by possible greater exposure of males to situations involving calculation and education. However our finding that hypertensive subjects had significant differences only in the language subset of MMSE is in contradiction to other studies where researchers have proved that mid-life high blood pressure levels are related to late cognitive decline.¹⁴ Adequate hypertensive control could be a possible explanation. Our finding that there was no relationship between MMSE scores and systolic and diastolic blood pressure measured concurrently differs from the Swedish cohort study¹³ which found that it was positively and significantly associated with baseline MMSE scores.

In conclusion, our study confirms that cognitive function changes with aging with recent memory showing a decline; there being no change in certain cognitive functions like short term auditory memory, immediate memory and language; while attention and calculation seemed to be somewhat enhanced in later periods of life - which though not statistically significant, could possibly be clinically significant. Education had an effect on MMSE scores. Males had higher scores in the attention and calculation subset and hypertensive subjects had significant differences only in the language subset of the MMSE.

A major limitation of this study, which is common to all cross sectional studies, is the possible inclusion of subjects with occult dementia. This study used the MMSE that is commonly used in Indian institutions keeping in mind the general literacy level and socio-economic status of subjects attending government hospitals, further studies can be done using more specific psychometric tests on a more varied South Indian population to

be more representative.

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APPENDIX

Table 3 - Comparison of the Mini-Mental State Examination (MMSE) subset scores of the 3 groups

MMSE subsets	Group I (Mean ± SD)	Group II (Mean ± SD)	Group III (Mean ± SD)	Statistical Analysis		
				Category	p Value	Significance
Orientation (Max. Score=10)	9.90 ± 0.30	9.70 ± 0.58	9.56 ± 0.61	I Vs II	.165	NS
				I Vs III	.004	S
				II Vs III	.534	NS
Registration (Max. Score = 3)	3.00 ± 0.00	3.00 ± 0.00	3.00 ± 0.00	I Vs II	1.00	NS
				I Vs III	1.00	NS
				II Vs III	1.00	NS
Attention and Calculation (Max. Score = 5)	4.40 ± 0.73	4.66 ± 0.72	4.10 ± 1.25	I Vs II	.601	NS
				I Vs III	.265	NS
				II Vs III	.009	S
Recall (Max. Score = 3)	1.96 ± 0.97	1.84 ± 1.08	1.78 ± 1.04	I Vs II	1.00	NS
				I Vs III	1.00	NS
				II Vs III	1.00	NS
Language (Max. Score=8)	8.00 ± 0.00	7.96 ± 0.20	7.96 ± 0.20	I Vs II	.654	NS
				I Vs III	.654	NS
				II Vs III	1.00	NS
Visual-constructional ability (Max. Score = 1)	0.82 ± 0.39	0.78 ± 0.42	0.56 ± 0.50	I Vs II	1.00	NS
				I Vs III	.011	S
				II Vs III	0.40	S

Results are expressed as mean and standard deviation

Group I	=	20 – 50 Years
Group II	=	60 – 75 Years
Group III	=	> 75 Years
MMSE	=	Mini-Mental State Examination
NS	=	Not Significant ($p > 0.05$)
S	=	Significant ($p < 0.05$)
HS	=	Highly significant ($p < 0.001$)

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An Empirical View on Private Tutoring in School Mathematics of Kamrup District

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Abstract- In this study samples are collected from several stakeholders involved with the entire privately organized tutoring system as well as the schools. Data have been gathered through interview from teachers, parents and students of various categories. This investigation mainly focused and why the students go for private tuition and how the tutorial classes build up students' knowledge and skills. The investigation revealed that not only the weaker students go for private tuition in mathematics but the students from all categories. Reasons of going mathematics tutorial classes ranged from getting pass marks to being forced by parents or pushed by class mates. However, common practice for most of the individual tutors is to complete the syllabus. Students expressed boldly that they could learn problem solving more easily in tutorial classes than in school.

I. INTRODUCTION

In the context of globalization the concept of education has been redefining frequently with the needs and aspirations of the people. Increasing demand of quality education creates huge pressure on the formal education system in most of the countries. In this competitive environment parents are eager to go any extent to provide facilities for right education to their children. They attempt to provide their children with the best opportunities in life have resorted to private tutoring as "...a means of retaining a relative advantage for their children in the education race" (Foondun, 2002, p. 491). Private tutoring also represents a significant financial investment by families to their children's education and in some countries is big business, with the majority of students having tutoring at some point during their school careers (Bray,1999). Private tutoring has been establishing globally a trend parallel to the formal school education. In many countries like Cambodia, Egypt, India, Japan, Kenya, Malta, Romania, Taiwan and Mauritius, the prevalence of supplementary tuition is high, and it is expected to increase even further (Bray, 2003).

There are many reasons for the demand for private tutoring. It can be either due to the weaknesses of the students or due to the negligence of the teachers. In some cases, although the teachers may be teaching properly at school, the students still may need tutoring if they are academically weak. In other cases, when the teachers do not teach properly at school, the students require tutoring from the teachers outside the school. In the reviews of such studies (Devin-Sheehan, Feldman, & Allen, 1976; Ellson, 1976; Fitz-Gibbon, 1977; Rosenshine & Furst,

1969) concluded that tutoring programs can contribute to the academic growth of the children who receive the tutoring and probably to the growth of the children who provide the tutoring as well. However, two of the reviews (Ellson, 1976; Rosenshine & Furst, 1969) reported that these contributions had been clearly demonstrated only for well-structured and cognitively oriented programs. Tutoring programs have definite and positive effects on the academic performance and attitudes of those who receive tutoring; also the tutored students outperformed their peers on examinations, and they expressed more positive attitudes toward the subjects in which they were tutored, described in Peter A. Cohen, James A. Kulik and Chen-Lin C. Kulik (1982).

In the study by Foondun (2002) the private tuition was defined as extra coaching and it was given by the teachers for extra income. Wolf (2002) who was writing about the Third International Mathematics and Science Study (TIMSS) used the term *Extra School Instruction* (ESI) to denote teaching and coaching activities in mathematics and science taking place outside of the regular school structure. But the coaching was not anticipated as extra care taken by the teachers under the auspices of the schools. In many countries in East and South East Asia children have private tuition in school subjects after the end of the normal school day, effectively extending the amount of time they spend learning. This structured support in school subjects has been termed 'shadow education' by Stevenson & Baker (1992) as it follows the school curriculum. It has the potential to make a substantial contribution to pupils' performance in national tests.

The present study aims at exploring a little more the phenomenon of private tutoring in mathematics, and the reasons for taking private tuition, the actual organization of tutorial classes and the knowledge and skills acquired during the private tuition sessions.

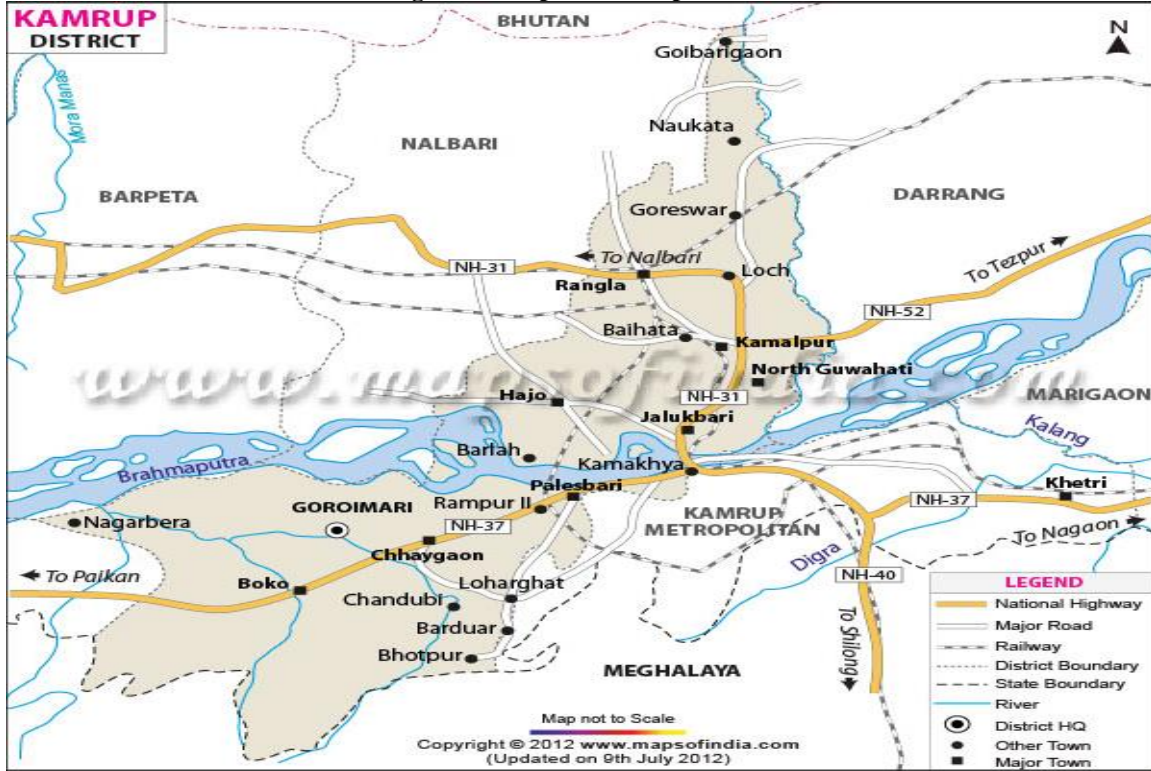
II. BACKGROUND

Kamrup District (Figure-1), one of the districts of Assam in north eastern India is situated between 25.46 and 26.49 North Latitude and between 90.48 & 91.50 East Longitude. With wide plains through which the mighty river Brahmaputra makes its way flowing a steady course from east to west, its demographic pattern is a heterogenous one. However, there exist a perceptible degree of mutual love, respect and inter-religious tolerance amongst them. Geographically it covers an area of 4,34,500 hectares out of which area cultivated and forest area 1,81,608 and 1,16,694 hectares respectively. Its climate is sub tropical with

semi dry summer and cold in winter. Flood occurs generally in the low lying areas of the district during May to August every year. Late flood during the later part of September & October also occurs. The occurrence of flood in the district is due to the river Bahmaputra and its Tributaries. The population of the

district is a unique blend of different races, cultures and religions. Total population in the district is 35,96,292 and its density 520/km² (1,400/sq mi) with literacy 70.95 percent (census, 2011).

Figure-1: Map of Kamrup district



School education system

As India is developing country with enormous human resources the government has realized the importance of educational development and therefore, provides required importance in education resulting progress. However, there are some areas which are yet to be emphasized. Different levels are there in school education system prevailed in India, given in the Table-1. The list of the various types of the schools prevailed in

the country is given in Table-2. The list of the Boards and Councils administering the school education system is given in the Table-3. There are several subjects taught at school e.g. language, literature, social studies, science and mathematics. From stakeholders' point of view mathematics has been considering as a difficult subject.

Table-1. Levels of schools in India:

Sl No	Level	Description
1	Pre Primary	Here, kids from 3 to 5 years of age prepare to enter school education through play group, nursery and Kindergarten.
2	Primary	It includes the age group of children of 6-11 years studying in classes from I to V
3	Middle	It consists of children studying in classes from VI to VIII of an age rang 12 to 14 years.

4	Secondary	It consists of students studying in classes IX and X of ages 15 and 16
5	Senior Secondary	It consists of students studying in classes XI and XII of ages 17 and 18

Table-2. Various types of the schools:

Sl No	Type of school	Description
1	Government	Fully managed by Government
2	Provincialized	Partially managed by Government
3	Recognized	Government has recognized for provincialization, but has not come under government management/assistance
4	Non-recognized	Established by private effort and only with permission of Government
5	Private	Established and run by private party

Table-3. Boards and Councils for school education in India:

Sl No	Board/council	Description
1	The Central Board of Secondary Education (CBSE)	Under the department of education, Govt. of India, it conducts examination and looks after the functioning of schools accredited to central education system from primary to senior secondary level
2	Boards under The State Government	State Board of education looks after the educational issues up to senior secondary level. However, Some states have separate board for secondary and higher secondary levels
3	The Council of Indian School Certificate Examination (CISCE)	It conducts two examinations 'Indian Certificate of Secondary Education' and 'Indian School Certificate'. Indian Certificate of secondary education is a k-10 examination for class X completers and Indian school certificate is a k-12 public examination conducted for class XII completers
4	The National Open School (NOS)	It was established by the Government of India in 1989. It is for those students who are unable to attend formal schools.

III. METHODOLOGY

In this empirical study, data regarding the private tutoring practices were gathered from the various stakeholders, amongst

others teachers, students, and parents. Total 30 teachers, 51 students and 34 parents from different secondary schools under both of the private as well as government sectors have been participated in the study willingly, when approached. However, some of the parents hesitated to express openly about the

prevailing private tutoring trend. For actual responsiveness from the stakeholders and convenience to conduct survey forms were designed separately to extract their inherent feel on this trend which had to be filled by them. Through the survey form for teachers, some reasons and viewpoints were sought, like reason of giving private tuition, about the organization of effective private tutoring session, what something difference is there in the school's formal class and in the tutorial class, in spite of teaching by the same teachers. After survey form filling episode an interview programme was structured with the teachers for clarifications. Through another survey form for the sample students, the reasons of taking private tuition in mathematics, how the tutorial class help in understanding mathematical concept were expected from the students. Parents viewpoints on this serious issue were also considered through another separate interview programme.

Survey and interviews for the teachers

The mathematics teachers participated here are from different secondary schools who provide private tuition in mathematics in secondary level i.e., from 6th to 10th standard.

What is your viewpoint on private tuition?

Most common reason was it is extra care to the students, especially to the weaker students. Two teachers stated that it is an attempt by some teachers concerned in the particular subject to lead the students into comfortable zone of learning the subject.

Why do you provide private tuition?

Most of them expressed that they provide private tuition for extra revenue and to enhance their efficiency level of teaching. Another important reason was given that the students need to practice more and more problems especially harder level problems for which they extend their helping hand. Three of them claimed that it was their genuine profession.

What do you focus in private tutoring session?

Their common response was to complete the syllabus with sufficient problems solving. Only two teachers pointed out that they helped the students for preparation of examinations by discussing some previous years examinations question papers.

How many students are there in one tutorial class?

Only three teachers mentioned that they gave private tuition in individual basis. Otherwise, most of the teachers interviewed gave tuitions in groups comprising 5 to 25 students. Although, private tuition provided group wise, individual attention for each student was there, they claimed so.

How do you plan to conduct the tutorial classes?

Most of the teachers mentioned that they used to check home work first given in the previous class followed by explanation about the concerned topic from the syllabus with solving few problems, then asked the students individually if anything was left to understand. Most of them used to teach 2 hours in a week in two classes at their own residence. However, 7 teachers used to attend the tutorial classes at different places and 4 teachers used to teach individually going student's home.

Is tutorial class necessary for the students if they attend the classes regularly in the school?

Unanimously all of them mentioned to be not necessary for all categories of students. However, they agreed on necessity of extra care i.e., private tutoring as they mentioned earlier, in the subject for the weaker students.

What type of materials do you follow for tutorial classes, text books, reference books or notes prepared by you?

The general response in this regards was that they relies on their self prepared notes. However, they mentioned about text books also which was used for practice only. Students to be interested attentive they had to take the help of day to day life situations, few of them opined.

How do you handle if students do not complete their assigned homework?

All of the teachers used to give verbal warnings, calling parents and taking words from the students to complete homework on the spot in front of them.

Do you evaluate the students in your tutoring classes through any tests?

Most of the teachers stated that they organize class tests frequently, immediately after completion of a chapter students had to face a test on that particular chapter. However, few of them disagreed it and mentioned that they assess through the tests held in the schools, because, schools organized sufficient tests and more than that was not necessary.

Finally, do you want to put any comment?

Surprisingly, 5 teachers strongly opposed the private tutoring system that there should be a legal action against the system despite, they involve with the system. Significantly, 7 teachers opined that if the students don't put their interest in school's formal classes regularly because of having private tuition, then it would be a threat to the formal education system. Others commented that for slow learners or weaker students private tutoring system was justified otherwise they would not be able to perform better. However, going for private tuition is being an established culture for all students, they added. A common complain from the teachers was that it was very difficult to make the students involvement concentrated in the regular school classes, because they value activities in tutorial classes more and more than what they do in the school classes.

Survey on students

All of them acknowledged about the contribution of private tuition in their learning mathematics. Private tuition provide an opportunity to understand the concepts and to solve lot of problems including higher difficulty level, they stated. Few students significantly mentioned that there is always a friendly environment among the teachers and the students in the tutorial classes unlike in school for which the students didn't hesitate to ask anything. The students noted that in tutorial classes syllabus is covered comfortably emphasizing on difficult problems with making practice of previous years' examination question papers. The students expressed that they did not choose the private tutor

themselves, on the basis of parents' recommendation they choose the tutor. Few students stated that whatever they work in the school classes, if that is practiced again in tutorial classes then that becomes easier to understand.

Survey on parents concerned

The parents, participated in the interview were very concerned about the scenario prevailing in the schools. As mathematics is key subject in school curriculum it is very important to score good in this subject to be helped in further studies, they commented. So, to improve children's mathematical performance they use to take the help of private tutors. They choose their private tutor on the basis of feed-back from other parents. They believe that only attending the school class students can't perform this subject satisfactorily. The interviewed parents mentioned that they consult with the tutor all everything about their children transparently at the time of start tuition, and later they meet the teacher frequently to have the feed-back. Some parents stated that their children were weak in mathematics, but when they were engaged with a private tuition then they improved. So, they claimed that private tuition in mathematics is extremely necessary for students, especially, weaker students. Two parents pointed out significantly, that if a private tutor can improve the students' performance in one subject only taking two hours weekly, why it is not possible in school taking four hours weekly in that subject. School authorities can rectify this problem by monitoring properly with necessary actions, they added.

IV. DISCUSSION

In this study the data reflect primarily the main reason of private tutoring is to earn extra revenue whereas from students' points of view it gives more and more practices and doubts clearing opportunities. It is very hard to imagine that how the private tutors complete the course by taking only hardly 2 hours weekly with individual attention and more practices. Moreover, students get the opportunity to practice previous year examination question papers also in tutorial classes before examination. It is really questionable. Does the enrichment strategy or remedial strategy play a role in learners' decision about seeking private tutoring (Baker et al, 2001) ?

In this study parents are found to be confident that private tutor can develop students' performance in mathematics.

Reasonably, all the stakeholders would expect tutoring to have a positive effect on the learners' performance, but research has not yet been able to demonstrate a definite positive correlation. In Polydorides (1986); Fergany (1994), they conducted a study in France, Greece and Egypt, but could not make conclusive findings about the effect of private tutoring on academic achievement. However, Bloom (1984) reported that tutoring gave students a two standard deviation gain above the average of students. Although, tutoring can have beneficial impacts on students' achievement and self-concepts, these are inconsistent, which has been reported in the research regarding the effects on attainment, as well-controlled experimental studies demonstrate strong positive effects (Bloom, 1984; Mischo & Haag, 2002) whereas international surveys do not (Baker *et al.*, 2001).

All the students concerned with this study unanimously opined that they go for private tuition, especially in mathematics to enrich the subject. However, analysis of the data from the Third International Mathematics and Science Study (TIMSS) carried out in 1995 by Wolf (2002) showed that except for Japan at Population 1, students performed better in mathematics without extra-school instruction. Also according to the students, individual attention and more practices lead them to be enriched through tutoring classes, but the research on effectiveness for tutorial classes carried out in Shanahan, 1998; Elbaum *et al.*, (2000) revealed that the quality of tutoring and the content of the programme influence effectiveness.

Here in the study, both the parents and the students strongly agreed with the private tutoring system, but, it is not affordable for all parents. So, it may harm enhancing social inequalities by discriminating rich and poor. If the private tutoring system really helps the students in learning mathematics then to what extent the system could be considered to be benefitted by everybody? Both the teachers and the students under the study stated about practices of model/previous year question papers for preparation of examination. Research should be conducted whether there is any significant difference in performance between the students who have access model/previous years question papers and the students who do not. After all, the popularity of private tutoring is growing globally in an unprecedented rate with a potentially large impact. Figure-2, radial cycle represents how various factors contribute to grow up private tutoring and gearing up (Figure-3) for global possession.

Figure-2: Radial Cycle

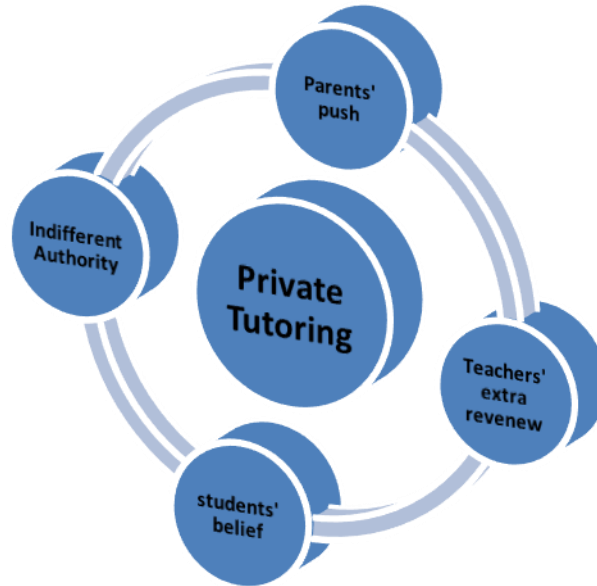
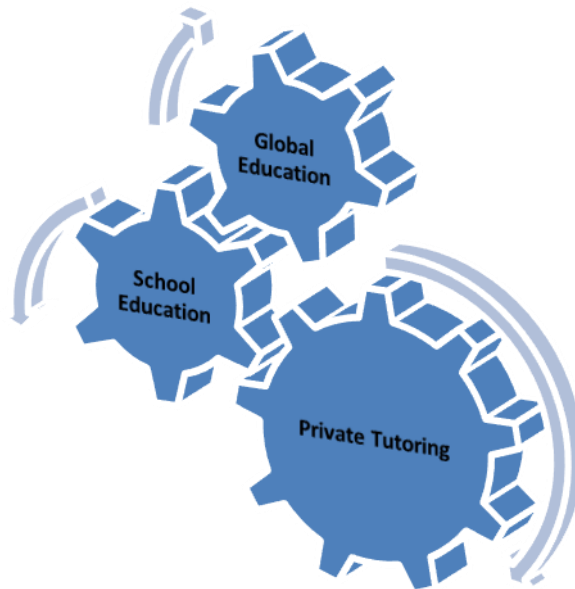


Figure-3: Possessing Globally



V. CONCLUSION

The private tutoring trend has been established in the district as grown up across the country and abroad. The unprecedented

rate of growing this system is posing a challenge to the regular formal system of education. Students taking private tuition are neglecting school work and the value system; because, in private tuition tutors guide the students from his/her level best with a

challenging attitude to enlarge their domains of profession. Private tutors treat the students and parents strategically always to keep him/her well impressed. To understand mathematical concepts and to develop problem solving skill students must learn from a pedagogically rich teacher in mathematics. If the students keep ignoring regular school works so, then it would be threat to the formal education system. This serious issue has to be emphasized by the policy makers intervening on curriculum, teachers salary structure, pedagogical development, evaluation system etc., and to think what can be executed for the slow learners.

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Parents Survey Form

Gunendra Chandra Das, M Sc, B Ed, Ph D scholar

Name: Occupation:
 No of children: Type of school:
 Annual income: No of tutors engaged.....

1. Why do you send your child for private tuition?.

.....

2. Who does insist for private tuition first, you , your child or school teacher?

.....

3. In which subject/subjects tutorial class is required for your child? And why?

.....

4. Do you believe that tutorial class is very important to improve in mathematics?

.....
.....
5. What type of tutoring class do you prefer - individual or group and Why?

.....6. How do you choose tutor?
.....

.....
7 Can the private tutor finish the syllabus?
.....

.....
8. Does the tutor teach anything other than syllabus?
.....

.....
9. What is the fee structure of tutorial classes?
.....

.....
10. Do you communicate with the tutor to know about your child's improvement?
.....
.....

Impact of Capital Structure on Financial Performance of the Listed Trading Companies in Sri Lanka

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Abstract- Capital structure is a financial tool that helps to determine 'how do firms choose their capital structure?' a firm's capital structure is then the composition or structure of its liabilities. In this study, an attempt has been made to analyze the Capital structure and financial performance during 2006 to 2010 (05 years) financial year of listed trading companies in Sri Lanka. For the purpose of this study, the data was extracted from the annual reports of sample companies. Correlation and multiple regression analysis are used for analysis. The results revealed there is positive relationship between capital structure and financial performance. And also capital structure is significantly impact on financial performance of the firm showed that debt asset ratio, debt equity ratio and long term debt correlated with gross profit margin(GPM), net profit margin(NPM), Return on Capital Employed(ROCE), Return on Asset (ROA) & Return on Equity(ROE) at significant level of 0.05 and 0.1

Index Terms- capital structure: Financial Performance; and profitability Ratios

I. INTRODUCTION

A firm basic resource is the stream of cash flows produced by its assets. When the firm is financed entirely by common stock, all of those cash flows belong to the stockholders. When it issues both debt and equity securities, it undertakes to split up the cash flows into two streams, a relatively safe stream that goes to the debt-holders and a more risky one that goes to the stockholders.

In finance, **capital structure** refers to the way in which an organization is financed a combination of long term capital(ordinary shares and reserves, preference shares, debentures, bank loans, convertible loan stock and so on) and short term liabilities such as a bank overdraft and trade creditors. A firm's capital structure is then the composition or 'structure' of its liabilities.

One of the most important issues in corporate finance is responding "how do firms choose their capital structure?" Locating the optimal capital structure has for a long time been a focus of attention in many academic and financial institutions that probes into this area. This is comprehensible as there is a lot of money to be made advising firms on how to improve their capital structure. Defining the optimal capital structure is a critical decision. This decision is important not only because of the impact such a decision has on an organization's ability to deal with its competitive environment.

Capital structure plays a role in determining the risk level of the company, and fixed cost is the key factor whether it is involved in production process or fixed financial charges. It should be kept low if the management is likely to confront an uncertain environment but how low or how high is the basic question. The assets of the company can be financed by owner or the loaner. The owner claims increase when the firm raises funds by issuing ordinary shares or by retaining the earnings which belong to the shareholders, the loaners claim increase when the company borrows money from the market using some instrument other than shares. The various means of financing represent the financial structure of the enterprises. The term capital structure is used to represent the proportionate between debt and equity, where equity includes paid-up capital, share premium, and all reserves & surplus.

The financing or capital structure decision is significant managerial decision, as it influences the shareholder return and risk. The market of the share also be affected by the capital structure decision. The company has to plan its capital structure initially at the time of its promotion. Subsequently, whether the funds have to be raised, a capital structure decision is involved. A demand for raising funds generates a new capital structure which needs a critical analysis. (Ruzben J. Bodhanwala).

II. RESEARCH PROBLEM

The purpose of this research is to investigate the impact of firms' capital structure on their financial performance. The research will use the data collected from listed companies in the Colombo Stock Exchange. The empirical research found that firm capital structure has a significant impact on financial performance. The findings enhance the knowledge of optimal capital structure and will help companies to make efficient financial performance in growing situations. Each individual business Firm must be considered separately and a ratio that is meaningful for a trading company may be completely meaning for a financial institution. Developed countries already conducted many research in this area but there is a lack of studies in developing countries. There is a deviation among those literatures. In that way, these research studies will be analyzed in this area.

III. RESEARCH QUESTION

In this research researcher is going to answer the following research question.

- 1 Whether capital structure affect on the company's financial performance?
- 2 What are the nature of relation ship between debt and equity?
- 3 To what extent capital structure affect on the company's financial performance?
- 4 What is the company's capital structure?

IV. OBJECTIVES OF THE STUDY

Main Objective that to investigate how the capital structure affects the company's financial performance.

Sub Objective

1. To identify the company's capital structure.
2. To identify the nature of relationship between debt and equity.
3. To identify the factors determine the optimal capital structure.

V. SIGNIFICANCE OF THE STUDY

This research will examine how capital structure affects on the selected company's financial performance. There are various methods of long term financing such as share issues, debentures and long term loans from banks and other financial institutions. Most of the researcher's findings didn't examine the financial performance that they only examine optimal capital structure. Which is difficult to decision? Therefore this research not only for the financial manager of an organization but also to further researcher who can get the idea for further research. Effective capital structure of listed trading companies lead to better performance of the firm. The firm must have the effective capital structure to achieve their financial performance. Because the modern industrial firm must conduct its business in a highly complex and competitive environment.

Scope of the study

The scope of this study is to identify and analyze the impact of capital structure on the selected company's financial performance. This research will be conducted in the listed company in Sri Lanka. There are 237 listed companies in Sri Lanka. The research will be conducted among sample of **11 trading listed companies**. And **seven** years data are collected to analyze the financial performance of the companies.

Meaning of Capital Structure

Capital Structure of a firm is the mix of different securities issued by the firm to finance its operations. Mix of financing methods used by a firm is called the firm's capital structure. Loosely Speaking, capital structure refers to the proportions of debt and equity that make up the liability owners equity side of firm's balance sheet often refers to the use of debt in a firm's capital structure as leverage.

The choice of a firm's capital structure is a marketing problem. It is essentially concerned with how the decides to divide its cash flows into two broad components ,fixed component that is earmarked to meet the obligations toward debt

capital and a residual component that belongs to equity shareholders.

Capital structure emerging the market

Research on the determinants of capital structure in emerging/developing markets has emerged as an extended new line of research for certain reasons. They are,

(1) Capital and stock markets in emerging markets are relatively less efficient and incomplete than their developed counterparts.

Companies in emerging markets may not be able to rationalize the financing decisions to follow a clear theoretical approach.

(2) Information asymmetry in emerging stock markets is considerably higher than the developed markets.

(3) The literature on the determinants of capital structure has already been developed in developed markets that have different institutional financing arrangements from those in emerging markets.

According to the three reasons above-mentioned, this paper tests the hypothesis that "in an emerging market, determinants of capital structure include mixed predictors from three theories: tradeoff, pecking order and free cash flow."

VI. MODERN CAPITAL STRUCTURE CHOICE

The development of capital structure theory today continues with a relaxation of some of the assumptions that were laid out in the original MM irrelevance theories. Some of those unrealistic assumptions include: the exclusion of taxes and transaction costs, and the assumption that all information pertaining to firm value or performance is available to all market participants at no cost. **MM (1963)1 and Miller (1977)2** published follow-up papers in which they relaxed the assumptions that there were no corporate and personal taxes. They concluded that because tax regulation allows firms to deduct debt interest payments as an expense, firms are encouraged to use debt in their capital structures. In other words, the tax deductibility of interest payments shields the pre-tax income of the firm and this ultimately lowers the weighted average cost of capital.

VII. THEORY OF CAPITAL STRUCTURE

Modigliani-Miller Theory

The Modigliani-Miller theorem (of **Franco Modigliani, Merton Miller**) forms the basis for modern thinking on **capital structure**. The basic theorem states that, under a certain market price process (the classical **random walk**), in the absence of **taxes, bankruptcy costs, and asymmetric information**, and in an **efficient market**, the value of a firm is unaffected by how that firm is financed.^[1] It does not matter if the firm's capital is raised by issuing **stock** or selling debt. It does not matter what the firm's **dividend** policy is. Therefore, the Modigliani-Miller theorem is also often called the capital structure irrelevance principle.

Propositions

The **theorem** was originally proven under the assumption of no taxes. It is made up of two propositions which can also be extended to a situation with taxes.

Consider two firms which are identical except for their financial structures. The first (Firm U) is unlevered that is, it is financed by equity only. The other (Firm L) is levered: it is financed partly by equity, and partly by debt. The Modigliani-Miller theorem states that the value of the two firms is the same.

Trade off Theory

The trade off theory of capital structure discusses the various corporate finance choices that a corporation experiences.

The theory is an important one while studying the financial economics concepts. The theory describes that the companies or firms are generally financed by both equities and debts. The theory primarily deals with the two concepts. Cost of finance distress and agency cost.

The purpose of the trade –off theory of capital structure is to explain the strategy of the firms to finance their investments sometimes by debt. The theory also studies the corresponding advantages and disadvantages of the financing either by equity or bound. The trade-off theory actually allows the cost of bankruptcy to exist.

According to the Miller, the attractiveness of debt decreases with the personal tax on the interest income. A firm experiences financial distress when the firm is unable to cope with the debt holders' obligations. If the firm continues to fail in making payments to the debt holders, the firm can even be insolvent.

The direct cost of financial distress refers to the cost of insolvency of a company. Once the proceeding of insolvency starts, the assets of the firm may be needed to be sold at distress price, which is generally much lower than the current value of the assets. A huge amount of administrative and legal costs are also associated with the insolvency. even if the company is not insolvent, the financial distress of the company may include a number of indirect cost like-cost of employees, cost of customers, cost of suppliers, cost of investors, cost of managers and cost of share holders.

The firms may often experience a dispute of interests among the management of the firm, debt holders and share holders. These disputes generally give birth to agency problems.

There is an alternative theory which could explain why profitable companies borrow less. It is based on asymmetric information. Managers know more than outside investors about the profitability and prospects of the firm. Thus investors may not be able to access the true value of a new issue of securities by the firm. They may be especially reluctant to buy newly issued common stock, because they worry that the new shares will turn out to be overpriced.

Such worries can explain why the announcement of a stock issue can drive down the stock price. If managers know more than outside investors. The manager will be tempted to time stock issues when their companies stock is overpriced. In other words, when the managers are relatively pessimistic. On the other hand, optimistic managers will see their company's shares as under priced and decide not to issue as a 'pessimistic manager' signal and mark down the stock price accordingly. You can also see why optimistic financial managers-and most managers are optimistic-would view a common stock issue as a relatively expensive source of financing.

These entire problems are avoided if the company can finance with internal funds, that is, with earning retained and reinvested. But if external financing is required, the path of least resistance is debt, not equity. Issuing debt seems to have a trifling effort on stock prices. There is less scope for debt to be disvalued and therefore debt issue is a less is a less worrisome signal to investors.

Agency Costs Theory

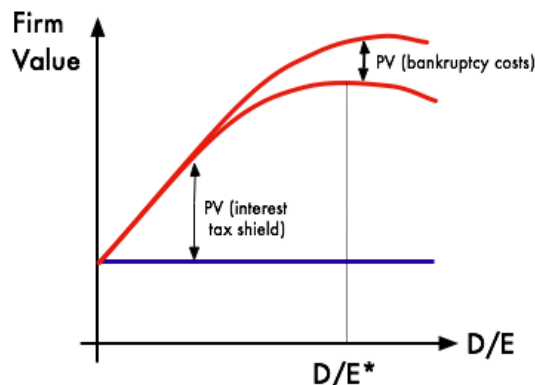
There are three types of **agency** costs which can help explain the relevance of capital structure.

Asset substitution effect: As D/E increases, management has an increased incentive to undertake risky (even negative NPV) projects. This is because if the project is successful, share holders get all the upside, whereas if it is unsuccessful, debt holders get all the downside. If the projects are undertaken, there is a chance of firm value decreasing and a wealth transfer from debt holders to share holders.

Underinvestment problem: If debt is risky (e.g. in a growth company), the gain from the project will accrue to debt holders rather than shareholders. Thus, management have an incentive to reject positive NPV projects, even though they have the potential to increase firm value.

Free cash flow: unless **free cash flow** is given back to investors, management has an incentive to destroy firm value through empire building and perks etc. Increasing leverage imposes financial discipline.

FIGURE1



Pecking Order Theory

VIII. REVIEW OF EMPIRICAL EVIDENCE

Stepen Jason kasozi (2009), his study examines the divide between finance theory and practice by analyzing the significance of the determinants of capital structure choice among 123 listed firms on the JSE, to determine whether these firms follow the trade-off theory or the pecking-order theory. Data obtained from McGregor's Bureau of Financial Analysis database was analyzed using standard multiple regressions, stepwise regressions and ANOVA techniques to test for financing behavior. The results revealed a significant positive correlation between debt financing and financial distress, and a

significant negative correlation between debt financing and the collateral value of assets during the period under study (1995-2005).

Joseph P.H. Fan, Sheridan Titman, and Garry Twite (2008), examined 'An International Comparison of Capital Structure and Debt Maturity Choices' this study examines the influence of institutions on the capital structure and debt maturity choices in a cross-section of firms in 39 developed and developing countries. They found that firms that choose to cross-list tend to use more equity and longer-term debt. They also found that taxes and the characteristics of the financial institutions that supply capital have an influence on how firms are financed. Finally, they found that the cross-sectional determinants of leverage differ across countries. In particular, the relationship between profitability and leverage tends to be stronger in countries with weaker shareholder protection.

Marc L. Lipson and Sandra Mortal (2008) 'Liquidity and Capital Structure'. In this paper we study the link between liquidity and capital structure decisions. Since enhanced liquidity reduces the required return on equity and the cost of issuing equity, we expect more liquid firms to prefer equity in their capital structures. Thus, in the cross section we expect more liquid firms to have less leverage and that when firms increase capital we expect them to prefer to increase it with equity. Stock market liquidity is a major concern to all those involved in one way or another in equity trading, and for that reason there are many studies devoted to investigating factors affecting liquidity, and how liquidity relates to asset values and expected returns. This paper highlights one important role liquidity plays on one corporate decision – it has a significant impact on capital structure.

Myers (1984) refers to this as a 'pecking order theory' which states that firms prefer to finance new investment, first internally with retained earnings, then with debt, and finally with an issue of new equity.

Hall et al. (2004) agreed that age is positively related to long-term debt but negatively related to short-term debt. **Booth et al. (2001)** in ten developing countries, and **Huang and Song (2002)** in China, find that tangibility is negatively related to leverage. It is argued, however, that this relation depends on the type of debt.

Titman and Wessels, 1988; Rajan and Zingales (1995), Firms with high levels of tangible assets will be in a position to provide collateral for debts. If the company then defaults on the debt, the assets will be seized but the company may be in a position to avoid bankruptcy. It is expected, therefore, that companies with high levels of tangible assets are less likely to default and will take on relatively more debt resulting in a positive relationship between tangibility and financial leverage.

Ross (1977) says that managers have better knowledge of the income distribution of a firm. When they issue debt, it may generate positive signals to the outside world about the firm's income distribution suggesting that the firm has stable income and is able to pay the periodic installments and interest payments. In this regard, higher debt may show higher confidence of managers in the firm's smooth income Distribution and adequacy of the income. Thus firms in their efforts to increase investors' confidence and thus increase the value of equity will use higher debt in the capital structure.

IX. METHODOLOGY

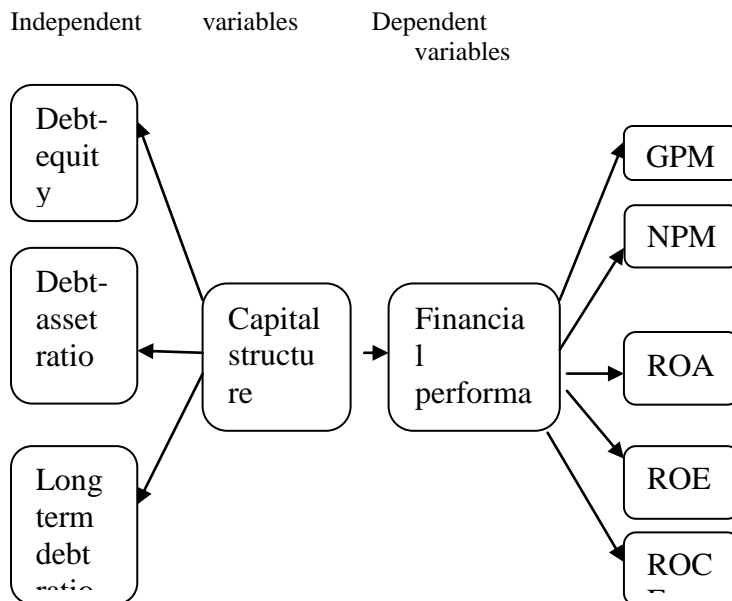
Sampling Methods

In this research researcher has been selected trading sector from the listed companies in Colombo stock exchange. This trading sector contains 11 companies. Data collect from the hand book of listed companies published by Colombo stock exchange & the individual company's annual reports.

The company's names are given below:

- Brown & company limited [BRWN]
- C.w.mackie plc[CWM]
- Ceylon & foreign traders limited[CFT]
- Eastern merchants limited[EMER]
- Environmental resources investment plc[GREG]
- Hay leys exports plc[HEXP]
- Office equipment limited[OFEQ]
- Radiant gems international limited[RGEM]
- Richard pieris exports plc[REXP]
- Singer(srilanka)limited[SINS]
- Tess agro limited[TESS]

X. CONCEPTUAL MODEL



Hypotheses

The following hypotheses are formulated.

H₁:- There is a negative relationship between debt equity ratio and financial performance variables (GPM, NPM, ROCE, ROE, and ROA).

H₂:- There is a positive relationship between debt asset ratio and financial performance variables (GPM, NPM, ROCE, ROE, and ROA).

H₃:- There is a positive relationship between long term debt ratio and financial performance variables (GPM, NPM, ROCE, ROE, and ROA).

H₄: capital structure is significantly impact on the financial performance of the trading companies in Sri Lanka.

Descriptive statistics

The following table shows the maximum, minimum, mean & standard deviation and also consist of number of samples and variance of each capital structure and financial performance variables.

	N	Maximum	Minimum	Mean	Std.deviation
GPM	77	23.01468	-5.287149	14.27181	3.7778049
NPM	77	8.3977968	-3.161258	14.27181	3.7778049
ROCE	77	11.8948	-1.228073	0.904906	0.9512654
ROA	77	24.128509	1.994274	10.32905	3.2138839
ROE	77	1.7017813	0.153347	0.904906	0.9512654
DEBTEQUITY RATIO	77	367.94721	98.06439	202.9009	14.2443287
DEBT ASSET RATIO	77	104.35144	57.5498	67.96053	8.2438176
LONGTERM DEBT RATIO	77	27.683021	15.21041	19.15669	4.376835

Hypothesis testing

Here the correlation analysis and regression analysis are used to test the hypothesis. The hypothesis testing has formulated by the researcher for this study based on the hypothesis referred in chapter 3.They are,

H₁:- There is a negative relationship between debt equity ratio and financial performance variables (GPM, NPM, ROCE, ROE, and ROA).

H₂:- There is a positive relationship between debt asset ratio and financial performance variables (GPM, NPM, ROCE, ROE, and ROA).

H₃:- There is a positive relationship between long term debt ratio and financial performance variables (GPM, NPM, ROCE, ROE, and ROA).

H₄: capital structure is significantly impact on the financial performance of the trading companies in silence.

XI. CORRELATION ANALYSIS

H₁, H₂, H₃ Correlation between capital structure variables (debt equity ratio, debt asset ratio and long term debt ratio) and financial performance variables (GPM, NPM, ROCE, ROA, ROE) of trading sector.

Correlations Matrix

Variabl e	GP M	NP M	RO CE	RO A	RO E	Deb t - equity	Debt- asset	LG debt rati o
GPM	1	.742	.409	.676**	.333	-.346	.783*	.457
NPM		1	.746	.688	.749	-.697	.468*	.308**
ROCE			1	-.359	-.779**	.801	.459	.285
ROA				1	.572**	-.655**	.356	.657**
ROE					1	-.371**	.493*	.736**
Debt- equity						1	.161	.265
Debt - asset							1	.056
L-term debt								1

*correlation is significant at the 0.05 level (1-tailed)

**correlation is significant at the 0.01 level (2-tailed)

The above correlation table indicates the relation ship between debt equity ratios, debt asset ratio and long term debt ratio are as follows,

- Correlation between debt equity ratio and GPM, NPM, ROCE, ROA, ROE is positive because R values of debt equity ratio& GPM is 0.327, debt equity ratio and NPM is 0.214, debt equity ratio and ROA is 0.256, debt equity ratio and ROCE is 0.458, debt equity & ROE is 0.186.
- Correlation between debt asset ratio and GPM, NPM, ROCE, ROA, ROE is positive because R values of debt asset & GPM is 0.583, debt asset ratio and NPM is 0.581, debt asset ratio and ROA is 0.741, ROCE is 0.481, debt equity & ROE is 0.254.
- Correlation between long term debt ratio and GPM, NPM, ROCE, ROA, ROE is positive because R values of long term debt ratio& GPM is 0.198, long term debt ratio and NPM is 0.432, long term debt ratio and ROA is 0.715, long term debt ratio and ROCE is 0.511, long term debt & ROE is 0.011.

According to the above result we can accept the hypothesis H₁, H₂, H₃ because the results indicate the negative relationship between debt equity ratio and financial performance variables & positive relationship between debt asset ratio, long-term debt ratio and financial performance variables (GPM, NPM, ROCE, ROA, and ROE).

Regression analysis

Regression analysis is a mathematical method to measure the impact of one (independent) variable on other (dependent) variable. In this part, the researcher has used this to test the hypothesis H₄ to measure the impact of capital structure on financial performance.

H₄: capital structure is significantly impact on the financial performance of the trading companies in Sri Lanka.

Regression analysis between independent variable debt equity ratio and financial performance variables

Dependent variable	R ²	Significance level
GPM	.119	0.005
NPM	.485	0.002
ROCE	.641	0.003
ROA	.429	0.002
ROE	.137	0.005

I) Regression analysis between debt equity ratio and GPM Based on the above table R² = 0.119. That means 11.9% of the variation in the GPM is determined by in the variation of debt equity ratio other remaining 88.1% is undetermined with a significant level of 0.005. This means 88.1% of variation of GPM may be caused by other variables.

II) Regression analysis between debt asset ratio and NPM
Based on the above table $R^2 = 0.485$. That means 21.9 % of the variation in the NPM is determined by in the variation of debt asset ratio other remaining 78.1% is undetermined with a significant level of 0.002. This means 78.1% of variation of NPM may be caused by other variables.

III) Regression analysis between debt equity ratio and ROCE
Based on the above table $R^2 = 0.641$. That means 64.1 % of the variation in the ROCE is determined by in the variation of debt equity ratio other remaining 35.9% is undetermined with a significant level of 0.003. This means 35.9 % of variation of ROCE may be caused by other variables

IV) Regression analysis between debt equity ratio and ROA
Based on the above table $R^2 = 0.429$. That means 42.9 % of the variation in the ROA is determined by in the variation of debt equity ratio other remaining 57.1% is undetermined with a significant level of 0.002. This means 57.1% of variation of ROA may be caused by other variables.

V) Regression analysis between debt equity ratio and ROE
Based on the above table $R^2 = 0.137$. That means 13.7 % of the variation in the ROE is determined by in the variation of debt equity ratio other remaining 86.3% is undetermined with a significant level of 0.005. This means 86.3% of variation of ROE may be caused by other variables.

Regression analysis between independent variable debt asset ratio and financial performance variables

Dependent variable	R^2	Significance level
GPM	.613	0.001
NPM	.219	0.002
ROCE	.210	0.005
ROA	.126	0.003
ROE	.243	0.005

I) Regression analysis between debt asset ratio and GPM
Based on the above table $R^2 = 0.613$. That means 61.3% of the variation in the GPM is determined by in the variation of debt asset ratio other remaining 38.7% is undetermined with a significant level of 0.001. This means 38.7% of variation of GPM may be caused by other variables.

II) Regression analysis between debt asset ratio and NPM
Based on the above table $R^2 = 0.219$. That means 21.9 % of the variation in the NPM is determined by in the variation of debt asset ratio other remaining 78.1% is undetermined with a significant level of 0.002. This means 78.1% of variation of NPM may be caused by other variables.

III) Regression analysis between debt asset ratio and ROCE
Based on the above table $R^2 = 0.210$. That means 21 % of the variation in the ROCE is determined by in the variation of debt asset ratio other remaining 79% is undetermined with a significant level of 0.005. This means 79 % of variation of ROCE may be caused by other variables

IV) Regression analysis between debt asset ratio and ROA
Based on the above table $R^2 = 0.126$. That means 12.6 % of the variation in the ROA is determined by in the variation of debt asset ratio other remaining 87.4% is undetermined with a

significant level of 0.003. This means 87.4% of variation of ROA may be caused by other variables.

V) Regression analysis between debt asset ratio and ROE
Based on the above table $R^2 = 0.243$. That means 24.3 % of the variation in the ROE is determined by in the variation of debt asset ratio other remaining 75.7% is undetermined with a significant level of 0.005. This means 75.7% of variation of ROE may be caused by other variables.

Regression analysis between independent variable long-term debt ratio and financial performance variables.

Dependent variable	R^2	Significance level
GPM	.208	0.004
NPM	.094	0.001
ROCE	.081	0.001
ROA	.431	0.000
ROE	.541	0.002

I) Regression analysis between long-term debt ratio and GPM

Based on the above table $R^2 = 0.208$. That means 20.8% of the variation in the GPM is determined by in the variation of long-term debt ratio other remaining 79.2% is undetermined with a significant level of 0.004. This means 79.2% of variation of GPM may be caused by other variables.

II) Regression analysis between long-term debt ratio and NPM

Based on the above table $R^2 = 0.094$. That means 9.4 % of the variation in the NPM is determined by in the variation of long-term debt ratio other remaining 90.6% is undetermined with a significant level of 0.001. This means 90.6% of variation of NPM may be caused by other variables.

III) Regression analysis between long-term debt ratio and ROCE

Based on the above table $R^2 = 0.081$. That means 8.1 % of the variation in the ROCE is determined by in the variation of long-term debt ratio other remaining 91.9% is undetermined with a significant level of 0.001. This means 91.9 % of variation of ROCE may be caused by other variables

IV) Regression analysis between long-term debt ratio and ROA

Based on the above table $R^2 = 0.431$. That means 43.1 % of the variation in the ROA is determined by in the variation of long-term debt ratio other remaining 56.9% is undetermined with a significant level of 0.000. This means 56.9% of variation of ROA may be caused by other variables.

V) Regression analysis between long-term debt ratio and ROE

Based on the above table $R^2 = 0.541$. That means 54.1 % of the variation in the ROE is determined by in the variation of long-term debt ratio other remaining 45.9% is undetermined with a significant level of 0.002. This means 45.9% of variation of ROE may be caused by other variables.

Therefore the above results point out the capital structure variables are significantly impact on financial performance of companies, and hypothesis H_4 is accepted by the researcher. Here the GPM, NPM, ROCE, ROA, ROA are considered as dependent variables to test the hypothesis & Debt equity ratio,

debt asset ratio & long term debt ratio are considered as independent variables. Based on the regression analysis the following findings are discovered. They are,

- 10.7% of variation in gross profit is explained by debt equity ratio and remaining 89.3% may be caused by other variables.
- 4.6% of variation in net profit is explained by debt equity ratio and remaining 95.5% may be caused by other variables.
- 21% of variation in ROCE is explained by debt equity ratio and remaining 79% may be caused by other variables.
- 6.6% of variation in ROA is explained by debt equity ratio and remaining 93.4% may be caused by other variables.
- 3.4% of variation in ROE is explained by debt equity ratio and remaining 96.4% may be caused by other variables.
- 4.6% of variation in gross profit is explained by debt asset ratio and remaining 95.5% may be caused by other variables.
- 33.8% of variation in net profit is explained by debt asset ratio and remaining 66.2% may be caused by other variables.
- 23.1% of variation in ROCE is explained by debt asset ratio and remaining 76.9% may be caused by other variables.
- 54.9% of variation in ROA is explained by debt asset ratio and remaining 45.1% may be caused by other variables.
- 6.5% of variation in ROE is explained by debt asset ratio and remaining 93.5% may be caused by other variables.
- 3.9% of variation in gross profit is explained by long term debt ratio and remaining 96.1% may be caused by other variables.
- 18.6% of variation in net profit is explained by long term debt ratio and remaining 81.4% may be caused by other variables.
- 26.1% of variation in ROCE is explained by long term debt ratio and remaining 73.9% may be caused by other variables.
- 51.2% of variation in ROA is explained by long term debt ratio and remaining 48.8% may be caused by other variables.

In addition to the above findings the ratio analysis interprets the followings.

When we focus on debt and equity position of trading industry, some firm had adequate level of debt capital and equity capital and also long term debt but maximum amount of firm didn't have standard rate among them. The trading industry firms maintained excess amount of capital structure and some firm faced shortage of capital funds in last seven years. So generally firms in trading industry didn't have good capital structure decisions. However we have considered the measures on the basis of total average of each, so we can agree with hypothesis

XII. SUMMARY

In this part, the researcher has concentrated on data presentation, data analysis, ratio analysis, and hypothesis testing. Correlation analysis showed that there is a positive relationship between capital structure variables and financial performance variables. So hypothesis H_1 , H_2 , H_3 are accepted and regression analysis showed that each of capital structure variables has a different significant level and this analysis is found that capital structure is significantly impact on financial performance of listed trading companies in Sri Lanka. So H_4 also accepted following chapter mainly involves finding of the study, suggestion for further study, finally conclusion.

Suggestions and Recommendations for further research

The researcher has experiencing the ability to provide suggestion and recommendation for further researcher to gain more worthy if any research will be conducted by them in this field. Some of the suggestion and recommendations are given below,

- Here the company's financial performance is computed based on debt equity, debt asset, long term debt but too many factors or measures have impact on financial performance of companies. So the result will be further valuable when researcher considers varies kinds of measures.
- There are 234 companies are listed in srilanka but this study has taken only one sector and also it consist of small number of firms. To generalize the analysis the sample size would be increased.
- Only some methods are used to test hypothesis such as correlation & regression. Further the researcher can add much variety of techniques to generalize their findings such as ANOVA, descriptive statistics and etc.
- Only secondary data are collected to analysis to do this research. Further researchers may use secondary data by visiting to every company.

XIII. CONCLUSION

This paper been completed with the important objectives of to what extend capital structure impact on financial performance of companies and whether the capital structure impact in financial performance of listed trading companies in Sri Lanka, that Correlation analysis showed that debt asset ratio, debt equity ratio and long term debt correlated with gross profit margin, net profit margin, ROCE, ROA & ROE at significant level of 0.05 and 0.1.

Finally conclude there is positive relationship between capital structure and financial performance. And also capital structure is significantly impact on financial performance of the firm. So every firm should make good capital structure decision to earn profit and carry on their business successfully.

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Determining the Extent of Contamination of Vegetables Affected by Tannery Effluent in Ejersa Area of East Shoa, Ethiopia

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Abstract- A field experiment was carried out during 2010/2011 and 2011/2012 years to determine the extent of contamination of vegetables by tannery effluent in Ejersa area of East Shoa, Ethiopia. Five treatments comprised of tannery effluent of different concentrations levels, i.e., 0, 25, 50, 75, 100% applied to six vegetable plants like onion (*Allium cepa* L.), carrot (*Daucus carota* L.), beet root (*Beta vulgaris* L.), Swiss chard (*Beta vulgaris* L.), tomato (*Lycopersicon esculentum* L.) and cabbage (*Brassica oleracea* L.). The treatments were arranged in Randomized Complete Block Design (RCBD) with five effluent concentrations (treatments), each replicated three times. All vegetable plants grown with different effluent concentrations and the effects of different concentrations of effluents were compared to that of normal water (control). Parameters considered to study were heavy metals like (cadmium, chromium, copper, lead, iron, zinc). Recently matured leaf samples were collected during fifty percent maturity and during full maturity. A composite of 20 leaf samples were collected from each plot, then analyzed and compared with those of natural limits and the safe limits of various agencies for vegetables. Swiss chard irrigated with different effluent concentration have been shown to accumulate relatively high concentrations of heavy metals compared to other vegetables included in the experiment. Cd, Cr, Fe and Pb in T₃ (75 % effluent concentration) and T₄ (100% effluent concentration) were recorded higher than the maximum limit for vegetables. Cu and Zn were recorded less than the maximum limits for vegetables. All metal concentrations increased with increasing effluent concentrations. Cabbage irrigated with different effluent concentrations, showed less concentrations of Cu, Fe, Pb and Zn which were found less than the maximum allowable limit for vegetables. Chromium was found to be less than the maximum allowable limit for vegetables. Comparing with other vegetables the concentration of heavy metals was recorded less in cabbage. Continuous monitoring of soil, plant and water quality together with prevention of metals entering to vegetables is prerequisite in order to prevent potential health hazards to human beings.

Index Terms- Contamination, Heavy Metals, Tannery Effluent, Vegetables.

I. INTRODUCTION

Vegetables are important ingredient of human diet that contain essential nutrients and trace elements (Abdullah and Chmielnicka, 1990). Vegetables constitute an important part of human diet since they contain carbohydrates, proteins, as well as vitamins, minerals, trace elements and fibers, and also have beneficial anti oxidative effects (Dastane, 1987). Until recently, however, they did not constitute a major part of the Ethiopian diet, except during the fasting period.

However, since recent years their consumption is increasing gradually, particularly among the urban community. This is due to increased awareness on food value of vegetables, as a result of exposure to other cultures and acquiring proper education (Fisseha Itanna, 2002). Wastewater irrigation results in significant mixing of heavy metal content of agricultural land (Mapanda et al., 2005). The chief cause is the waterways through which heavy metals are leached out of the soil and are taken by the vegetation. If plants decay, these toxic metals are redistributed and as a consequence their enrichment in the agricultural soil occurs. Bioaccumulation, geo accumulation and biomagnifications may result because of entrance of these heavy metals to the ecosystem. Thus long term wastewater irrigation leads to build up of heavy metals in soils and food crops (Khan et al., 2008). Rapid industrialization and urbanization with insufficient environmental monitoring planning often results in discharging of the industrial and sewage waste into rivers and lakes which lead to gradual pollution of our water resources. Many times such wastewater is drained to the agricultural land where this polluted water is used for irrigating crops including vegetables.

Thus polluted effluent water is found to be rich not only in organic matter and nutrients but also in heavy metals like lead, chromium, cadmium, nickel, cobalt etc that finally reach to the soil of agricultural area and leads to food chain contamination as crops and vegetables absorb them from the soil. Heavy metals are not easily biodegradable and it leads to their accumulation in human vital organs causing varying degrees of illness on acute and chronic exposure (Ward et al., 1995). Heavy metal contamination of vegetables cannot be underestimated as these foodstuffs are important components of human diet.

The vegetable farm at Ejersa is among the vegetable farms of the area, where a substantial amount of vegetables are being produced seasonally. The farm is irrigated with the wastewater from the effluent by the tannery and from underground water that may be contaminated by the effluent of the tannery. Before several decades, the water from the river in the area was clean. However, with the increase in the urban population and industrialization, the water has now become contaminated with various pollutants among which are heavy metals. Vegetables grown at contaminated sites could take up and accumulate metals at concentrations that are toxic (Weigert, 1991). In addition they could be contaminated as farmers wash them with wastewater before bringing them to market. The leafy vegetables under this study; namely, cabbage and Swiss chard are usually mixed with potatoes and carrots and cooked to form a special sauce known as "alicha", while tomato is usually cut in pieces, seasoned well and eaten raw as salad (Fisseha Itanna, 2002).

Heavy metal accumulation may pose a direct threat to human health (Turkdogan et al., 2003). Cadmium accumulation may cause bone deformation, kidney damage, anemia, injury of central nervous system and liver disease. Copper toxicity may induce hypertension, coma and sporadic fever. Zinc accumulation causes vomiting and renal damage, whereas hexavalent chromium may induce gastro-intestinal ulceration and cancer (Prabu, 2009). Heavy metal contamination of the food items is one of the most important aspects of food quality assurance (Marshall, 2004; Radwan and Salama, 2006; Wang et al., 2005; Khan et al., 2008). International and national regulations on food quality have lowered the maximum permissible levels of toxic metals in food items due to an increased awareness of the risk these metals pose to food chain contamination (Radwan and Salama, 2006).

II. MATERIALS AND METHODS

The study was conducted during 2010/2011 and 2011/2012 years at the Ethiopia Tannery Share Company (ETSC), one of the largest tanneries of the country found about 90 km East of Addis Ababa in Ejersa area of East Shoa.

The seed of six vegetables onion (*Allium cepa* L., Var. Bombay red), carrot (*Daucus carota* L., Var. nantus), beet root (*Beta Vulgaris* L., Var. Detroit dark red.), Swiss chard (*Beta Vulgaris* L., Var. Fordhook giant), tomato (*Lycopersicon esculentum* L., Var. roma VF) and cabbage (*Brassica oleracea* L., Var. Copenhagen market) vegetable plants were purchased from vegetable seed importers by keeping the higher standard of purity and quality of germination. The effluent is discharged from Ethiopia Tannery Share Company. The effluent was collected in big plastic containers directly from the outlet of the tannery and prepared in different concentrations. The treatments were made by mixing measured amounts of wastewater in T₀ (normal water) i.e. diluted T₁ (25%), T₂ (50%), T₃ (75%) and undiluted T₄ (100%) effluent. The vegetables were grown in three replications on the plot size of (1.2 m x 2 (2.4 m²)) for onion, carrot, beet root, Swiss chard and for tomato & cabbage on 1.8 m x 2 m (3.6 m²). Depending on the space between plants and rows, the total area of the experiment plots was 415.00 m². The Treatments were arranged in Randomized Complete Block Design (RCBD) with three replications.

All cultural practices like:- land cultivation, sowing depth, transplanting, space between plants and rows, hoeing, weeding, fertilizer applications and pesticides applications for all plots were kept uniformly as per recommendations. Vegetable plants were irrigated with normal water against mixture of different effluent concentrations every other days in accordance with the plant requirements through the crop period for full nourishment of the vegetable plants and to keep the soil moist using hand held pouring cans. Recently matured leaf samples were collected from the field irrigated with different effluent concentrations during half maturity (fifty percent flowering) and full maturity. The samples were collected twice during a period of two years to represent the dry and rainy season and divided into leaf and root. A composite of 20 leaf samples were collected from each plot.

The leaf samples were prepared in laboratory, where they were thoroughly washed to remove all adhered soil particles. Samples were cut into small pieces, air dried for 2 days (depending of the plant type) and finally dried at 100 ± 1 °C in an oven for 72 hrs. The sample were ground in warm condition and passed through 1 mm sieve. Samples were analyzed to determine heavy metal accumulation in vegetable plants following the method given by APHA (1998) FAAS (Flame Atomic Absorption Spectrometer) and GFAAS (Graphite Furnace Atomic Absorption Spectrometer) Analyst 600 Perkin Elmer were used to determine heavy metals such as Cd, Cr, Cu, Fe, Pb, and Zn.

The 0.5 gm of well homogenized sample was weighed into a clean silica dish and 0.5 ml of 20% sulphuric acid was added. Thorough mixing of wet samples was done and stirring rod was rinsed with water into clean silica dish. Content of the dish was dried in an oven at 110°C. Then it was heated over a soft flame until all volatile matter was removed. The dish was later transferred to furnace set at 250°C and temperature was raised slowly to 500°C for about 6 to 8 hr. If the ash was not carbon free, 0.5 ml of nitric acid was added and dish was returned to the furnace at 500°C and ashing was done for about 30 min. It was done triplicate. Later 1 ml of nitric acid and 10 ml of water were added to the clean ash and the mixture was heated till the ash was dissolved. The content was qualitatively transferred to a 50 ml volumetric flask. Sample blank solutions were prepared using the same procedures described for the samples. Same quantities of reagents including water were used for sample and blank. All chemicals used were of analytical grade. The 1000 ppm stock solution of each of the metal ion was prepared and required dilutions were made for the purpose of calibration curves. Both sample and blank solutions were analyzed with AAS and concentrations of all metals were determined (MMAF, 2005).

The collected data were subjected to combined statistical analysis of variance (ANOVA) over years using SAS software package 2010. Treatment means that showed significant differences were separated by Duncan's Multiple Range Test (DMRT).

III. RESULTS AND DISCUSSIONS

The data presented in Table 1 shows the effect of tannery effluent with concentration of T₀ (0% normal water, i.e control) and T₁ (25% effluent concentration) was found Cd = 0.001 & 0.12 mg kg⁻¹, Cr = 0.002 & 1.15 mg kg⁻¹, Cu = 0.007, 4.10 mg kg⁻¹, Fe 0.005 & 6.00 mg kg⁻¹, Pb = 0.007 & 0.08 mg kg⁻¹ Zn = 0.009 & 8.80 mg kg⁻¹ which was less than the maximum limit for vegetables. Germination failure was observed at higher effluent concentration of 50,75 and 100% plant was very susceptible to high effluent concentrations, which is T₂ (50% effluent concentration), T₃ (75% effluent concentration) and T₄ (100% concentration), no growth was observed in both two years. This may be attributed to the toxicity caused due to increasing amount of various organic and inorganic compounds present in higher concentration of the effluent. Statistically significant differences between treatments were observed in all metal concentrations.

Table 1. Mean metal concentrations in onion plant irrigated with tannery effluent representing the dry and rainy seasons during 2010/11 and 2011/12 years

Treatments	Metals content (mg kg ⁻¹) (Mean of three replications at half and full maturity)					
	Cd	Cr	Cu	Fe	Pb	Zn
T ₀	0.001 ^a	0.002 ^a	0.007 ^a	0.005 ^a	0.007 ^a	0.009 ^a
T ₁	0.12 ^b	1.15 ^b	4.10 ^b	6.00 ^b	0.08 ^b	8.80 ^b
CV (%)	3.76	8.76	10.43	11.42	5.55	12.68
Maximum limits for Vegetables*	0.2	2.3	73.3	425.5	0.3	99.4

Means followed by different letters within the same column are significantly different at 5% probability level.

*Source: FAO/WHO-Codex alimentarius commission, 2001

Table 2 shows that, the mean concentration of Cd, Cu, Fe, Pb and Zn in all treatments (T₁ – T₄) were increased with increasing effluent concentrations. The mean concentration of metals in carrot plant however, were recorded less than the maximum limits for vegetables. Chromium was generally the highest concentration in the analyzed samples.

It was also observed the same germination problem in treatment T₁, T₂ and T₃, but in Treatment T₄ (100% effluent concentration) no plant growth was observed in both two year experiments, this may happen due to the susceptibility of the carrot to the highest concentration of tannery effluent. The result showed statistically significant differences between treatments (P<0.05) for all metal concentrations.

Table 2. Metal concentrations in carrot plant irrigated with tannery effluent representing the dry and rainy seasons during 2010/ 2011 and 2011/2012 years

Treatments	Metals content (mg kg ⁻¹) (Mean of three replications at half and full maturity)					
	Cd	Cr	Cu	Fe	Pb	Zn
T ₀	0.003 ^a	0.002 ^a	0.007 ^a	0.008 ^a	0.005 ^a	0.009 ^a
T ₁	0.07 ^b	1.35 ^b	5.74 ^b	9.50 ^b	0.13 ^b	9.60 ^b
T ₂	0.10 ^c	1.82 ^c	7.50 ^c	11.42 ^c	0.29 ^c	22.46 ^c
T ₃	0.13 ^d	2.42 ^d	15.90 ^d	16.65 ^d	0.64 ^d	38.75 ^d
CV (%)	1.74	3.76	8.73	6.48	3.26	4.32
Maximum limits for Vegetables*	0.2	2.3	73.3	425.5	0.3	99.4

Means followed by different letters within the same column are significantly different at 5% probability level.

*Source: FAO/WHO-Codex alimentarius commission, 2001

The mean metal concentrations in beet root irrigated with different effluent concentrations, shows the mean concentration level of Cd, Cu, Fe and Zn were found less than the maximum allowable or permissible limit for vegetables. Chromium (Cr) and lead (Pb) were found more than the maximum allowable limit for vegetables. All heavy metals concentrations in treatments T₁ – T₃ (25% - 100%

effluent concentrations) were observed in increasing order, which means the concentration of heavy metals increases with increasing effluent concentrations which showed statistically significant differences between treatments (Table 3).

Table 3. Metal concentrations in beet root irrigated with tannery effluent representing the dry and rainy seasons during 2010/11 and 2011/12 years

Treatments	Metals content (mg kg ⁻¹) (Mean of three replications at half and full maturity)					
	Cd	Cr	Cu	Fe	Pb	Zn
T ₀	0.002 ^a	0.004 ^a	0.005 ^a	0.007 ^a	0.007 ^a	0.005 ^a
T ₁	0.09 ^b	1.23 ^b	0.31 ^b	23.45 ^b	0.12 ^b	6.63 ^b
T ₂	0.12 ^c	1.42 ^c	10.33 ^c	77.32 ^c	0.15 ^c	22.65 ^c
T ₃	0.15 ^d	2.34 ^d	13.27 ^d	194.63 ^d	0.87 ^d	72.14 ^d
T ₄	0.19 ^e	3.32 ^e	31.45 ^e	384.30 ^e	1.22 ^e	90.40 ^e
CV (%)	4.33	5.27	8.68	10.45	4.82	9.64
Maximum limits for Vegetables*	0.2	2.3	73.3	425.5	0.3	99.4

Means followed by different letters within the same column are significantly different at 5% probability level

*Source: FAO/WHO-Codex alimentarius commission, 2001

The mean metal concentration in Swiss chard irrigated with different effluent concentrations have been shown to accumulate relatively high concentrations of heavy metals comparing to other vegetables included in the experiment. In this study the mean concentration of Cd, Cr, Fe and Pb in T₃ (75 % effluent concentration = 0.26, 2.03, 110.51, 0.32 mg kg⁻¹) respectively and T₄ (100% effluent concentration = 0.29, 2.45, 217.10 and 0.43 mg kg⁻¹) respectively, were recorded higher than the maximum limit for vegetables. Cu and Zn were recorded less than the maximum limits for vegetables. All metal concentrations increased with increase of effluent concentrations which showed statistically significant differences between treatments (Table 4).

Table 4. Mean metal concentrations in Swiss chard irrigated with tannery effluent representing the dry and rainy seasons during 2010/11 and 2011/12 years

Treatments	Metals content (mg kg ⁻¹) (Mean of three replications at half and full maturity)					
	Cd	Cr	Cu	Fe	Pb	Zn
T ₀	0.004 ^a	0.007 ^a	0.007 ^a	0.007 ^a	0.002 ^a	0.002 ^a
T ₁	0.12 ^b	1.34 ^b	8.31 ^b	21.21 ^b	0.14 ^b	12.67 ^b
T ₂	0.20 ^c	1.62 ^c	18.33 ^c	84.32 ^c	0.25 ^c	31.65 ^c
T ₃	0.26 ^d	2.03 ^d	27.41 ^d	110.51 ^d	0.32 ^d	51.13 ^d
T ₄	0.29 ^e	2.45 ^e	33.17 ^e	217.10 ^e	0.43 ^e	69.43 ^e
CV (%)	1.56	3.32	5.67	11.44	1.35	6.42
Maximum limits for Vegetables*	0.2	2.3	73.3	425.5	0.3	99.4

Means followed by different letters within the same column are significantly different at 5% probability level.

*Source: FAO/WHO-Codex alimentarius commission, 2001

Table 5 shows that, the mean concentrations of Cd, Cr, Cu, Fe, Pb and Zn in all treatments (T₁ – T₄) increased with increasing effluent concentrations, even though, the concentration of metals in tomato plant were recorded less than the maximum limit for vegetables. In treatment T₄ chromium (Cr) shows the slightly more than the maximum allowable limit for vegetables. Lead (Pb) was also found more than the maximum limits for vegetables. In Treatment T₄ (100% effluent concentration) no plant growth was observed in both two years, this may happen due to the susceptibility of the tomato plant to the highest concentration of tannery effluent. The result showed statistically significant differences between treatments (P<0.05) for all metal concentrations.

Table 5. Mean metal concentrations in tomato plant irrigated with tannery effluent representing the dry and rainy seasons during 2010/11 and 2011/12 years

Treatments	Metals content (mg kg ⁻¹) (Mean of three replications at half and full maturity)					
	Cd	Cr	Cu	Fe	Pb	Zn
T ₀	0.006 ^a	0.007 ^a	0.005 ^a	0.005 ^a	0.002 ^a	0.004 ^a
T ₁	0.10 ^b	1.14 ^b	5.31 ^b	34.53 ^b	0.12 ^b	8.63 ^b
T ₂	0.13 ^c	1.92 ^c	12.74 ^c	97.63 ^c	0.28 ^c	32.35 ^c
T ₃	0.18 ^d	2.33 ^d	15.43 ^d	124.51 ^d	0.37 ^d	43.23 ^d
CV (%)	0.94	2.58	4.76	11.66	1.13	5.38
Maximum limits for Vegetables*	0.2	2.3	73.3	425.5	0.3	99.4

Means followed by different letters within the same column are significantly different at 5% probability level.

*Source: FAO/WHO-Codex alimentarius commission, 2001

The mean concentration level of Cd, Cu, Fe, Pb and Zn in cabbage treated with different effluent concentrations were found less than the maximum allowable limit for vegetables. Chromium was found less than the maximum allowable limit for vegetables, which was T₁ = 0.74, T₂ = 1.42, T₃ = 1.83 and T₄ = 2.13 mg kg⁻¹. Comparing with other vegetables the concentration of heavy metals were recorded less. The concentration of heavy metals in all treatments were recorded to increased with increasing effluent concentrations which were significantly difference between treatments (Table 6).

Table 6. Mean metal concentrations in cabbage plant irrigated with tannery effluent representing the dry and rainy seasons during 2010/11 and 2011/12 years

Treatments	Metals content (mg kg ⁻¹) (Mean of three replications at half and full maturity)					
	Cd	Cr	Cu	Fe	Pb	Zn
T ₀	0.005 ^a	0.004 ^a	0.009 ^a	0.005 ^a	0.003 ^a	0.006 ^a
T ₁	0.08 ^b	0.74 ^b	0.31 ^b	23.45 ^b	0.12 ^b	6.63 ^b
T ₂	0.13 ^c	1.42 ^c	10.33 ^c	77.32 ^c	0.15 ^c	22.65 ^c
T ₃	0.15 ^d	1.83 ^d	12.41 ^d	86.51 ^d	0.22 ^d	51.23 ^d
T ₄	0.19 ^e	2.13 ^e	26.30 ^e	103.15 ^e	0.29 ^e	53.64 ^e
CV (%)	0.54	2.46	5.52	8.27	1.22	4.72
Maximum limits for Vegetables*	0.2	2.3	73.3	425.5	0.3	99.4

Means followed by different letters within the same column are significantly different at 5% probability level.

*Source: FAO/WHO-Codex alimentarius commission, 2001

It was observed that all metal contents in all vegetable plants were found to be lowest in treatment T₁ (25% effluent concentration) and highest in T₄ (100% effluent concentrations). Present investigation has clearly shown that the mixture of tannery effluent in higher proportion may cause toxicity during the consumption of the vegetables.

Differences in metal concentrations in vegetables seem to imply that different types of vegetables have different abilities to accumulate metals. In spite of the mechanism involved in the element uptake by root, plants are known to respond to the amount of readily mobile metals in soil. The order of toxic heavy metal concentrations in vegetables vary with toxic metals. Different vegetable species accumulate different metals depending on environmental conditions, metal species and plant available forms of heavy metals (Lokeshwari & Chandrappa, 2006).

Genotypical differences in tolerance and co-tolerance to heavy metals are well known in some species and ecotypes of natural vegetation. Onion, carrot and tomato plants were highly sensitive to the high effluent concentrations, which led to the poor germination and total kill of plants. Cabbage was generally the least accumulator of metals as compared to other vegetables. The mean concentration of Cr was found less than the maximum allowable limit. Cu content in all vegetables was also found less than the maximum limit. Cd accumulation was more in leafy vegetables viz., Swiss chard. The reason for the accumulation is that Cd is

relatively easily taken up by leafy vegetables and also due to the foliar absorption of atmospheric deposits on plant leaves (Midio & Satake, 2003). An earlier study on metal contents of vegetables from Addis Ababa market showed that Swiss chard contained the highest Cd and cabbage the least (Rahlbeck et al., 1999). Leafy vegetables accumulate higher metal contents than others (Al Jassir *et al.*, 2005).

Heavy metals are one of a range of important types of contaminants that can be found on the surface and in the tissues of fresh vegetables. Prolonged human consumption of unsafe concentrations of heavy metals in food stuff may lead to the disruption of numerous biological and biochemical process in the human body (Prabu, 2009). Heavy metal accumulation gives rise to toxic concentrations in the body, while some elements (e.g. arsenic, cadmium, chromium) act as carcinogens and others (e.g. mercury and lead) are associated with development abnormalities in children. The Codex Committee on Food Additives and Contaminants of the Joint FAO/WHO Food Standards Programme, has proposed draft levels for typical daily exposure and theoretical maximum daily intake (TMDI) for some of these metals in vegetables (Codex, FAO/WHO, 2001). Accordingly, the intake of most of the metals constitute less than 10% of the TMDI. Arsenic, chromium, iron and lead are at present of greater concern of health risk than the other metals. Metal concentrations in the vegetables studied would not suffice for determining health implications. This depends also on the dietary pattern of the consumers.

It is because of this, that the intake of metals from the studied vegetables constitutes much less than the TMDI or the provisional tolerable weekly intake (PWTI), which are used to express the exposure of consumers and associated health risk. A recent study on leafy vegetables bought from Addis Ababa market also confirms this (Fisseha Itanna, 1999). However, with increase in vegetable consumption this situation could easily change.

For instance, it has been reported that through the introduction of bio-intensive gardening in some households in Addis Ababa the daily vegetable intake per person has risen from 5gm to 161gm (ENDA, Ethiopia, 2002).

IV. CONCLUSIONS AND RECOMMENDATIONS

From the study it is revealed that, untreated tannery effluent is the main source of pollution to the irrigation with contaminated effluent containing variable amounts of heavy metals leading to increase in concentration of metals in vegetables, which was grown using polluted effluent. Concentration of metals in vegetables will provide baseline data and there is a need for intensive sampling for quantification of results throughout the country. Since cabbage is the least accumulator of metals and metalloids, it may be less risky to eat cabbage at Ejersa than eating Swiss chard from health standpoint. Heavy metals have a toxic impact, but detrimental impacts become apparent only when long term consumption of contaminated vegetables occurs. It is therefore suggested that regular monitoring of heavy metals in vegetables and other food items should be performed in order to prevent excessive build up of these heavy metals in the human food chain.

To avoid entrance of metals into the food chain, tannery effluent should not be discharged into rivers and farmlands without prior treatment. Apart from treating the discharge that enters into the farms, it is also imperative to utilize alternative measures of cleaning up the already contaminated substrates. Continuous monitoring of soil, plant and water quality together with prevention of metals entering vegetables is prerequisite in order to prevent potential health hazards to human beings. Periodical monitoring the rate of contamination and consumption is thus necessary to assess the overall exposure level in the community. Reduced crop contamination and improved safe food can be achieved through, reducing pollution at source, improved vegetable production and post harvest handling and using support for vegetable trading systems to improve food safety.

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A Security approach for Data Migration in Cloud Computing

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Abstract-- Cloud computing is a new paradigm that combines several computing concepts and technologies of the Internet creating a platform for more agile and cost-effective business applications and IT infrastructure. The adoption of Cloud computing has been increasing for some time and the maturity of the market is steadily growing. Security is the question most consistently raised as consumers look to move their data and applications to the cloud. I justify the importance and motivation of security in the migration of legacy systems and I carry out an approach related to security in migration processes to cloud with the aim of finding the needs, concerns, requirements, aspects, opportunities and benefits of security in the migration process of legacy systems.

Index Terms-- Security; Cloud Computing; Data Migration; Encryption

I. BACKGROUND

1. Overview of Cloud Computing

Cloud computing services such as Amazon EC2 and Windows Azure are becoming more and more popular but it seems many people are still unclear as to what exactly the buzzword “Cloud computing” actually means. In its simplest form, the principle of Cloud computing is the provision of computing resources via a network.

Cloud Computing has become one of the most talked about technologies in recent times and has got lots of attention from media as well as analysts because of the opportunities it is offering. The market research and analysis firm IDC suggests that the market for Cloud Computing services was ` 68000 crore in 2008 and will rise to ` 178500 crore/year by 2012 [1]. It has been estimated that the cost advantages of Cloud Computing to be three to five times for business applications and more than five times for consumer applications. According to a Gartner press release from June 2008, Cloud Computing will be “no less influential than e-business” [2].

Enterprises have been striving to reduce computing costs and for that reason most of them start consolidating their IT operations and later using virtualization technologies. For the good of the enterprises there is a new technology to help them in this i.e. Cloud Computing. Cloud Computing claims to take enterprises search to a new level and allows them to further reduce costs through improved utilization, reduced administration and infrastructure cost and faster deployment cycles [3].

Cloud Computing is a term used to describe both a platform and type of application. As a platform it supplies, configures and reconfigures servers, while the servers can be physical machines or virtual machines. On the other hand, Cloud Computing describes applications that are extended to be accessible through the internet and for this purpose large data centers and powerful servers are used to host the web applications and web services [3,p2].

The cloud is a metaphor for the Internet and is an abstraction for the complex infrastructure it conceals. There are some important points in the definition to be discussed regarding Cloud Computing. Cloud Computing differs from traditional computing paradigms as it is scalable, can be encapsulated as an abstract entity which provides different level of services to the clients, driven by economies of scale and the services are dynamically configurable [6, p1].

There are many benefits stated of Cloud Computed by different researchers which make it more preferable to be adopted by enterprises. Cloud Computing infrastructure allows enterprises to achieve more efficient use of their IT hardware and software investments.

This is achieved by breaking down the physical barrier inherent in isolated systems, automating the management of the group of the systems as a single entity. Cloud Computing can also be described as ultimately virtualized system and a natural evolution for data centers which offer automated systems management [3, p4].

Enterprises need to consider the benefits, drawbacks and the effects of Cloud Computing on their organizations and usage practices, to make decision about the adoption and use. In the enterprise, the “adoption of Cloud Computing is as much dependent on the maturity of organizational and cultural (including legislative) processes as the technology, per se” [7].

Many companies have invested in Cloud Computing technology by building their public clouds, which include Amazon, Google and Microsoft. These companies are often releasing new features and updates of their services. For instance Amazon Web Services (AWS) released a Security2 and Economics3 center on their website to have academic and community advice regarding these issues [12]. This shows that there are still lots of doubts about the costs and security for enterprises to adopt Cloud Computing. Hence, the issues of economics and security in Cloud Computing for enterprises must be researched. As large organizations are inherently complex hence, it is very important for Cloud Computing to deliver the real value rather than just be a platform for simple tasks such as application testing or running product demos. For this reason, issues around migrating application systems to the cloud and satisfying the needs of key stakeholders should be explored. The stakeholders include technical, project, operations and financial managers as well as the engineers who are going to be developing and supporting the individual systems. For enterprises economics or cost factor is important but at the same time customer relationships, public image, flexibility, business continuity and compliance are of same importance.

2. Types of Cloud Providers

Cloud services are usually divided in the three main types, Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS) and Infrastructure-as-a-Service (IaaS).

a. Software as a Service (SaaS)

SalesForce. The applications are typically offered to the clients via the Internet and are managed completely by the Cloud provider. That means that the administration of these services such as updating and patching are in the provider’s responsibility. One big benefit of SaaS is that all clients are running the same software version and new functionality can be easily integrated by the provider and is therefore available to all clients.

b. Platform as a Service (PaaS)

PaaS Cloud providers offer an application platform as a service, for example Google App Engine. This enables clients to deploy custom software using the tools and programming languages offered by the provider. Clients have control over the deployed applications and environment-related settings. As with SaaS, the management of the underlying infrastructure lies within the responsibility of the provider.

c. Infrastructure as a Service (IaaS)

IaaS delivers hardware resources such as CPU, disk space or network components as a service. These resources are usually delivered as a virtualization platform by the Cloud provider and can be accessed across the Internet by the client. The client has full control of the virtualized platform and is not responsible for managing the underlying infrastructure.

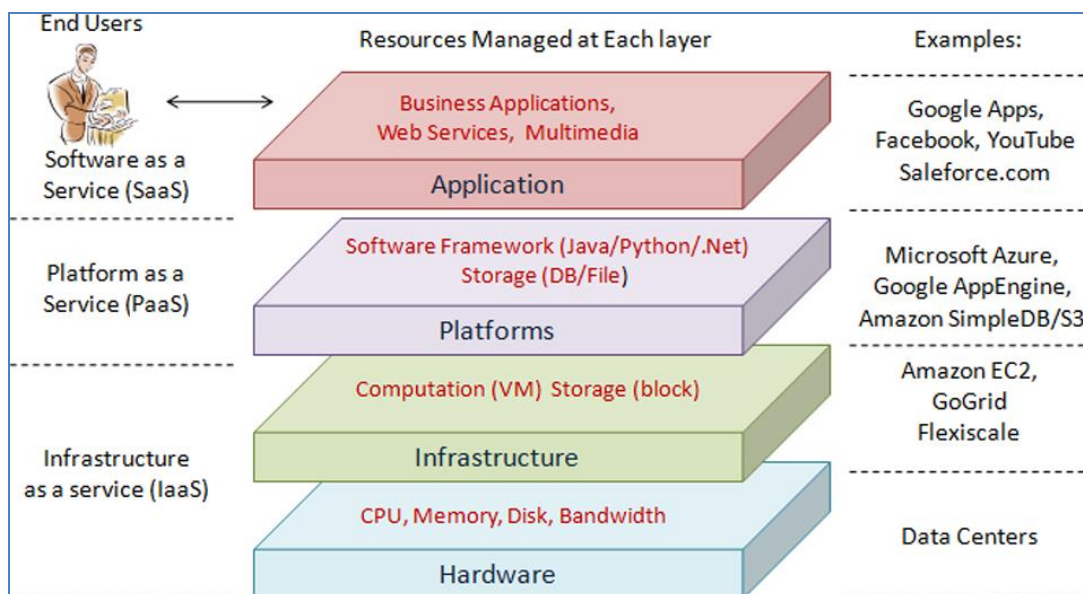


Figure 1: A layered model of Cloud Computing

(Source: Qi Zhang et al., Cloud computing: state-of-the-art and research challenges, J Internet Serv Appl (2010) pp. 7–18)

3. Security issues and challenges

Heightened security threats must be overcome in order to benefit fully from this new computing paradigm. Some security concerns are listed and discussed below:

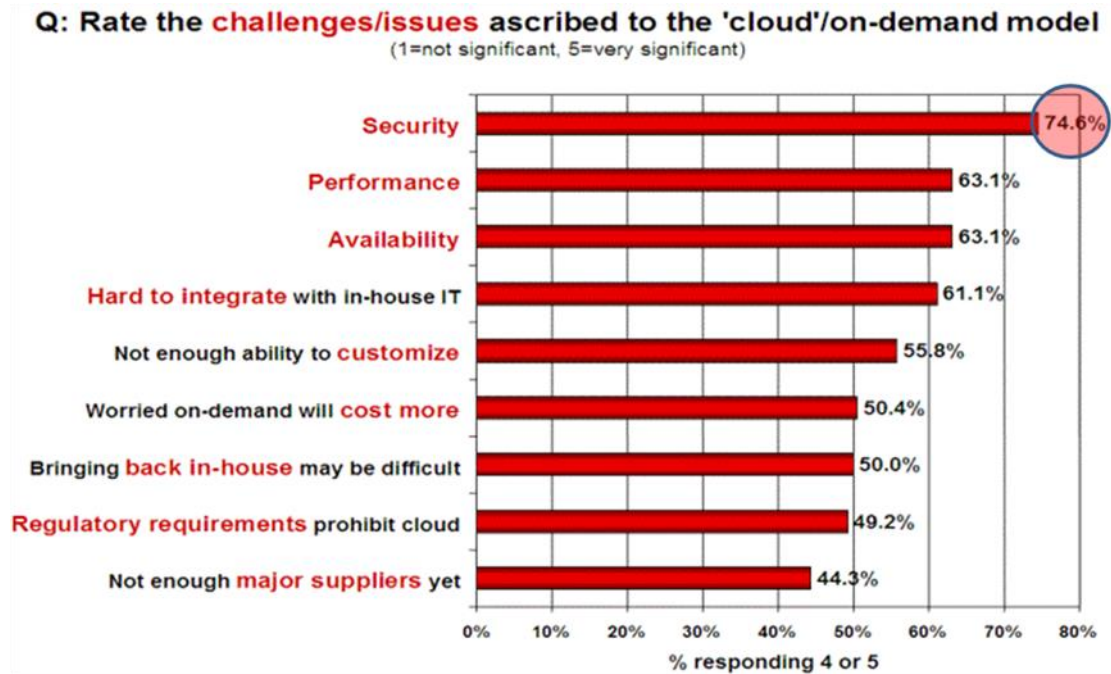


Figure 2: Security is the Major Issue

(Source: <http://www.csrc.nist.gov/groups/SNS/cloud-computing/cloud-computing-v26.ppt> at slide 17)

- a. *Security concern #1:* With the cloud model control physical security is lost because of sharing computing resources with other companies. No knowledge or control of where the resources run.
- b. *Security concern #2:* Company has violated the law (risk of data seizure by (foreign) government).
- c. *Security concern #3:* Storage services provided by one cloud vendor may be incompatible with another vendor's services if user decides to move from one to the other (e.g. Microsoft cloud is incompatible with Google cloud). (Pearson et al. 2003)
- d. *Security concern #4:* Who controls the encryption/decryption keys? Logically it should be the customer.
- e. *Security concern #5:* Ensuring the integrity of the data (transfer, storage, and retrieval) really means that it changes only in response to authorized transactions. A common standard to ensure data integrity does not yet exist.
- f. *Security concern #6:* In case of Payment Card Industry Data Security Standard (PCI DSS) data logs must be provided to security managers and regulators. [9][10][11]
- g. *Security concern #7:* Users must keep up to date with application improvements to be sure they are protected.
- h. *Security concern #8:* Some government regulations have strict limits on what data about its citizens can be stored and for how long, and some banking regulators require that customer's financial data remain in their home country.
- i. *Security concern #9:* The dynamic and fluid nature of virtual machines will make it difficult to maintain the consistency of security and ensure the audit ability of records.
- j. *Security concern #10:* Customers may be able to sue cloud service providers if their privacy rights are violated, and in any case the cloud service providers may face damage to their reputation. Concerns arise when it is not clear to individuals why their personal information is requested or how it will be used or passed on to other parties.

II. SECURITY CHALLENGE IN DATA MIGRATION

1. A perception on the Data Migration

Data migration to a cloud computing environment is in many ways an exercise in risk management. Both qualitative and quantitative factors apply in an analysis. The risks must be carefully balanced against the available safeguards and expected benefits, with the understanding that accountability for security remains with the organization. Too many controls can be inefficient and ineffective, if the benefits outweigh the costs and associated risks. An appropriate balance between the strength of controls and the relative risk associated with particular programs and operations must be ensured.

Data security is another important research topic in cloud computing. Since service providers typically do not have access to the physical security system of data centers, they must rely on the infrastructure provider to achieve full data security. Even for a virtual private cloud, the service provider can only specify the security setting remotely, without knowing whether it is fully implemented. The infrastructure provider, in this context, must achieve the following objectives: (1) *confidentiality*, for secure data access and transfer, and (2) *auditability*, for attesting whether security setting of applications has been tampered or not. Confidentiality is usually achieved using cryptographic protocols, whereas auditability can be achieved using remote attestation techniques. Remote attestation typically requires a trusted platform module (TPM) to generate non-forgable system summary (i.e. system state encrypted using TPM's private key) as the proof of system security. However, in a virtualized environment like the clouds, VMs can dynamically migrate from one location to another; hence directly using remote attestation is not sufficient. In this case, it is critical to build trust mechanisms at every architectural layer of the cloud. Firstly, the hardware layer must be trusted using hardware TPM. Secondly, the virtualization platform must be trusted using secure virtual machine monitors [14, 15]. VM migration should only be allowed if both source and destination servers are trusted. Recent work has been devoted to designing efficient protocols for trust establishment and management.

2. Need for securing data migration process

Cloud Migration is one of much conversed point where cloud managers face extreme problems at the time of data migration from a company's server to a server that forms cloud elsewhere. Why they face troubles let's find out. As I know, cloud behaves as an interface through which organizations can access data in a virtual environment. Thus, smooth functioning of it depends primarily on how well groomed and knowledgeable cloud providers are in this area.

Moreover, if data migration is not done systematically and properly, it can give rise to problems concerning data and cloud security of company's assets that primarily comprise of data. Thus, hiring cloud providers having sound experience about the field with ample knowledge and skill sets becomes vital for managing cloud more effectively and efficiently.

Example: Suppose an XYZ company wants to shift its data to cloud storage for increased uptime and scalability, it goes to cloud service provider for performing such functions. Now, the cloud provider starts initializing steps for data transfer to cloud, but in between face problems like data crash or unauthorized access by third parties. This is where the problem lies. The proprietor of data that hired cloud manager would not only face reputation losses but also monetary losses. Similar case was experienced when Amazon cloud failure happened and several businesses suffered immense losses due to it.

Thus, securing data remains an utmost priority of cloud managers to prevent global cloud security threats that also include cross-border security concerns.

3. Characteristic of Data Migration

- a. Commercial relation exists between clouds
- b. Transmission of mass data
- c. Many workers which execute transmission process concurrently

III. PROPOSED SOLUTION OF SECURING DATA MIGRATION PROCESS

We have talked about security in cloud computing many times before, explaining why it is just as safe as conventional networking security, even citing its benefits over the conventional. However, there are many who still find cloud computing security lacking.

Individuals which still worry about cloud security are those that fall under the financial institution category like banks, brokers, lenders and the like. They do not trust third party cloud computing providers and vendors, at least not with their most sensitive information and data. They might use cloud computing for some things like websites and applications that they think they can risk security with, but they would never consider parting with direct access of their financial and other similar data.

The biggest reason behind this is simpler than most would imagine as it has something to do with numbers and probability, thought they probably would not admit it is something as basic as that and would rather cite some technical issue like migration and data

integrity. Those are valid points, but they are not truly even problems. With ease and security of data migration through cloning and inter-server data transfers with services like Cloud Velocity, migration is truly a no pain no worry process. The real reason as I have said is the probability of a successful attack. Government systems and financial data systems are under attack multiple times a day, and a sizeable majority of these fail at the first lines of defense. The probability of a successful attack is always real, and this probability of success increases as the number of attempts increases.

The process of transitioning all or part of a company's data, applications and services from on-site premises behind the firewall to the cloud, where the information can be provided over the Internet on an on-demand basis. While a cloud migration can present numerous challenges and raise security concerns, cloud computing can also enable a company to potentially reduce capital expenditures and operating costs while also benefiting from the dynamic scaling, high availability, multi-tenancy and effective resource allocation advantages cloud-based computing offers.

1. Understanding for Distributed file system over clouds

Google File System (GFS) [17] is a proprietary distributed file system developed by Google and specially designed to provide efficient, reliable access to data using large clusters of commodity servers. Files are divided into chunks of 64 megabytes, and are usually appended to or read and only extremely rarely overwritten or shrunk. Compared with traditional file systems, GFS is designed and optimized to run on data centers to provide extremely high data throughputs, low latency and survive individual server failures.

Inspired by GFS, the open source Hadoop Distributed File System (HDFS) [18] stores large files across multiple machines. It achieves reliability by replicating the data across multiple servers. Similarly to GFS, data is stored on multiple geo-diverse nodes. The file system is built from a cluster of data nodes, each of which serves blocks of data over the network using a block protocol specific to HDFS. Data is also provided over HTTP, allowing access to all content from a web browser or other types of clients. Data nodes can talk to each other to rebalance data distribution, to move copies around, and to keep the replication of data high.

2. Prediction based Encryption (PBE)

Predicate Based Encryption (PBE), represents a family of asymmetric encryption schemes that allows for selective fine-grained access control as part of the underlying cryptographic operation. The origins of PBE are in Identity Based Encryption (IBE). In IBE schemes an entity's encryption key is derived from a simple string that represents the entity's own public identity e.g. an email address. For example, given an entity "Virendra" his corresponding encryption key will be *Enc (Virendra) == kushwah.virendra248@gmail.com.* During encryption, the resulting cipher-text will effectively be labelled with the string representing the encryption key, the entity's public identity. An entity's decryption key will be derived from the same string used for the encryption key e.g. Virendra's decryption key will be derived from his e-mail address. On receipt of a ciphertext message the recipient will be able to decrypt the cipher-text if and only if the two identities, contained within the decryption key and cipher-text, are 'equal'. PBE schemes offer a richer scheme in which an entity's 'identity' can be constructed from a set of attributes and decryption is associated with access policies that offers a more expressive means with which to describe the relation between the attributes.

A solution might be Prediction Based Encryption (PBE) for multicasting. PBE is a combination of both IBE (Identity Based Encryption)[19][20] and ABE (Attribute Based Encryption) [22][24]. In this work, the attributes are used to design user's decryption keys and to encrypt simple text messages. Decryption occurs when a match occurs between the attributes held by the entity (in their Decryption key) and the attributes used to construct a simple text. This matching occurs through the use of predicates, which describe:

- The required attributes needed to decrypt
- The relationship between the attributes.

PBE scheme supports four operations allowing for encryption, decryption and key generation. The precise value for encryption and decryption keys is dependent upon both the construction of the scheme and placement of predicates. A general PBE scheme consists of the four operations[18]:

- **Setup:** initializes the crypto-scheme and generates a master secret key MSK, used to generate decryption keys, and a set of public parameters MPK.

$(MSK, MPK) := \text{Setup} ()$

- **KeyGen:** generates a decryption key $Dec (entity)$ based upon the master secret key and some entity supplied input.
 $Dec (entity) := \text{KeyGen} (MSK, input)$
- **Encrypt:** encrypts a plain-text message M using the public parameters and supplied encryption key for an entity.

$$CT: = \text{Encrypt} (M, MPK, \text{Enc} (\text{entity}))$$

- **Decrypt:** decrypts a cipher-text if and only if the attributes held by the entity can satisfy the access policy.
 $M: = \text{Decrypt} (CT, MPK, \text{Dec} (\text{entity}))$

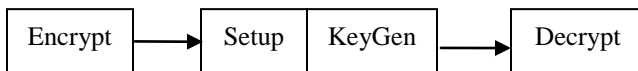


Figure 3. Functioning of the proposed system

3. Working Structure

The working structure of proposed solution can be recognized by the following and important figure. It illustrates entire details toward the security needs.

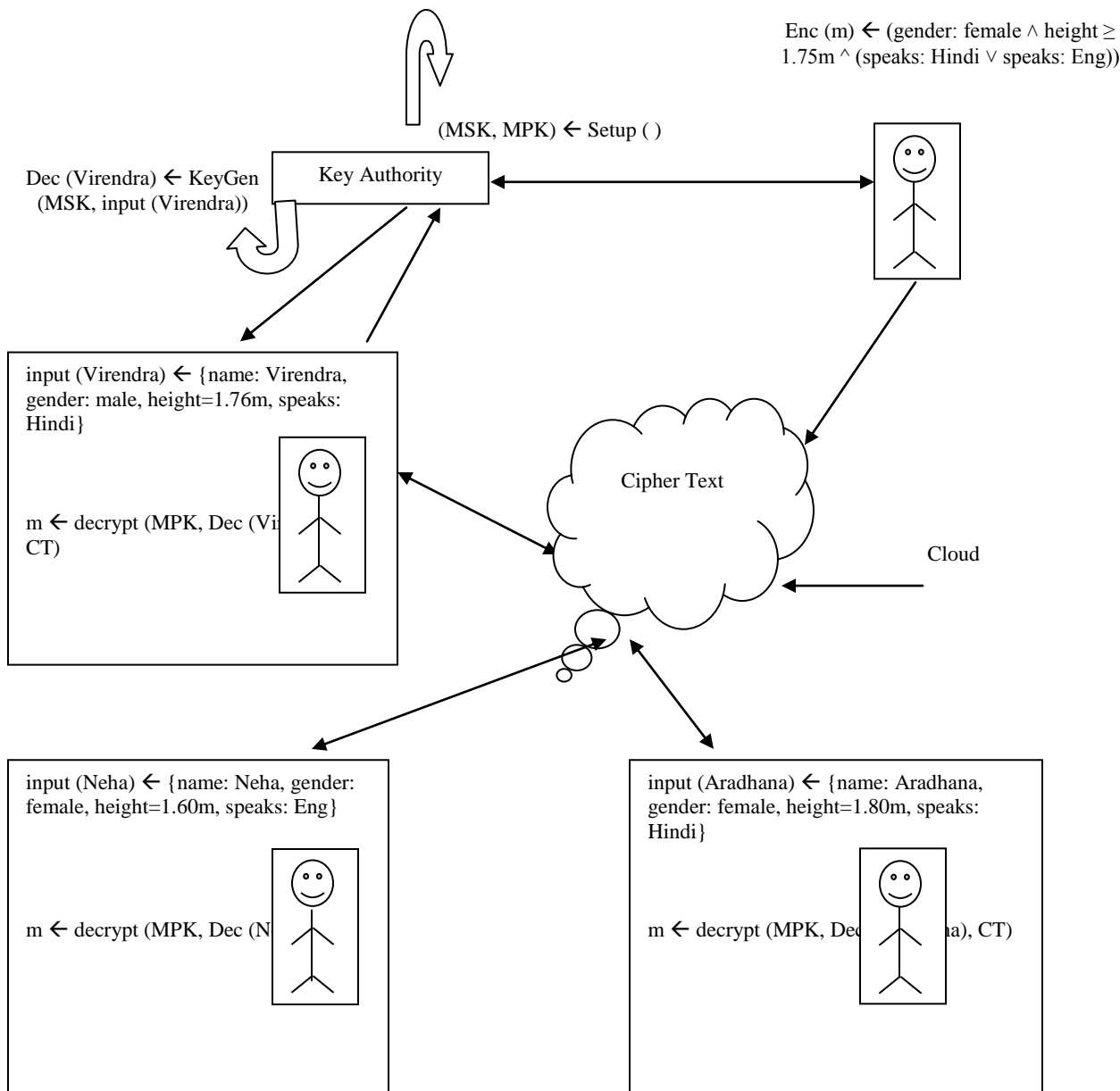


Figure 4: Overall working of the system

The overall working of the proposed solution can be understood by the below diagram. As shown in the diagram, when Virendra, Neha and Aradhana want to communicate for sending and receiving cloud’s data. Here, only Aradhana can access the Cloud’s data.

She is only authorized person who can access the Cloud's data based on Encryption of the message with specific parameters. The encrypted data can be decrypted by its Master Public Key (MPK) as mentioned above.

The working can be under covered by a File System, which is identified by HDFS (Hadoop Distributed File System). This file system creates a layer between the encrypted data and shared link or channel.

IV. CONCLUSION & FUTURE WORK

Cloud is growing because cloud solutions provide users with access to high computational power at a fraction of the cost of buying such a solution outright and which can be acquired on demand; the network becomes an important element in the cloud where users can buy what they need when they need it. Although industry leaders and customers have wide-ranging expectations for cloud computing, privacy and security concerns remain a major impediment to widespread adoption.

The benefits of Cloud computing are the first weapon when organizations or companies are considering moving their applications and services to Cloud, analyzing the advantages that it entails and the improvements that they can get. If the customers decide to incorporate their businesses or part of them to the Cloud, they need to take into account a number of risks and threats that arise, the possible solutions that can be carried out to protect their applications, services and data from those risks, and some best practices or recommendations which may be helpful when the customers want to integrate their applications in the Cloud.

The future work can be carried out the optimization of security work as an idea to ensure about the work reliability. With the help of LP (Linear Programming), we will optimize the secured data.

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Analysis of Effective Area and Splicing Loss Behavior of Square and Hexagonal Photonic Crystal Fiber

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Abstract- This paper investigates the core and cladding effective area and splicing loss behavior of a square lattice photonic crystal fiber. These behaviors of square lattice photonic crystal fiber are also compared with the hexagonal photonic crystal fiber. Effective index method is applied for the numerical calculation and the plot has been analyzed by using MATLAB. It has been observed that by choosing some sufficient dimensional parameter a square lattice photonic crystal fiber has sufficiently large effective area and nearly zero splice loss of 0.0006dB at 1.55 μ m.

Index Terms - photonic crystal fiber (PCF), effective index method (EIM), effective area (A_{eff}), Fiber-To-The-Home (FTTH).

I. INTRODUCTION

Photonic crystal fiber is just a new class of optical fiber based on the properties of photonic crystal. It contains an array of holes running along the length of the fiber [1]. PCF contains periodic regions of low and high dielectric. It can guide light not only through the well known total internal reflection but also through the photonic band gap mechanism. PCFs are generally divided into two main categories: index guiding fibers that have a solid core and photonic band gap or air guiding fibers that have periodic micro-structured elements and a core of low index material also called hollow core PCF. Thus due to the crystal like structure of photonic crystal fiber, PCF leads to the number of unusual properties that could not be possible in conventional optical fiber. PCF has ability to be single mode over a broad range of wavelengths [2]. Nowadays, optically-driven data exchange media are playing a central role in many new applications such as defense, security, sensing, transportation, computing and medicine [3]. Today it seems that everyone wants high-speed data, dependable voice service, and high-quality video. Whether these services are delivered by digital subscriber line (DSL), cable modems, or wireless architectures is insignificant as long as the service is fast and dependable. Fiber to the Home or FTTH - enables service providers to offer a variety of communications and entertainment services, including carrier-class telephony, high-speed Internet access etc. Providing all these services together requires increasing bit rate per channel or increasing the power level through the channel. Thus sufficiently large effective area PCF allows high power level without nonlinear effects and material damage. Thus photonic crystal fiber has great potential as communication fiber. Transmission of signal through the fiber optic channel mainly depends upon the loss associated with the fiber. In the field of optical communication there is great development since the introduction of photonic crystal as fiber by Phillip Russel [4][5] in the year 1998.

Applications are emerging in many diverse areas of science including the field of optoelectronics. For example- Ranka et al [6], first shown that an ultra-small core fiber made from solid glass and surrounded by very large air-holes can be arranged to have a nearly zero chromatic dispersion in the 800nm wavelength. In the year 2000, breakthrough losses of 13dB/km were reported in hollow-core photonic band gap fiber by the researchers [7]. Fully characterized hollow core PCF is now commercially available with losses below 0.1 dB/m [8].

Fiber to the home (FTTH), also called "fiber to the premises" (FTTP), is the installation and use of optical fiber from a central point directly to individual buildings such as residences, apartment buildings and businesses to provide unprecedented high-speed Internet access. The splicing loss is a very important parameter of PCF to calculate. It occurs due to misalignment when two optical fibers are joined together. Thus by controlling the splice loss of the fiber, it will be of great use in these telecommunication applications. Based on the current development in the area of optics, it is needed to improve the structure, performance and the cost for

the future implementation of crystal fiber everywhere in the field of communication.

In this paper effective index method (EIM) [9][10] is used for the numerical calculation of effective index of cladding (n_{fsm}), effective area (A_{eff}), and splice loss of both square and hexagonal crystal fiber and the plot has been drawn by using MATLAB software.

II. PROPOSED STRUCTURE

The design of photonic crystal fiber is very flexible. There are many parameters like- air hole diameter (d), hole to hole spacing (Λ), number of air hole ring etc. to manipulate. By manipulating all these parameters a number of unusual behaviors of PCF can be seen. The geometrical quantities that describes a PCF can be represented as

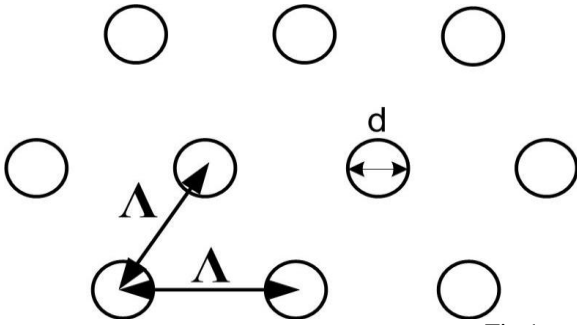


Fig 1: geometrical behaviors describing PCF

The proposed structure of square lattice PCF is

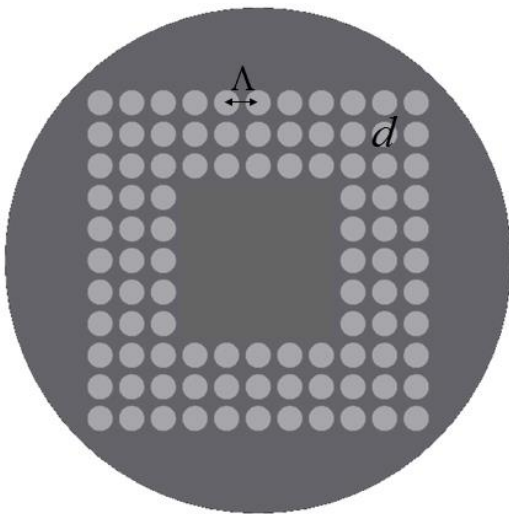


Fig 2: square lattice PCF having three numbers of air hole rings

And the hexagonal PCF can drawn by removing two central air hole rings from the given structure. It also has three number of air hole rings. The dimensional parameter for both the structures are taken same.

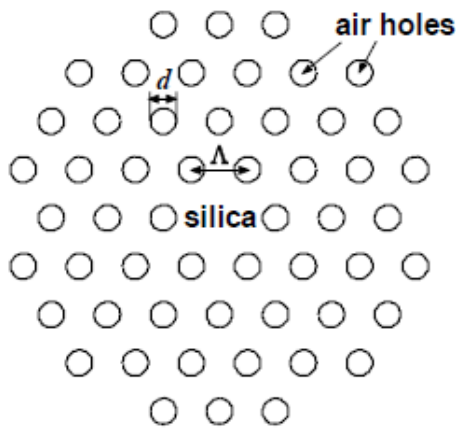


Fig 3: Hexagonal PCF

Both the structure contains three number of air hole rings. The structural parameters of both the given structure is same. In the proposed structures of the PCF, air hole diameter, $d = 0.5\mu\text{m}$, pitch (Λ) = $3\mu\text{m}$. The background material for both the structure is taken as SiO_2 with refractive index 1.445.

III. NUMERICAL ANALYSIS AND SIMULATION RESULTS

Photonic crystals with periodicity in transverse direction supports mode which is referred as space filling mode (SMF) because they are infinitely extends in transverse direction. In the effective index method, the photonic crystal cladding is replaced by a single material with refractive index equal to the modal index of fundamental space filling mode [5]. The modal effective refractive index is calculated by solving the scalar wave equation within a unit cell of photonic crystal, centered on one of the holes. PCF can be well parameterized by V-parameter which is given as-

$$V_{PCF} = \frac{2\pi}{\lambda} a \sqrt{(\eta_{co}^2 - \eta_{fsm}^2)} \quad (1)$$

With

$$U = \frac{2\pi}{\lambda} a \sqrt{\eta_{co}^2 - \eta_{cl}^2} \quad (2)$$

$$W = \frac{2\pi}{\lambda} a \sqrt{\eta_{cl}^2 - \eta_{fsm}^2} \quad (3)$$

$$u = \frac{2\pi}{\lambda} b \sqrt{\eta_{fsm}^2 - \eta_{cl}^2} \quad (4)$$

$$b = \Lambda \sqrt{\frac{\sqrt{2}}{2\pi}} \quad \text{for hexagonal PCF}$$

$$b = \Lambda \sqrt{\frac{2}{\pi}} \quad \text{for square lattice PCF}$$

Where η_{co} and η_{fsm} are the refractive index of core and the space filling mode respectively. 'a' is the effective area of core region and b is the core radius.

The effective area of the photonic crystal fiber can be calculated from the formula

$$A_{eff} = \frac{[\iint_{-\infty}^{\infty} |F(x,y)|^2 dx dy]^2}{\iint_{-\infty}^{\infty} |F(x,y)|^4 dx dy} \quad (5)$$

Where $F(x, y)$ is the modal field distribution inside the fiber.

The spot size or the mode field diameter W_{pcf} is calculated directly from the Peterman II equation. The equation is given by-

$$W_{pcf} = \sqrt{2}\rho \frac{J_1(U_{eff})}{W_{eff}J_0(U_{eff})} \quad (6)$$

Where ρ is the core radius of PCF and J is the Bessel function.

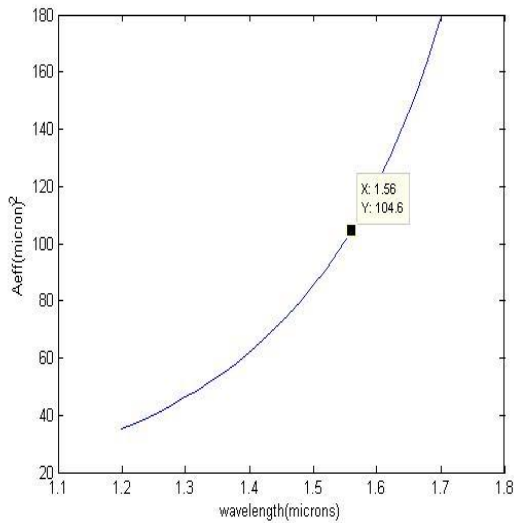


Fig 4: Effective area of square lattice PCF

The Effective area plot of hexagonal PCF is shown below. From the two plots of A_{eff} , it is clear that in the entire telecommunication band, the effective area of square lattice PCF is larger than that of the hexagonal PCF. Specially at $1.56\mu\text{m}$ of telecommunication band the effective area of square lattice PCF is $104\mu\text{m}^2$ and that of the hexagonal PCF it is $45.29\mu\text{m}^2$.

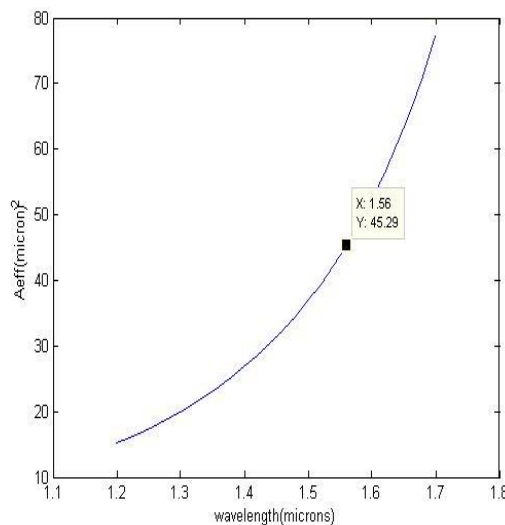


Fig 5: Effective area of Hexagonal PCF

The splice loss occur due to misalignment when two optical fibers are joined together. It is an important parameter to calculate when two PCF are spliced. In this paper splice loss is calculated by using the spot size values. The splice loss in terms of spot size is given as

$$\alpha(dB) = 4.343 \left[\frac{u}{W_{pcf}} \right]^2 \quad (7)$$

Where u is transverse offset between two fibers.

It is clear from the plot that the splice loss of both the fibers are very low i.e.; nearly zero. In case of square lattice PCF the splice loss at $1.56\mu\text{m}$ of telecommunication band is given as 0.0006115dB for air hole diameter $0.4\mu\text{m}$. but it is 0.0008241dB at same frequency in hexagonal PCF with same structural parameter. It is clear from the diagrams that the splicing loss dominates as we go to larger size of air hole diameter.

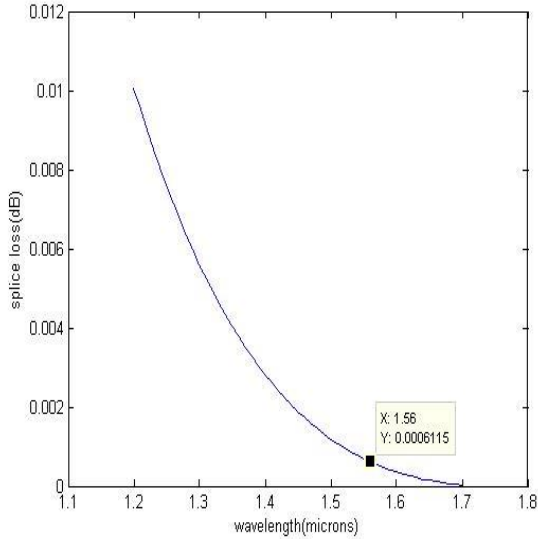


Fig 6: splice loss of square lattice PCF with $d=0.4\mu\text{m}$, $\Lambda=3\mu\text{m}$

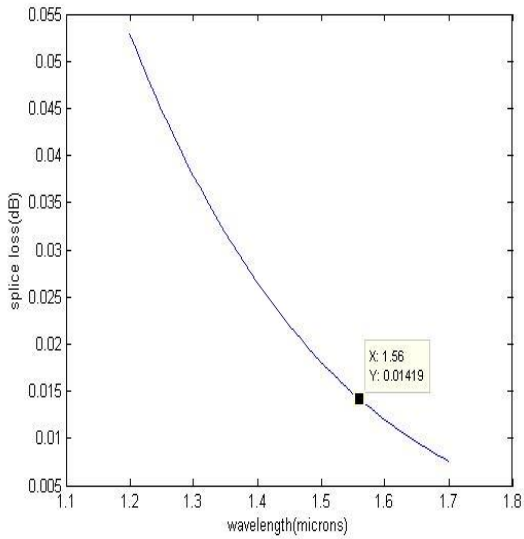


Fig 7: splice loss of square lattice PCF with $d=0.5\mu\text{m}$, $\Lambda=3\mu\text{m}$

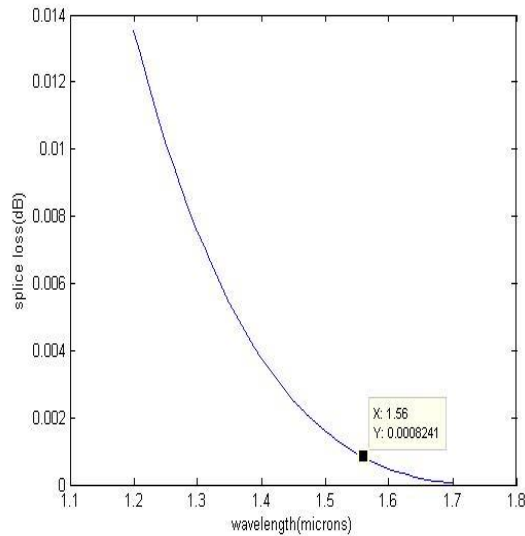


Fig: splice loss of hexagonal PCF with $d=0.4\mu\text{m}$, $\Lambda=3\mu\text{m}$

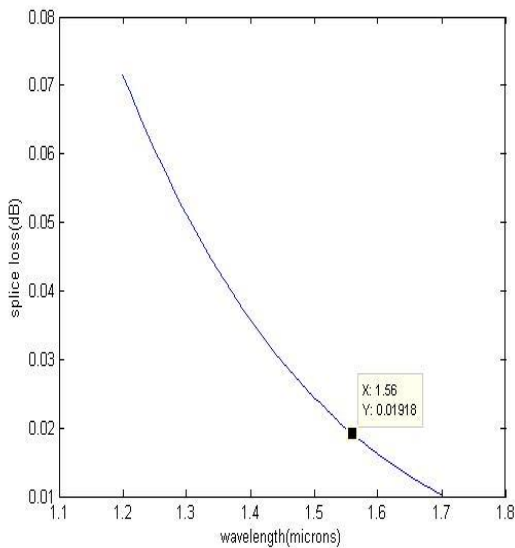


Fig: splice loss of hexagonal PCF with $d=0.5\mu\text{m}$, $\Lambda=3\mu\text{m}$

From the given plots it is clear that with increasing the air hole size of the PCF, the splice loss of the corresponding fiber also increases. We can see from the figure that at $d=0.5\mu\text{m}$, the splice loss is 0.014dB for square lattice PCF and it is 0.019dB for hexagonal PCF. The lattice constant $\Lambda=3\mu\text{m}$ is taken same for all the structures. The total number of air hole rings in the structure used is three.

IV. CONCLUSIONS

Studying the result of two photonic crystal structure i.e. square and hexagonal PCF, shows that the by using sufficient number of dimensional parameter, the effective area of the square lattice is larger than that of hexagonal lattice. Thus allows more power level in the fiber which will be very useful in modern triple-play delivery of voice, data and tele-services for the telecommunication purpose. The splice loss is also comparatively less for square lattice PCF. Hence it will also be suitable for FTTH communication application.

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Evaluation of Antifungal Properties of Certain Plants against *Drechslera Oryzae* Causing Brown Leaf Spot of Rice in Manipur Valley

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Abstract- Antifungal activity of aqueous extracts of locally available plants which are known for their medicinal values were tested *in vitro* against *Drechslera oryzae*, the causal organism of brown leaf spot of rice. The plants extracts were tested against the mycelial growth of *D. oryzae* at different concentrations of 5%, 10%, 15% and 20% using poisoned food technique. Among the plants extracts, *Acorus calamus* extract at 20% concentration alone showed 80.0% inhibition of mycelial growth whereas the other tested plants showed less inhibitory effect. In field trial, aqueous extract of *Acorus calamus* showed maximum percentage of disease control and reduced the disease incidence by 45.29% as compared with control plot.

Index Terms- Plant extracts, antifungal properties, *Drechslera oryzae*, brown leaf spot, rice.

I. INTRODUCTION

Brown leaf spot of rice caused by *Drechslera oryzae* (Breda de Haan) Subram. and Jain. is one of the major fungal disease of rice which occurs in almost all the rice growing areas [7]. The disease is of great importance in several countries and has been reported to cause considerable losses. It occurs, occasionally as an epidemic disease every year in mild or severe form. Several chemicals have been reported to control the disease [2]. The spraying of the fungicides have been reported to reduce the disease severity effectively [1]. However, the indiscriminate use of chemical fungicides to control the disease is not only hazardous to living beings but also adversely affects the environment [5]. This results to find out an alternative approaches which are economically feasible and eco-friendly like botanical pesticides or biological agents to control the disease [5]. The present investigation was therefore undertaken to test the antifungal activity of certain plant extracts against *D. oryzae*, the causal organism of brown leaf spot of rice.

II. MATERIALS AND METHODS

Ten locally available plants viz. *Acorus calamus*, *Allium hookeri*, *Artemisia vulgaris*, *Azadirachta indica*, *Centella asiatica*, *Eupatorium birmanicum*, *Lantana camara*, *Phlogocanthus thyrsoiflorus*, *Zanthoxylum alatum* and *Zingiber officinalis*, which are known for their medicinal values were selected to test their antifungal properties against *D. oryzae*. Aqueous extract of plant parts such as leaves, rhizomes were prepared by using the standard method as given by Gerard

Ezhilan et. al. [3]. The fresh plants parts were taken and washed with running tap water followed by sterile distilled water. It was then ground with sterile distilled water at the rate of 1 ml per gram of plant tissue (1:1 V/W) with mortar and pestle and filtered through double layered white muslin cloth. The filtrate so obtained formed the standard plant extract solution i.e.100 percent. The plant extract thus prepared were tested *in vitro* against the mycelial growth of *D. oryzae* using poisoned food technique. Potato Dextrose Agar (PDA) with 2% agar was used as culture medium. Varying amounts of the plants extract were added to the sterilized molten PDA to get a final concentration of 5%, 10%, 15% and 20%. The poisoned PDA was poured into sterile petriplates and allowed to set. Four replications were maintained for each concentration. Then the petriplates were inoculated with mycelium disc (4mm diameter) of the test fungus taken from the margin of five days old pure culture. The mycelium disc inoculated on PDA with no plant extracts but with only sterile water acts as control plate. The whole set up was incubated in inverted position at $26 \pm 1^\circ\text{C}$ in BOD incubator for 7 days. The radial growth of *D. oryzae* was measured after seven days of incubation and the percent inhibition of the fungal growth was calculated by using the formula given by Vincent [4].

$$I = \frac{C - T}{C} \times 100$$

where,

I = percent inhibition.

C = growth in control.

T = growth in treatment.

In vivo Tests:

In vivo tests were carried out at Langthabal, a small village located at the outskirts of the Imphal city for two consecutive growing years (2010 and 2011). The experiment was conducted in a sick field which shows disease incidence of brown leaf spot of rice during the last three years of cropping seasons. A susceptible rice variety (RCM10) was sown in a randomized block design in 3×3 m² plots with three replications for each treatment. The 25 days old seedlings were transplanted @ 2-3 plants per hill at a spacing of 20 cm row to row and 15 cm plant to plant. The effective plant extract that showed high percentage of inhibition at 20% concentration in *in vitro* test viz. *Acorus calamus*, *Artemisia vulgaris*, *Centella asiatica*, *Lantana camara*, *Phlogocanthus thyrsoiflorus* were further determined to see their effect in *in vivo* conditions. The plant extracts with 20% concentration were sprayed at weekly interval starting from

tillering stage till flowering stage. In control plot only distilled water was sprayed. Data on disease incidence were recorded at weekly interval and calculated as per the formula given below:

Percent Disease Incidence,

$$(DI\%) = \frac{\text{Total no. of plants infected by a particular disease}}{\text{Total no. of plants assessed}} \times 100$$

The data so obtained was statistically analysed to ascertain the effectiveness of the treatments.

III. RESULTS

The result presented in Table 1 showed that the plant extracts were significantly effective against the mycelial growth of *D. oryzae* as compared with the control plates. Among the

plant extracts, aqueous extract of *Acorus calamus* (80.0%) at 20% concentration showed highest mycelial growth inhibition followed by *Artemisia vulgaris* (40.0%) and *Centella asiatica* (40.0%). Again, aqueous extract of *Eupatorium birmanicum*, *Lantana camara*, *Phlogocanthus thyrsiflorus*, *Zanthoxylum alatum* and *Zingiber officinalis* showed 30% or more mycelial growth inhibition while *Allium hookeri* and *Azadirachta indica* showed less than 30% inhibition of mycelial growth.

The data presented in Table 2 showed that in *in vivo test*, the selected plants reduced the disease incidence during the two successive cropping seasons. Among the plants, maximum percent of reduction in disease incidence over control was observed in *Acorus calamus* (45.29%) followed by *Artemisia vulgaris* (26.44%), *Centella asiatica* (24.11%), *Lantana camara* (19.98%) and *Phlogocanthus thyrsiflorus* (18.21%).

IV. TABLES

Table 1: Effect of plant extracts on radial growth of mycelium of *D. oryzae* at different concentrations.

Test plants	Parts used	Mycelial growth (in cm) at different conc ⁿ .				Mean	% inhibition of mycelial growth at different conc ⁿ .			
		5%	10%	15%	20%		5%	10%	15%	20%
<i>Acorus calamus</i>	Rhizome	1.8	1.6	1.3	0.9	1.4	60.0	64.4	71.1	80.0
<i>Allium hookeri</i>	Leave	4.4	4.3	3.8	3.4	4.0	2.2	4.4	15.6	24.4
<i>Artemisia vulgaris</i>	Leave	3.3	3.2	2.8	2.7	3.0	26.7	28.9	37.8	40.0
<i>Azadirachta indica</i>	Leave	3.5	3.4	3.4	3.3	3.4	22.2	24.4	24.4	26.7
<i>Centella asiatica</i>	Leave	3.2	3.0	2.8	2.7	2.9	28.9	33.3	37.8	40.0
<i>Eupatorium birmanicum</i>	Leave	3.7	3.4	3.3	3.1	3.4	17.8	24.4	26.7	31.1
<i>Lantana camara</i>	Leave	3.6	3.5	3.4	2.8	3.3	20.0	22.2	24.4	37.8
<i>Phlogocanthus thyrsiflorus</i>	Leave	3.7	3.5	3.2	2.9	3.3	17.8	22.2	28.9	38.6
<i>Zanthoxylum alatum</i>	Leave	3.7	3.5	3.3	3.0	3.4	17.8	22.2	26.7	33.3
<i>Zingiber officinalis</i>	Rhizome	3.5	3.3	3.1	3.1	3.3	22.2	26.7	31.1	31.1
Control		4.5	4.5	4.5	4.5	4.5				
Mean		3.5	3.4	3.2	3.0					

CD (P = 0.05) Between plant extracts: 0.04
Between concentrations: 0.06

* Mean of four replications.

Table 2: Effect of plant extracts on the incidence of brown spot of rice in *in vivo tests*.

Test plants	D.I.%		Pooled mean	% Disease control
	2010	2011		
<i>Acorus calamus</i>	16.17 (23.71)	14.83 (22.65)	15.5	45.29%
<i>Artemisia vulgaris</i>	20.00 (26.57)	21.67 (27.74)	20.84	26.44%

<i>Centella asiatica</i>	20.17 (26.69)	22.83(28.54)	21.50	24.11%
<i>Lantana camara</i>	21.50 (27.62)	23.83(29.22)	22.67	19.98%
<i>Phlogocanthus thrysiflorus</i>	22.33(28.20)	24.00(29.33)	23.17	18.21%
Control	27.33(31.52)	29.33(32.79)	28.33	

CD (P = 0.05) Between plant extracts: 12.9

* Mean of three replications.

* Values in parentheses are arcsine transformed values ($x = \sin^{-1} \sqrt{\hat{p}}$).

V. DISCUSSION

The application of chemical fungicides to control the disease has many drawbacks and is hazardous to the environment. Hence, to find out an alternative, locally available plants which possess medicinal properties were investigated. The use of plants extracts as antifungal substance against many fungal diseases has been reported by many workers. Bisht and Khulbe [2] reported maximum inhibition of mycelial growth of *D. oryzae* by *Juglans regia* (64.11%) in *in vitro* experiment. In the present study, aqueous extract of *Acorus calamus* alone showed 80.0% mycelial growth inhibition in *in vitro* experiment and 45.29% reduction of DI% in *in vivo test*. The fungicidal activity of *Acorus calamus* extract against *D. oryzae* might be due to the presence of antifungal compounds like α -asarone and β -asarone. Thingujam and Chhetry [6] also reported the effectiveness of the Tulsi leaf extract for the management of brown leaf spot disease of upland rice. The antifungal and anti microbial effect of *Acorus calamus* has already been reported by many workers.

VI. CONCLUSION

From the present study, it is concluded that locally available plant like *Acorus calamus* can be used to control the brown spot disease of rice in Manipur agro climatic condition without any harmful effect to the environment. Hence, more and more locally available plants need to be identified as an alternative means in place of chemical fungicides for safe and effective control of plant diseases.

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Three-Dimensional Finite Element (FE) Model for Armchair and Zigzag Type Single-Walled Carbon Nanotubes

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Abstract- Three-dimensional finite element (FE) model for armchair and zigzag type single-walled carbon nanotubes (SWCNTs) is proposed. The model development is based on the assumption that carbon nanotubes, when subjected to loading, behave like space-frame structures. The bonds between carbon atoms are considered as connecting load-carrying members, while the carbon atoms as joints of the members. To create the FE models, nodes are placed at the locations of carbon atoms and the bonds between them are modeled using three-dimensional shell element. The elastic moduli of shell element is determined by using a linkage between molecular and continuum mechanics. The investigation includes armchair and zigzag SWCNTs.

It is found that the choice of Vander wall forces, the interaction significantly affects the calculation of Young's modulus. The obtained values of Young's modulus agree very well with the corresponding theoretical results and many experimental measurements. Dependence of elastic moduli to diameter and length of the nanotubes is also obtained. The presented results demonstrate that the proposed FE model may provide a valuable tool for studying the mechanical behavior of carbon nanotubes and their integration in nano composites.

So far we dealt with single walled carbon nanotube. The elements were considered as shell element, it is a uniaxial element with tension, compression, torsion, and bending capabilities. The element has six degrees of freedom at each node: translations in the nodal x, y, and z directions and rotations about the nodal x, y, and z axes. Stress stiffening and large deflection capabilities are included.

I. INTRODUCTION

Nanotubes are members of the fullerene structural family. Their name is derived from their long, hollow structure with the walls formed by one-atom-thick sheets of carbon, called graphene. These sheets are rolled at specific and discrete angles, and the combination of the rolling angle and radius decides the Nanotube properties. Within the layers the atoms are arranged at the corners of hexagons which fill the whole plane. The carbon atoms are strongly (covalently) bound to each other (carbon-carbon distance ~ 0.14 nm). The layers themselves are rather weakly bound to each other.

Carbon nanotubes (CNTs) are amongst the most explored one-dimensional nanostructures and have attracted tremendous interest from fundamental science and technological perspectives. CNTs have been used in many laboratories to build prototype nanodevices. These devices include metallic wires,

field-effect transistors, electromechanical sensors and displays. They potentially form the basis of future all-carbon electronics.

A carbon nanotube can be considered as a large molecule consisting of carbon atoms, forming a hexagonal mesh. It may also be regarded as a one atom thick sheet of graphite, rolled into a tube with high aspect ratio. Such a tube can be considered as a fundamental structural unit, known as single-walled carbon nanotube. Using that fundamental structural unit, a multi-walled carbon nanotube can be formed. MWNTs are in fact concentrically nested SWNTs, with a distance between the layers or walls equal to 0.34 nm.

Each atom in a single layer has three nearest neighboring atoms and they are bonded by covalent bonds, which have characteristic properties (bond length and bond angle). Atoms on different layers of MWNTs are not connected by covalent bonds and the only interaction between them is through Vander Waals forces. Vander Waals forces are rather weak compared to covalent bonds.

Carbon nano tubes are held together by means of strong sp² covalent bonding between carbon atoms. The weak interlayer coupling gives graphite the property of a seemingly very soft material. One of the physical properties of carbon nanotubes is that it's possible to make them only a single atomic layer thick. This means that they can be about 1/50,000th the thickness of a human hair

1.1 BACKGROUND LEADING UP TO CARBON NANOTUBES

Until the mid-1980's pure solid carbon was thought to exist in only two physical forms, diamond and graphite. Diamond and graphite have different physical structures and properties however their atoms are both arranged in covalently bonded networks. These two different physical forms of carbon atoms are called allotropes.

In 1985 a group of researchers led by Richard Smalley and Robert Curl of Rice University in Houston and Harry Kroto of the University of Sussex in England made an interesting discovery. They vaporized a sample of graphite with an intense pulse of laser light and used a stream of helium gas to carry the vaporized carbon into a mass spectrometer.

The mass spectrum showed peaks corresponding to clusters of carbon atoms, with a particularly strong peak corresponding to molecules composed of 60 carbon atoms, C₆₀. The fact that C₆₀ clusters were so easily formed led the group to propose that a new form or allotrope of carbon had been discovered. It was spherical in shape and formed a ball with 32 faces. Of the 32

faces, 12 were pentagons and 20 were hexagons exactly like a soccer ball.(as shown in fig below)

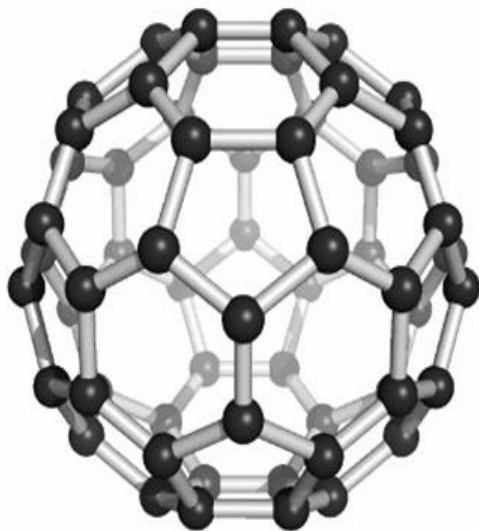


Fig.1 Buckminster fullerene

We see this unusual soccer ball-shape expressed in a wide variety of physical objects, for instance soccer balls, new golf balls, architecture, and art. These molecules were named after an architect, Buckminster Fuller, who was responsible for the design of the first geodesic domes. A geodesic dome that you may be familiar with is "Spaceship Earth" at Epcot Center (Disney World). The soccer ball shaped C₆₀ molecule was named "Buckminster Fullerene" or "buckyball" for short.

After this discovery, other related molecules (C₃₆, C₇₀, C₇₆ and C₈₄) composed of only carbon atoms were also discovered and they and the buckyball were recognized as a new allotrope of carbon. This new class of carbon molecules is called the fullerenes. Fullerenes consist of hexagons and pentagons that form a spherical shape. Fullerenes have also been proposed as possible HIV inhibitors as well as potential constituents in interstellar space.

1.2 DISCOVERY OF CARBON NANOTUBES

The unique geometric properties of this new allotrope of carbon did not end with soccer shaped molecules, it was also discovered that carbon atoms can form long cylindrical tubes. These tubes were originally called "buckytubes" but now are better known as carbon nanotubes or CNT for short. These molecules are shaped like a tube; imagine a sheet of graphite ("graphene sheet") or chicken wire rolled into a tube.

The carbon Nanotube was discovered in 1991 by the Japanese electron microscopist Sumio Iijima who was studying the material deposited on the cathode during the arc-evaporation synthesis of fullerenes. He found that the central core of the cathodic deposit contained a variety of closed graphitic structures including nanoparticles and nanotubes, of a type which had never previously been observed.

The tubes are hollow cylinders with diameters ranging from 1 to 50 nm and having a length in the range of

micrometers. Nanotubes have been constructed with length-to-diameter ratio of up to 132,000,000:1, significantly larger than for any other material. The properties of the material vary as the surface to volume ratio varies. **They only contain carbon atoms and can be thought of a seamless cylinder rolled from a graphite sheet.** Extensive experiments using various advanced measurement tools have been carried out to identify the mechanical properties and the behaviors of CNT including the Young's modulus, shear modulus, buckling behavior and vibration responses. Due to their exceptional mechanical and electrical properties: small size, low density, high stiffness, high strength etc., CNTs represent a very promising material in many areas of science and industry.

Carbon Nanotubes have many structures, differing in length, thickness, and in the type of helicity and number of layers. Although they are formed from essentially the same graphite sheet, their electrical characteristics differ depending on these variations, acting either as metals or as semiconductors.

1.3. Classification of carbon nano tubes

Carbon Nanotubes can be classified mainly based on the following two factors

1.3.1 Classification based on chirality

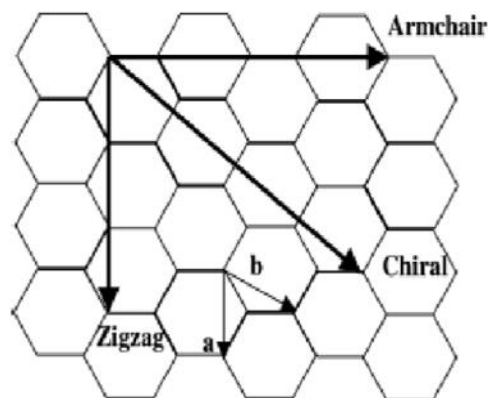


Fig.2 representation of chirality of CNT

The way the graphene sheet is wrapped is represented by a pair of indices (n, m). The integer's n and m denote the number of unit vectors along two directions in the honeycomb crystal lattice of graphene. If m = 0, the nanotubes are called **zigzag nanotubes**, and if n = m, the nanotubes are called **armchair nanotubes**. Otherwise, they are called **Chiral**. The diameter of an ideal Nanotube can be calculated from its (n, m) indices as follows

$$d = \frac{a}{\pi} \sqrt{(n^2 + nm + m^2)}.$$

where a = 0.246 nm.

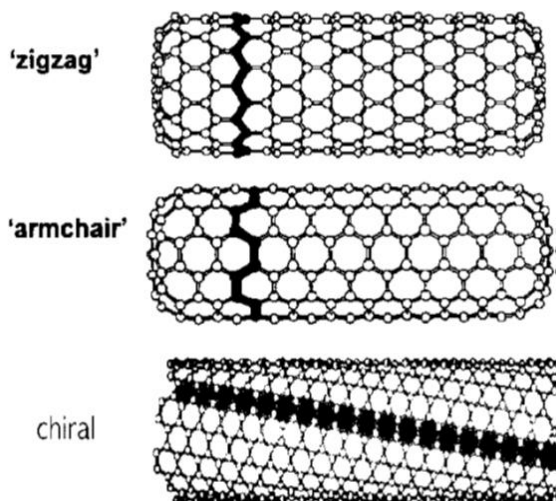


Fig.3 Armchair, Zigzag and Chiral CNTS

Our current project deals about comparison between the armchair and zigzag type of tubes at different wall thickness and at different loading conditions.

1.3.2 Based on number of graphene sheets being rolled

Single walled carbon nano tubes (SWNT) are most widely used nano tubes. Most single-walled nanotubes have a diameter of close to 1 nanometer, with a tube length that can be many millions of times longer. The structure of a SWNT can be conceptualized by wrapping a one-atom-thick layer of graphite called graphene into a seamless cylinder. Single-walled nanotubes are likely candidates for miniaturizing electronics. The most basic building block of these systems is the electric wire, and SWNTs with diameters of an order of a nanometer can be excellent conductors. One useful application of SWNTs is in the development of the first intermolecular field-effect transistors.

Multi-walled carbon nanotubes (MWNT) consist of multiple rolled layers (concentric tubes) of graphene. There are two models that can be used to describe the structures of multi-walled nanotubes. In the Russian Doll model, sheets of graphite are arranged in concentric cylinders. In the Parchment model, a single sheet of graphite is rolled in around itself, resembling a scroll of parchment or a rolled newspaper. The interlayer distance in multi-walled nanotubes is close to the distance between graphene layers in graphite, approximately 3.4 Å. Multi walled carbon nano tubes are mainly used in space elevators due to their extreme physical properties.

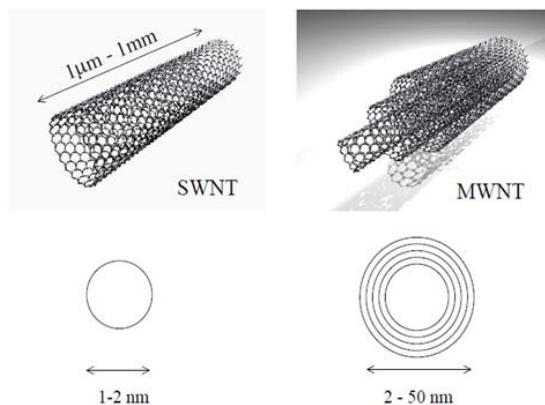


Fig.4 Single wall / Multi wall nanotubes

The failure criteria of CNTS are described by its compressive loading condition. Carbon nano tubes mainly fail due to buckling. Buckling is characterized by a sudden failure of a structural member subjected to high compressive stress, where the actual compressive stress at the point of failure is less than the ultimate compressive stresses that the material is capable of withstanding.

1.4. PROPERTIES OF CARBON NANO TUBES

Carbon nano tubes are quite interesting than the other nano materials because of their excellent properties that they can exhibit. Some of the properties that a carbon nano tube can exhibit are clearly discussed in this paper. The properties of the carbon nano tubes will not be the same for each and every tube. There will be a significant change in properties as the length to diameter ratio varies.

1.4.1. MECHANICAL PROPERTIES

Carbon nanotube is one of the strongest materials in nature. Carbon nanotubes (CNTs) are basically long hollow cylinders of graphite sheets. Although a graphite sheet has a 2D symmetry, carbon nanotubes by geometry have different properties in axial and radial directions. It has been shown that CNTs are very strong in the axial direction. Young's modulus on the order of 270 - 950 GPa and tensile strength of 11 - 63 GPa were obtained.

On the other hand, there was evidence that in the radial direction they are rather soft. The first transmission electron microscope observation of radial elasticity suggested that even the van der Waals forces can deform two adjacent nanotubes. Later, nano indentations with atomic force microscope were performed by several groups to quantitatively measure radial elasticity of multiwalled carbon nanotubes and tapping/contact mode atomic force microscopy was recently performed on single-walled carbon nanotubes. Young's modulus of on the order of several GPa showed that CNTs are in fact very soft in the radial direction.

Radial direction elasticity of CNTs is important especially for carbon nanotube composites where the embedded tubes are subjected to large deformation in the transverse direction under the applied load on the composite structure.

1.4.2. Strength

Carbon nanotubes are the strongest and stiffest materials yet discovered in terms of tensile strength and elastic modulus respectively. This strength results from the covalent sp^2 bonds formed between the individual carbon atoms. CNTs are not nearly as strong under compression. Because of their hollow structure and high aspect ratio, they tend to undergo buckling when placed under compressive, torsional, or bending stress.

Further studies, such as one conducted in 2008, revealed that individual CNT shells have strengths of up to ~ 100 GPa, which is in agreement with quantum/atomistic models. Since carbon nanotubes have a low density for a solid of 1.3 to 1.4 g/cm^3 , its specific strength of up to $48,000 \text{ kN}\cdot\text{m}\cdot\text{kg}^{-1}$ is the best of known materials, compared to high-carbon steel's $154 \text{ kN}\cdot\text{m}\cdot\text{kg}^{-1}$. Under excessive tensile strain, the tubes will undergo plastic deformation, which means the deformation is permanent.

Although the strength of individual CNT shells is extremely high, weak shear interactions between adjacent shells and tubes leads to significant reductions in the effective strength of multi-walled carbon nanotubes and carbon nanotube bundles down to only a few GPa's.

1.4.3. Hardness

Standard single-walled carbon nanotubes can withstand a pressure up to 24 GPa without deformation. They then undergo a transformation to super hard phase nanotubes. Maximum pressures measured using current experimental techniques are around 55 GPa. However, these new super hard phase nanotubes collapse at an even higher, unknown, pressure. The bulk modulus of super hard phase nanotubes is 462 to 546 GPa, even higher than that of diamond (420 GPa for single diamond crystal).

1.4.4. Kinetic properties

Multi-walled nanotubes are multiple concentric nanotubes precisely nested within one another. These exhibit a striking telescoping property whereby an inner nanotube core may slide, almost without friction, within its outer nanotube shell, thus creating an atomically perfect linear or rotational bearing. This is one of the first true examples of molecular nanotechnology, the precise positioning of atoms to create useful machines. Already, this property has been utilized to create the world's smallest rotational motor. Future applications such as a gigahertz mechanical oscillator are also envisaged.

1.4.5. Electrical properties

Because of the symmetry and unique electronic structure of graphene, the structure of a nanotube strongly affects its electrical properties. For a given (n, m) nanotube, if $n = m$, the nanotube is metallic; if $n - m$ is a multiple of 3, then the nanotube is semiconducting with a very small band gap, otherwise the nanotube is a moderate semiconductor. Thus all armchair $(n = m)$ nanotubes are metallic, and nanotubes $(6, 4)$, $(9, 1)$, etc. are semiconducting.

Because of their nanoscale cross-section, electrons propagate only along the tube's axis and electron transport involves quantum effects. As a result, carbon nanotubes are

frequently referred to as one-dimensional conductors. There have been reports of intrinsic superconductivity in carbon nanotubes. Many other experiments, however, found no evidence of superconductivity, and the validity of these claims of intrinsic superconductivity remains a subject of debate.

1.4.6. Optical Properties

Within materials science, the optical properties of carbon nanotubes refer specifically to the absorption, photoluminescence, and Raman spectroscopy of carbon nanotubes. Spectroscopic methods offer the possibility of quick and non-destructive characterization of relatively large amounts of carbon nanotubes. There is a strong demand for such characterization from the industrial point of view: numerous parameters of the nanotube synthesis can be changed, intentionally or unintentionally, to alter the nanotube quality.

Carbon nanotubes are unique "one dimensional systems" which can be envisioned as rolled single sheets of graphite (or more precisely graphene). This rolling can be done at different angles and curvatures resulting in different nanotube properties. The diameter typically varies in the range 0.4–40 nm (i.e. "only" ~ 100 times), but the length can vary $\sim 10,000$ times reaching 18.5 cm. Thus the nanotube aspect ratio, or the length-to-diameter ratio, can be as high as 132,000,000:1, which is unequalled by any other material. Consequently, all the properties of the carbon nanotubes relative to those of typical semiconductors are extremely anisotropic (directionally dependent) and tunable.

1.4.7. Thermal properties

As nanoscale graphitic structures, carbon nanotubes are of great interest for their thermal properties. The low-temperature specific heat and thermal conductivity show direct evidence of 1-D quantization of the phonon band structure. Modeling of the low-temperature specific heat allows determination of the on-tube phonon velocity, the splitting of phonon sub bands on a single tube, and the interaction between neighboring tubes in a bundle.

All nanotubes are expected to be very good thermal conductors along the tube, exhibiting a property known as "ballistic conduction", but good insulators laterally to the tube axis. Measurements show that a SWNT has a room-temperature thermal conductivity along its axis of about $3500 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$; compare this to copper, a metal well known for its good thermal conductivity, which transmits $385 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$. A SWNT has a room-temperature thermal conductivity across its axis (in the radial direction) of about $1.52 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$, which is about as thermally conductive as soil. The temperature stability of carbon nanotubes is estimated to be up to 2800°C in vacuum and about 750°C in air.

1.5. Applications of Carbon nano tubes

1.5.1. Current Applications

Current use and application of nanotubes has mostly been limited to the use of bulk nanotubes, which is a mass of rather unorganized fragments of nanotubes. Bulk nanotube materials may never achieve a tensile strength similar to that of individual tubes, but such composites may, nevertheless, yield strengths

sufficient for many applications. Bulk carbon nanotubes have already been used as composite fibers in polymers to improve the mechanical, thermal and electrical properties of the bulk product.

1.5.2. Potential Applications

The strength and flexibility of carbon nanotubes makes them of potential use in controlling other nanoscale structures, which suggests they will have an important role in nanotechnology engineering. The highest tensile strength of an individual multi-walled carbon nanotube has been tested to be 63 GPa. Carbon nanotubes were found in Damascus steel from the 17th century, possibly helping to account for the legendary strength of the swords made of it.

1.5.3. Structural

Because of the carbon nanotubes superior mechanical properties, many structures have been proposed ranging from everyday items like clothes and sports gear to combat jackets and space elevators. However, the space elevator will require further efforts in refining carbon nanotube technology, as the practical tensile strength of carbon nanotubes can still be greatly improved.

Carbon nanotubes are also a promising material as building blocks in bio-mimetic hierarchical composite materials given their exceptional mechanical properties (~1 TPa in modulus, and ~100 GPa in strength). Initial attempts to incorporate CNTs into hierarchical structures led to mechanical properties that were significantly lower than these achievable limits. Because of the high mechanical strength of carbon nanotubes, research is being made into weaving them into clothes to create stab-proof and bulletproof clothing. The nanotubes would effectively stop the bullet from penetrating the body, although the bullet's kinetic energy would likely cause broken bones and internal bleeding.

1.5.4. In electrical circuits

Nanotube-based transistors, also known as carbon nanotube field-effect transistors (CNTFETs), have been made that operate at room temperature and that are capable of digital switching using a single electron. However, one major obstacle to realization of nanotubes has been the lack of technology for mass production. In 2001 IBM researchers demonstrated how metallic nanotubes can be destroyed, leaving semiconducting ones behind for use as transistors. Their process is called "constructive destruction," which includes the automatic destruction of defective nanotubes on the wafer. This process, however, only gives control over the electrical properties on a statistical scale.

1.5.5. As electrical cables and wires

Wires for carrying electrical current may be fabricated from pure nanotubes and nanotube-polymer composites. Recently small wires have been fabricated with specific conductivity exceeding copper and aluminum; these cables are the highest conductivity carbon nanotube and also highest conductivity non-metal cables.

1.5.6. As paper batteries: A paper battery is a battery engineered to use a paper-thin sheet of cellulose (which is the major constituent of regular paper, among other things) infused with aligned carbon nanotubes. The nanotubes act as electrodes;

allowing the storage devices to conduct electricity. The battery, which functions as both a lithium-ion battery and a super capacitor, can provide a long, steady power output comparable to a conventional battery, as well as a super capacitor's quick burst of high energy—and while a conventional battery contains a number of separate components, the paper battery integrates all of the battery components in a single structure, making it more energy efficient.

1.5.7. Solar cells

One of the promising applications of single-walled carbon nanotubes (SWNTs) is their use in solar panels, due to their strong UV/Vis-NIR absorption characteristics. Research has shown that they can provide a sizeable increase in efficiency, even at their current un-optimized state. Solar cells developed at the New Jersey Institute of Technology use a carbon nanotube complex, formed by a mixture of carbon nanotubes and carbon buckyballs (known as fullerenes) to form snake-like structures. Buckyballs trap electrons, but they can't make electrons flow. Add sunlight to excite the polymers, and the buckyballs will grab the electrons. Nanotubes, behaving like copper wires, will then be able to make the electrons or current flow.

1.5.8. Hydrogen storage

In addition to being able to store electrical energy, there has been some research in using carbon nanotubes to store hydrogen to be used as a fuel source. By taking advantage of the capillary effects of the small carbon nanotubes, it is possible to condense gases in high density inside single-walled nanotubes. This allows for gases, most notably hydrogen (H₂), to be stored at high densities without being condensed into a liquid. Potentially, this storage method could be used on vehicles in place of gas fuel tanks for a hydrogen-powered car. A current issue regarding hydrogen-powered vehicles is the onboard storage of the fuel. Current storage methods involve cooling and condensing the H₂ gas to a liquid state for storage which causes a loss of potential energy (25–45%) when compared to the energy associated with the gaseous state. Storage using SWNTs would allow one to keep the H₂ in its gaseous state, thereby increasing the storage efficiency. This method allows for a volume to energy ratio slightly smaller to that of current gas powered vehicles, allowing for a slightly lower but comparable range.

An area of controversy and frequent experimentation regarding the storage of hydrogen by adsorption in carbon nanotubes is the efficiency by which this process occurs. The effectiveness of hydrogen storage is integral to its use as a primary fuel source since hydrogen only contains about one fourth of the energy per unit volume as gasoline.

1.5.9. Ultra capacitors

MIT Laboratory for Electromagnetic and Electronic Systems uses nanotubes to improve ultra capacitors. The activated charcoal used in conventional ultra capacitors has many small hollow spaces of various sizes, which create together a large surface to store electric charge. But as charge is quantized into elementary charges, i.e. electrons, and each such elementary charge needs a minimum space, a significant fraction of the electrode surface is not available for storage because the hollow

spaces are not compatible with the charge's requirements. With a nanotube electrode the spaces may be tailored to size—few too large or too small—and consequently the capacity should be increased considerably.

.FINITE ELEMENT MODELING

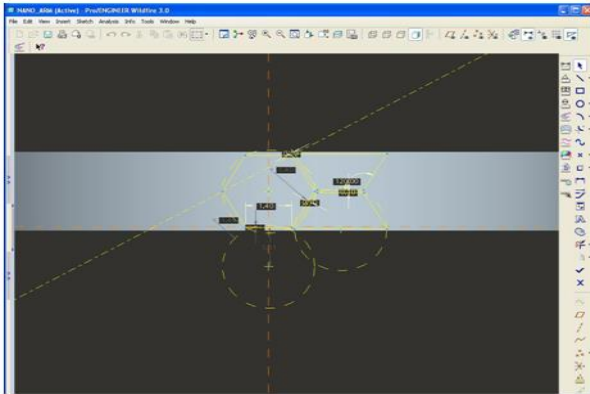


Fig 5. Modeling the base circle for development of arm chair CNT usi

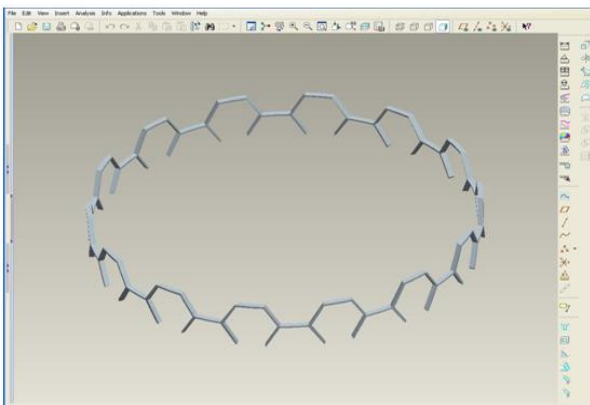


Fig6. Modeling of armchair CNT structure Using pro-e

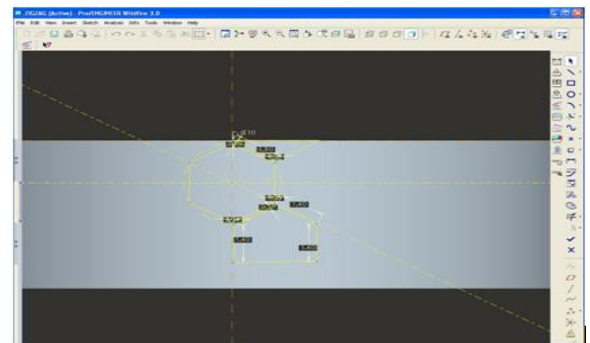


Fig 7. Modeling the base circle for development of zigzag CNT using pro e

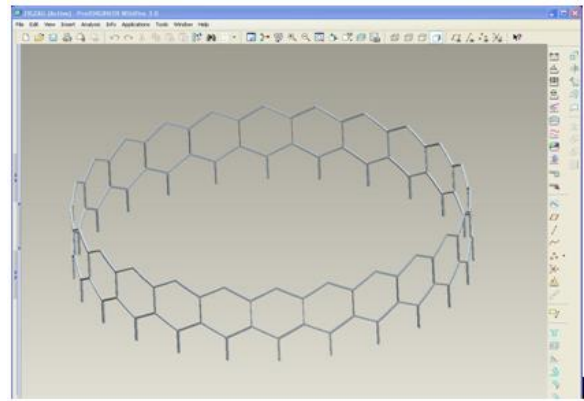


Fig 8. modelling of zigzag CNT structure in pro ENGINEER

Design procedure for meshing of armchair CNT:

- Shell 63 element is used because of the following properties
 1. Shell63 has both bending and membrane capabilities.
 2. Both in-plane and normal loads are permitted.

The element has six degrees of freedom at each node:

- translations in the nodal x, y, and z directions
- Rotations about the nodal x, y, and z-axes.

Stress stiffening and large deflection capabilities are included. A consistent tangent stiffness matrix option is available for use in large deflection (finite rotation) analyses

- The model of armchair carbon nano tube has only one row of the structure of cnt as designed in pro engineer
- using hyper mesh the full structure of cnt is developed.
- finished structure of armchair carbon nano tube is used for further usage.

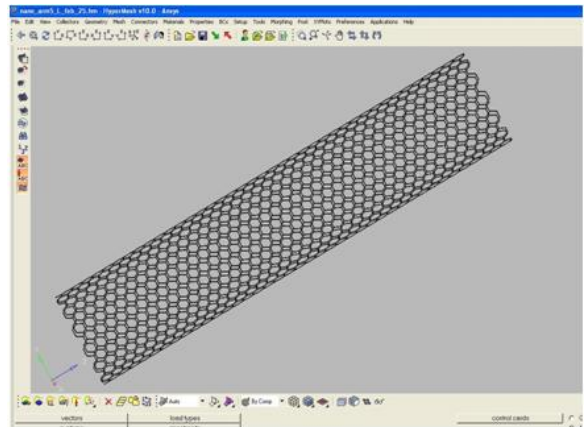


Fig 9 meshing of armchair CNT

Design procedure for meshing of zigzag CNT:

- Shell 63 element is used because of the following properties
 - Shell63 has both bending and membrane capabilities.
 - Both in-plane and normal loads are permitted.
 - The element has six degrees of freedom at each node:
- translations in the nodal x, y, and z directions
- Rotations about the nodal x, y, and z-axes.

- Stress stiffening and large deflection capabilities are included.
- A consistent tangent stiffness matrix option is available for use in large deflection (finite rotation) analyses
- The imported model of zigzag carbon nano tube has only one row of the structure of cnt as designed in pro engineer
- using hyper mesh the full structure of cnt is developed
- the finished structure of zigzag carbon nano is used for further usage.

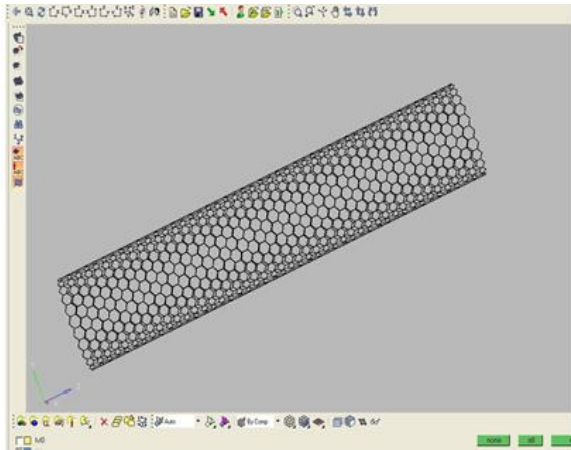


Fig 10 meshing of zigzag CNT

It has been stated that carbon nanotubes are bonded together with covalent bonds which form the hexagonal lattice. These bonds are characterized by bond length and a bond angle. The displacement of individual atoms under the axial force is constrained by the bonds. Therefore, the total deformation of the Nanotube is the result of the interactions between the bonds. The bonds are considered as connecting load carrying elements and the atoms as joints of the connecting elements. The CNTs are simulated as space frame structures. The single walled carbon Nanotube is modeled using the ANSYS 10 software. The wall thickness of the tube is considered to be equal to that of cross sectional diameter of the element. The element chosen is shell which is a combination of spring-slider-damper element. The damping coefficient and the limiting sliding is considered in order to provide an effect of the weak Vander Waals forces in CNTs. In this work the carbon atoms are considered as nodes and the bonds are considered as the elements. The model is meshed and the boundary conditions are applied. The tube is fixed at one end with all degrees of motion arrested at one end and an axial load is applied on the other end.

Design procedure of single wall armchair carbon Nanotube using Ansys:

- The procedure can be broadly classified into
 - Pre processing
 - Processing (solution)
 - Post processing

Pre-Processing

Pre processing consists of model generation and discretization into finite elements.

Processing (solution)

After the model is built in pre processing phase, the solution to the analysis is obtained in the processing phase. ts. Boundary conditions are introduced and solution procedures are performed. structural static analysis is used to determine the displacements, stresses, strains and forces that occur in the continuum as a result of applied loads.

Post Processing

Any post processor displays graphically the results in the following modes.

Auto generation-results are presented as charts, tables graphs etc.

The boundary conditions are applied. All degrees of freedom of each node is arrested on one end of the structure while an axial force is applied on each node the other end as shown in fig

Post processing Nodal solution is obtained and the Z-component of displacement is obtained.

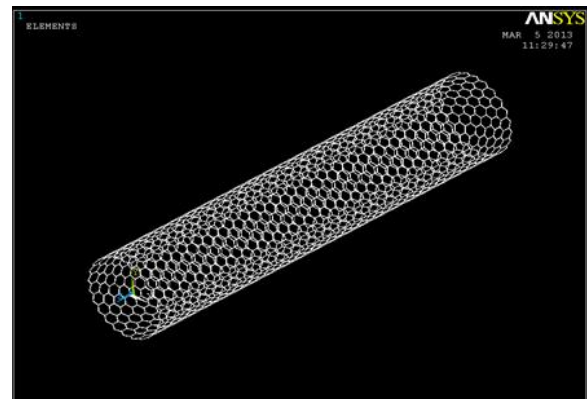


Fig 10 post-processing in ansys

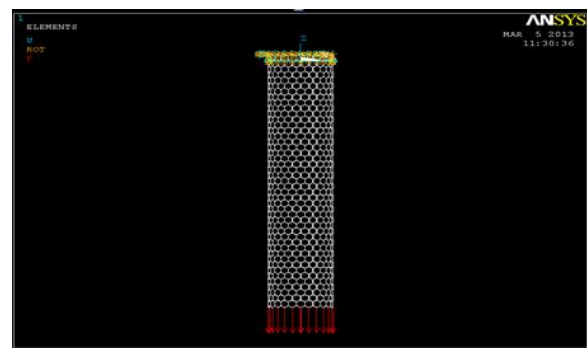


Fig 11 post-processing in ansys

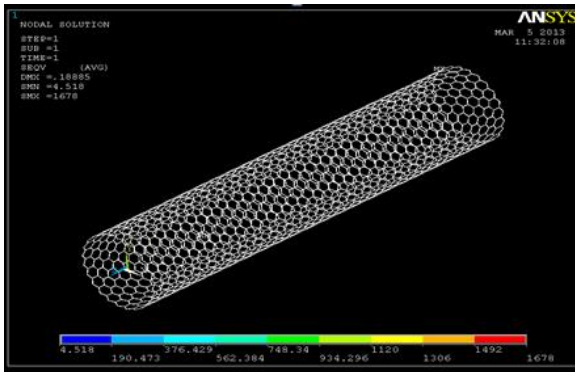


Fig 12 post-processing in ansys

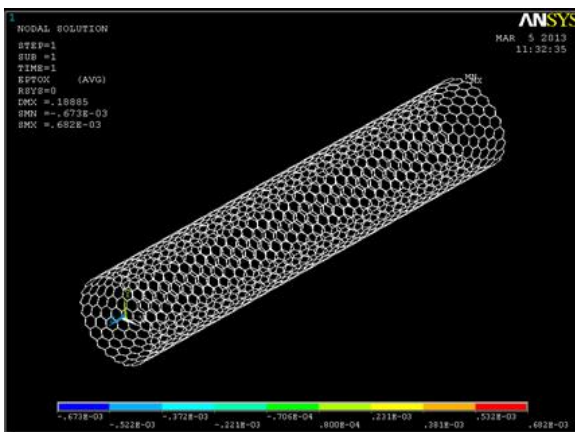


Fig 13 post-processing in ansys

II. RESULTS AND DISCUSSIONS

The potential use of CNTs as reinforcing materials in nanocomposites or in present advanced composites, originated the need to investigate their mechanical properties.

Two of the properties receiving great attention, because they are appointing the effectiveness of CNTs, are the Young's modulus and tensile strength. Many theoretical and experimental research efforts have been placed on the investigation of Young's modulus of CNTs.

Young's modulus of CNTs either calculated using theoretical methods or measured using experimental techniques show a very wide scatter. The reason for that refers to the physical difficulty of direct experimental measurements, the approximable nature of theoretical methods used and mainly to the dependence of Young's modulus to various geometrical and nano-structural parameters. In the following, the FE model is applied to assess the effect of wall thickness, diameter and chirality on the Young's and shear moduli of SWCNTs.

The Young's modulus of a material is the ratio of normal stress to normal strain as obtained from a uni-axial tension test. Following this definition, the Young's modulus of SWCNTs is been calculated using the following equation

$$Y = \frac{\sigma}{E} = \frac{\frac{F}{A_0}}{\frac{\Delta H}{H_0}}$$

where F is the total applied force,
A0, the cross-sectional area,
H0 the initial length and
DH is the elongation.
A0 is equal to πDt

Where, D is the mean diameter of the tube.

In the case of armchair and zigzag SWCNTs, their initial length H0 is preset since all the sub marginal nodes are situated at the same plane.

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Priority Page Content Rank by Web Search Result using the Rank Improvement

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Abstract- The problem of finding relevant documents has become much more difficult due to the return a large number of Web pages generally in the form of ranked list data on the WWW. This result increases the users' searching time to find the desired information within the search results, while in general most users just want to result pages to find new/different results. Thus a work is done which reduced a search space and high priority pages are to move upwards in the result list. The Web mining tools are used to classify, cluster and order the documents so that users can easily navigate through the search result and find the desired Information content. The method first performs query clustering in query logs and then capture the weight of clicked web pages in each cluster and also capture the rank of that pages then we find out the new rank by adding the weight and existing rank, Now apply the heap sort and set the level according to the high priority

In this paper, architecture is being proposed that introduces methods that order the results according to both the relevancy and the importance of documents. This proposed work results in reduced search space as user intended pages tend to move up words in result list.

Index Terms- WWW; Query log; Cluster; Search Engine; Ranking Algorithm, Heap sort

I. INTRODUCTION

WWW is one of the popular resource for text, image, audio, video, and metadata. In order to analyze such data, some technique called web mining technique are used by various web application and tools. Web mining describes the use of data mining technique to automatically discover Web documents and services, to extract information from the web resource and to uncover the general pattern on the Web. However, with the overwhelming volume of information on the Web, the task of finding relevant information related to a specific query /topic is becoming increasingly difficult. Many advanced Web searching technique have been recently developed to taken this problem and are being used in the commercial Web search engines such as Google and Yahoo. Google [3] has been found out that more than 50% of the search engine users consult no more than first two screens of results [4]. To get the required information, the user may have to sift through a very large list of documents displayed by search engines, posing the problem of information overkill thus necessitating the need to look for alternative techniques for documents presentation.

R.Cooley et al [4] and Dr. M.H.Dunham [5] divide web mining into three Categories namely web content mining, web structure mining and web usage mining. Web Content Mining emphasis on the content of Web page instead of its embedded links. Web Structure Mining is used to generate structural summary about the Web sites and Web pages. Web Usage Mining tries to discover user navigation patterns from web data and useful information from the interactions of the users while surfing on the web. Nowadays, providing a set of web pages based on query words is not a big problem

In search engines [2]. Instead, the problem is that a search engine returns a large number of web pages in response to user queries and users have to spend much time in finding their desired information from the long list resulting in information overload problem [2]. Almost all search engines store their user activities in the form of query logs. Query logs provide an excellent opportunity for gaining insight into how a search engine is used and what the user's interest are since they form a complete record of what use searched for in a given time frame.

In this paper the work proposed is to optimize the result of a search engine by returning the more relevant and user desired pages on the top of search result list. The paper has the following 4 steps: Section II describe the related work and terminologies used in the work; section III illustrates the proposed optimization technique in detail along with proposed page rank with heap sort algorithms. The practical evaluation of the work is given in section IV; section V concludes the paper with some discussion on future research.

II. RELATED WORK

The notation of Web log Mining has been a subject of interest since many years. Most of the search engines use Page ranking algorithms, which can arrange the documents in order of their relevance, importance and content Page ranking algorithms [9, 10] have been proposed in the literature such as Page Rank, Weighted Page Rank. The typical logs [3] of search engine includes the following entries (1) User IDs, (2) Query q issued by the user, (3) URL u selected by the user, (4) Rank r of the URL u clicked for the query q and (5) Time t at which the query has been submitted for search. Table 1 for this format.

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2.1 Page Rank Algorithm

Page Rank [10, 11, 12] was developed at Stanford University by Larry page (cofounder of Google search engine) and Sergey Brin. Google uses this algorithm to order its search results in such a way that important documents move up in the results of a search while moving the less important pages down in its list. This algorithm states that if a page has some important

incoming links to it, then its outgoing links to other pages also become important, thus it takes back links into account and propagates the ranking through links. When some query is given, Google combines precompiled Page Rank scores with text matching scores to obtain an overall ranking score for each resulted web page in response to the query. Although many factors determine the ranking of Google search results but Page Rank continues to provide the basis for all of Google's web search tools.

Random Surfer Model [11] which states that not all users follow the direct links on WWW. The modified version is given in (1).

$$PR(u) = (1-d) + d \sum_{v \in B(u)} \frac{Pr(v)}{N_v} \tag{1}$$

TABLE 1 DATA FOR QUERY

UserID	Query	Clicked URL	Time
12345	Marutiswift	www.mautiswift.com	2012-03-14 00:01:9
12345	Gaudi	www.gaddi.com	2012-03-14 00:04:18
12345	marutidzire	http://www.marutidzire.com	2012-03-14 00:04:18
.....

Where u represents a web page, B (u) is the set of pages that point to u .PR (v) and PR (u) are rank scores of page u and v respectively. Nv denotes the number of outgoing links of page v, d is a damping factor [6] that is usually set to 0.85. d can be thought of as the probability of users" following the direct links and (1 – d) as the page rank distribution from non-directly linked pages.

2.1.1 Example illustrating working of PR

To explain the working of Page Rank, let us take an example hyperlinked structure shown in Figure 2, where A, B and C are three web pages. The Page Ranks for pages A, B, C can be calculated using (2) as shown below.

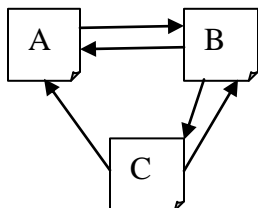
$$PR(A) = (1-d) + d ((PR (B))/2+PR(C)/2) \tag{a}$$

$$PR (B) = (1-d) + d (PR (A)/1+PR(C)/2) \tag{b}$$

$$PR(C) = (1-d) + d (PR (B)/2) \tag{c}$$

By calculating the above equations with d=0.5 (say), the page ranks of pages A, B and C become:

$$PR (A) =1.2, PR (B) =1.2, PR(C) = 0.8$$



Example Hyperlinked Structure

2.2 Weighted Page Rank Algorithm

Wenpu Xing and Ali Ghorbani [8] proposed an extension to standard Page Rank called Weighted Page Rank (WPR). It assumes that more popular the web pages are more linkages other web pages tend to have to them or are linked to by them. This algorithm assigns larger rank values to more important pages instead of dividing the rank value of a page evenly among its outgoing linked pages.

The weight of the URL is estimated to be its popularity and order of access corresponding to the user query. Suppose a sequential pattern < {A}, {B}, {C}> belongs to a query cluster matched with the query .This pattern can be graphically Presented as shown in figure

$$Weight(X) = \frac{\ln(\text{lenpat}(x))}{\text{level}(x)}$$

Where lenpat(x) is the efficient length/depth of the sequential pattern in which X occur and level (X) is the depth of X in the pattern .Consider the example pattern of figure the weight of pages comes out to be:

$$\begin{aligned} Weight (A) &= 0.65 \\ Weight (B) &= 0.93 \\ Weight(C) &= 0.60 \end{aligned}$$

III. THE PROPOSED OPTIMIZATION SYSTEM

A novel optimization method based on learning from historical query logs is proposed to predict user's information in a better way.

The search engine architecture is modified so as to add the component for calculating importance and relevancy of pages. The modified architecture is displayed in figure:

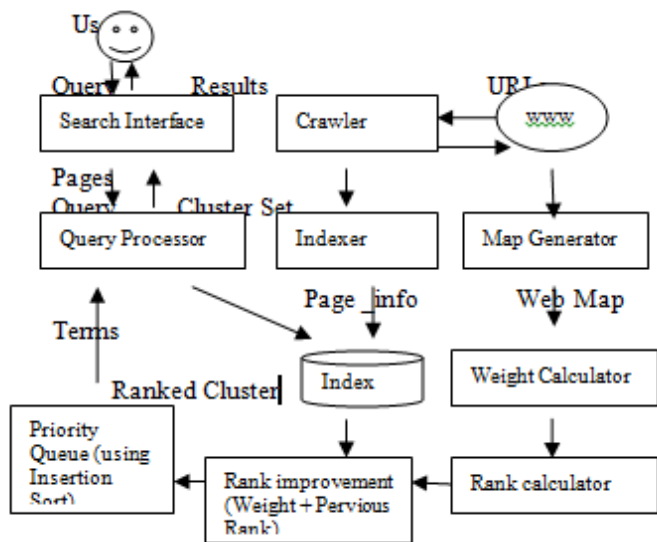


Figure: Priority Based Search Engine Architecture

When a user submit a query on the search engine interface, the query processor component match the query terms with the index repository of the search engine and return a list of matched documents in response .The user browsing behavior including the submitted queries and clicked URLs get stored in the logs .The Rank Updater component works online and takes input the matched documents received by query processor. It improves the ranks of page based on the weights assigned to each according to a sequential pattern which were discovered offline. And a heap sort which gave the first priority according to the new Page Rank.

The working and algorithm for different functional modules are explained below.

a) WWW: The World Wide Web is a system of interlinked hypertext documents accessed via the Internet With a web browser, one can view web pages that may contain text, images, videos, and other multimedia, and navigate between them via hyperlinks

b) Crawler: A Web crawler is one type of boot, or software agent, or computer program, it starts with a list of URLs to visit, it identifies all the hyperlinks in the page and adds them to the list of URLs to visit, called the crawl frontier. Web crawling providing up-to-date data. Web crawlers are mainly used to create a copy of all the visited pages for later processing by a search engine that will index the downloaded pages to provide fast searches. Crawlers can also be used for automating

maintenance tasks on a Web site, such as checking links or validating HTML code.

c) Search Interface: It is a Graphical interface of a search engine on which the user can enter his query e.g. the Google interface. There are two parts to a search engine's user experience: the user interface (design of the search forms and results pages) and the functionality (how well it matches and sorts pages). When you install a search engine, you should consider both aspects, design the interface carefully and test all aspects of the usability.

d) Query Processor: It is the component used to taking the user query from the search interface and processing it word by word.

e) Indexer: It collects and stores data to facilitate fast and accurate information retrieval. The index is usually built in an alphabetical order of term and contains extra information regarding the page such as its URL, frequency and position of term. It provides a more useful vocabulary for the internet or onsite search engine. Index design incorporates interdisciplinary concepts from linguistics, cognitive psychology, mathematics, informatics, physics, and computer science. An alternate name for the process in the context of search engines designed to find web pages on the Internet is web indexing.

f). Map Generator: This module generates a map/graphical structure of the WWW. The map is used further find out the inlinks and outlinks of the web pages

g) Rank improvement: The rank of a page can be improved with the help of its assigned weight .The new rank now becomes:

$$\text{New Rank}(X) = \text{Rank}(X) + \text{Weight}(X) \quad (5)$$

Where rank(X) is the exiting rank value (Page Rank) of page X and weight(X) is the popularity given to X.

h) Priority queue: A priority queue is a collection of elements that each element has been assigned a priority and such that order in which elements are deleted and processed comes from the following rules:

- 1) An element of higher priority is processed before any element of lower priority.
- 2) Two element with the same priority are processed according to the order in which they were added to the queue.

Heap Sort:

A max Heap is a complete binary tree with the property that the value at each node is at least as large as that its children this is called heap Property. Heap sort inserts the input list elements into a binary heap data structure. The largest value (in a max-heap) or the smallest values (in a min-heap) are extracted until none remain, the values having been extracted in sorted order. The heap's invariant is preserved after each extraction, so the only cost is that of extraction.

A. Building the heap tree The array represented as a tree, {40, 80, 35, 90, 45, 50, 70}

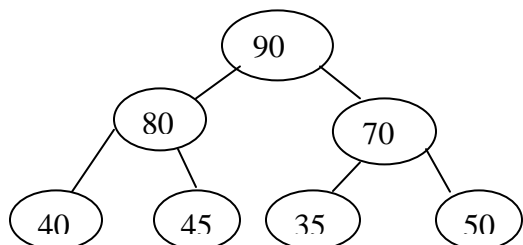


Figure: Forming the page rank from the set

A novel optimization method based on learning from historical query logs is proposed to predict user’s information needs in a better way. The final approach is to re_rank the search result list by modifying the already assigned rank score of the web page using the discovered sequential pattern. The rank updating improves the relevancy of the web page which are already visited by some users in the past .By this way , the time user spends for seeking out the required information from search result list can be reduced and the more relevant Web pages can be presented.

The algorithm is based on the simple perspective; initially all queries are considered to be unassigned to any cluster. Each unclassified query is examined against all other queries.

Algorithm: rank improve (Q,n)

Given: A set of n queries and corresponding clicked URLs stored array Q [qi, URL1....., URLm], 1≤i≤n

Output: A set C= {C1, C2..., Ck} of k query.

// Start of algorithm

```

K=0;
For (each query P in Q)
Set Clusterid (P) = NULL;
For (each P∈ Q with clustered (P) = NULL)
{
I =n, page= Q (n);
Clusterid (p) =ck;
Weight(X) =  $\frac{\ln(\text{lenpar}(X))}{\text{level}(X)}$ 
Page_rank(X) = (1-d) + d  $\sum_{V \in B(X)} \frac{PR(v)}{N_v}$ 
New Page_rank(X) = Page_rank + Weight(X)

While (i>1) and (Q [i/2] <New Page_rank(X)) do
{
Q[i] = Q [i/2];
I=i/2;
}
Q[i] =New Page_rank;
return true;
}
K=k+1;
}
    
```

It may be noted from the literature that page ranking algorithms have become more and more efficient in order to achieve higher precision; they have been made to satisfy the needs of all users in a concise manner. The returned documents should be arranged in a user friendly manner. The paper focuses on other techniques like clustering also to represent the results according to the user needs

Rank improvement:

This module takes the input from the query processor and matched documents of a user query and an improvement is applied to improve the rank score of the returned pages. The module operates online at the query time and applied the improvement on the current documents.

Step 1: Given an input user query q and matched document D collected from the query processor, the cluster ck is found to which the query q belongs.

Step 2: Sequential pattern of the concerned cluster the retrieved from the local repository maintained by the sequential pattern generator.

Step 3: The level weight are calculated for every page X present in the sequential pattern.

Step 4: The rank are calculated for every page X present in the sequential pattern. The improved is calculated as the summation of pervious rank and assigned weight value.

By improving the ranks using a priority queue, the result of a search engine can be optimization so as to better serve the user need. The user can now find the popular and relevant pages upwards in the result list.

IV. EXPERIMENTAL RESULTS

To show the practical evaluation of the proposed architecture, a fragment of sample query log is consider .The following function is tested:

1. Pattern generation
2. Weight Calculation and Rank updation
3. Priority Rank based indexing

1. Pattern generation

For each cluster c1 and c2, corresponding URLs form the Query Cluster Database are extracted .Two columns (ClusterID and URL) need to be retrieved. URLs are assigned to different variable

For example,
A= www.marutiswift.com,
B=www.gaadi.com,
C=www.swiftdezire.com

2. Weight calculation and Rank Improvement

Weight of each URL can be determined in the following ways:

Weight (A) =1.099, Weight (B) =0.549
Weight(C) =0.549, Weight (A)=0.366

The ranking of search results has been modified to a great extent and the more relevant Web pages can be implemented in this ways.

Table RANK IMPROVEMENT WITH WEIGHT OF PAGES

Page/URL	Rank	Weight	New Rank
A	1.2	0.65	1.85
B	1.2	0.93	2.13
C	0.8	0.60	1.40
.....

3. Priority Rank Based Indexing

High priority takes the first place in this ways

Page/URL	Priority queue
B	2.13
A	1.85
C	1.40
.....

V. CONCLUSION AND FUTURE SCOPE

Web mining is used to extract useful information from Users 'past behavior. In this paper the Page Rank and Weighted Page Rank algorithms are used by many search engine but the users may not get the required relevant documents easily on the top few pages. To solve this problem we use the Weighted Page Content Rank has been proposed which which employ Web structure mining as well as Web Content mining technique. This algo is improving the order of the page in the result list so that the user gets the relevant and important pages in the list.

A query log analysis the proposed for implementing effective web search. The most important feature is that the result optimization method is based on users' feedback, which determines the relevance between Web pages and user query words. The returned pages with improved page ranks are directly mapped to the user feedbacks and dictate higher relevance than pages that exist in the result list. Bipartite graph technique can be employed on query logs to retrieve a better clustering of user queries and thus returning more efficient results.

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Web Search Result using the Rank Improvement

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Abstract- The problem of finding relevant documents has become much more difficult due to the return a large number of Web pages generally in the form of ranked list data on the WWW. This result increases the users' searching time to find the desired information within the search results, while in general most users just want to result pages to find new/different results. Thus a work is done which reduced a search space and high priority pages are to move upwards in the result list. The Web mining tools are used to classify, cluster and order the documents so that users can easily navigate through the search result and find the desired Information content .The method first performs query clustering in query logs and then capture the weight of clicked web pages in each cluster and also capture the rank of that pages then we find out the new rank by adding the weight and existing rank, Now apply the Insertion Sort and set the level according the high priority

In this paper, architecture is being proposed that introduces methods that order the results according to both the relevancy and the importance of documents. This proposed work results in reduced search space as user intended pages tend to move up words in result list.

Index Terms- WWW; Query log; Cluster; Search Engine; Ranking Algorithm, Insertion Sort

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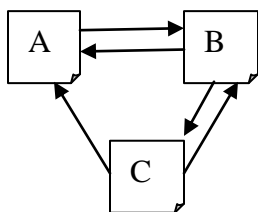
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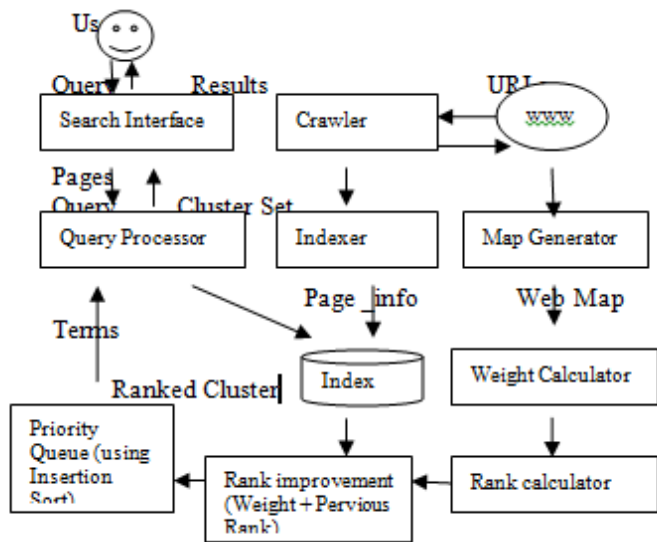


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c) Search Interface: It is a Graphical interface of a search engine on which the user can enter his query e.g. the Google interface. There are two parts to a search engine's user experience: the user interface (design of the search forms and results pages) and the functionality (how well it matches and sorts pages). When you install a search engine, you should consider both aspects, design the interface carefully and test all aspects of the usability.

d) Query Processor: It is the component used to taking the user query from the search interface and processing it word by word.

e) Indexer: It collects and stores data to facilitate fast and accurate information retrieval. The index is usually built in an alphabetical order of term and contains extra information regarding the page such as its URL, frequency and position of term. It provides a more useful vocabulary for the internet or onsite search engine. Index design incorporates interdisciplinary concepts from linguistics, cognitive psychology, mathematics, informatics, physics, and computer science. An alternate name for the process in the context of search engines designed to find web pages on the Internet is web indexing.

f). Map Generator: This module generates a map/graphical structure of the WWW. The map is used further find out the inlinks and outlinks of the web pages

g) Rank improvement: The rank of a page can be improved with the help of its assigned weight .The new rank now becomes:

$$\text{New Rank}(X) = \text{Rank}(X) + \text{Weight}(X) \quad (5)$$

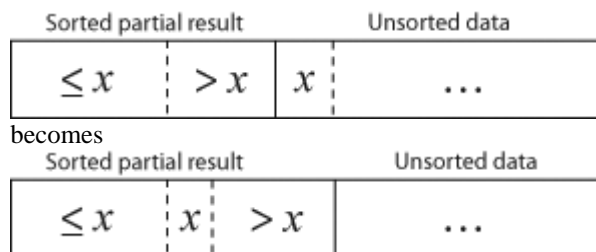
Where rank(X) is the exiting rank value (Page Rank) of page X and weight(X) is the popularity given to X.

h) Priority queue: A priority queue is a collection of elements that each element has been assigned a priority and such that order in which elements are deleted and processed comes from the following rules:

- 1) An element of higher priority is processed before any element of lower priority.
- 2) Two element with the same priority are processed according to the order in which they were added to the queue.

Insertion Sort: Every repetition of insertion sort removes an element from the input data, inserting it into the correct position in the already-sorted list, until no input elements remain. The choice of which element to remove from the input is arbitrary, and can be made using almost any choice algorithm.

Sorting is typically done in-place. The resulting array after k iterations has the property where the first $k + 1$ entries are sorted. In each iteration the first remaining entry of the input is removed, inserted into the result at the correct position, thus extending the result:



A novel optimization method based on learning from historical query logs is proposed to predict user's information needs in a better way. The final approach is to re_rank the search result list by modifying the already assigned rank score of the web page using the discovered sequential pattern. The rank updating improves the relevancy of the web page which are already visited by some users in the past. By this way, the time user spends for seeking out the required information from search result list can be reduced and the more relevant Web pages can be presented.

The algorithm is based on the simple perspective; initially all queries are considered to be unassigned to any cluster. Each unclassified query is examined against all other queries.

Algorithm: rank improve (Q,n)

Given: A set of n queries and corresponding clicked URLs stored array Q [qi, URL1....., URLm], 1≤i≤n

Output: A set C= {C1, C2...., Ck} of k query.

// Start of algorithm

```

{
K=0;
For (each query P in Q)
Set Clusterid (P) = NULL;
    For (each P∈ Q with clustered (P) = NULL)
    {
I = n, page = Q (n);
Clusterid (p) =ck;
Weight(X) =  $\frac{\ln(\text{lenpar}(X))}{\text{level}(X)}$ 
Page_rank(X) =  $(1-d) + d \sum_{V \in B(X)} \frac{PR(v)}{N_v}$ 
NewPage_rank(X) = Page_rank + Weight(X)

For (j=2; j≤page; j++)
{
NewPage_rank= Q[j];
i=j-1;
While ((i≥1) && (item<Q[i]))
{
Q [i+1] = Q[i];
i=i-1;
}
Q [i+1] =Newpage_rank;
}
}
K=k+1;
}

```

It may be noted from the literature that page ranking algorithms have become more and more efficient in order to achieve higher precision, they have been made to satisfy the needs of all users in a concise manner. The returned documents should be arranged in a user friendly manner. The paper focuses on other techniques like clustering also to represent the results according to the user needs

Rank improvement: This module takes the input from the query processor and matched documents of a user query and an improvement is applied to improve the rank score of the returned pages. The module operates online at the query time and applied the improvement on the current documents.

Step 1: Given an input user query q and matched document D collected from the query processor, the cluster ck is found to which the query q belongs.

Step 2: Sequential pattern of the concerned cluster the retrieved from the local repository maintained by the sequential pattern generator.

Step 3: The level weight are calculated for every page X present in the sequential pattern.

Step 4: The rank are calculated for every page X present in the sequential pattern. The improved is calculated as the summation of pervious rank and assigned weight value.

By improving the ranks using a priority queue, the result of a search engine can be optimization so as to better serve the user need. The user can now find the popular and relevant pages upwards in the result list.

IV. EXPERIMENTAL RESULTS

To show the practical evaluation of the proposed architecture, a fragment of sample query log is consider .The following function is tested:

1. Pattern generation
2. Weight Calculation and Rank updation
3. Priority Rank based indexing

1. Pattern generation

For each cluster c1 and c2, corresponding URLs form the Query Cluster Database are extracted .Two columns (ClusterID and URL) need to be retrieved. URLs are assigned to different variable

For example,
A= www.marutiswift.com,
B=www.gaadi.com,
C=www.swiftdezire.com

2. Weight calculation and Rank Improvement

Weight of each URL can be determined in the following ways:

Weight (A) =1.099, Weight (B) =0.549

Weight(C) =0.549, Weight (A)=0.366

The ranking of search results has been modified to a great extent and the more relevant Web pages can be implemented in this ways.

Table RANK IMPROVEMENT WITH WEIGHT OF PAGES

Page/URL	Rank	Weight	New Rank
A	1.2	0.65	1.85
B	1.2	0.93	2.13
C	0.8	0.60	1.40
.....

3. Priority Rank Based Indexing

High priority takes the first place in this ways

Page/URL	Priority queue
B	2.13
A	1.85
C	1.40
....

V. CONCLUSION AND FUTURE SCOPE

Web mining is used to extract useful information from Users' past behavior. In this paper the Page Rank and Weighted Page Rank algorithms are used by many search engine but the users may not get the required relevant documents easily on the top few pages. To solve this problem we use the Weighted Page Content Rank has been proposed which employ Web structure mining as well as Web Content mining technique. This algo is improving the order of the page in the result list so that the user gets the relevant and important pages in the list.

A query log analysis the proposed for implementing effective web search. The most important feature is that the result optimization method is based on users' feedback, which determines the relevance between Web pages and user query words. The returned pages with improved page ranks are directly mapped to the user feedbacks and dictate higher relevance than pages that exist in the result list. Bipartite graph technique can be employed on query logs to retrieve a better clustering of user queries and thus returning more efficient results.

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Non Linear Oscillator Systems and Solving Techniques

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Abstract- The paper involves thorough study of non-linear vibratory oscillators and numerical methodology to analyse and resolute the non-linear dynamical world. The study involves the analysis of non-linear oscillators like the *Van der Pol Oscillator* and *Duffing Oscillator*. Application of regular perturbation method in the oscillator is also demonstrated. The equilibrium and stability analysis of the oscillators with graphical representation is simulated through *XPP-AUT* and *MATLAB*. The graphical and mathematical depiction of damping with altering parameters in oscillators' equations is also shown. Saddle points, centers and equilibrium points of consequent curves are depicted in scale. Apart from the oscillators, implementation of "Method of Multiple Scales" and "Method of Averaging" in non-linear dynamical equations is also rendered numerically in the study with the conclusion that the "Method of Multiple Scales" produces better results than the "Method of Averaging".

Index Terms- Van der Pol Oscillator, Duffing Oscillator, Dynamics, Multiple-scales

I. INTRODUCTION

The prime interest lied in analyzing the dynamics of non-linear oscillator systems mainly Van der Pol Oscillator and Duffing Oscillator. The dynamical world was dealt with solving techniques and the results were compared. The methods under consideration are "Method of Multiple Scales" and "Method of Averaging". In Method of Multiple Scales we retard the actual time using the order of the parameter and the variable is written in terms of retarded time coefficients. On the contrary, Method of Averaging helps in optimizing the solution near the mean position only. Both these methods are depicted in sample oscillator equations and henceforth compared to conclude that which one of them produces better results.

II. THE VAN DER POL OSCILLATOR

In 1920, a Dutch scientist named Balthasar Van der Pol established experimental results on the dynamics of an oscillator in electrical circuits governed by a second order differential equation, which later came to be known as Van der Pol Oscillator. The consequent results also proved that Van der pol oscillator obeys Lienard's theorem which proves that it has stable limit cycle in the phase space. The Van der Pol Oscillator also describes how a pacemaker controls the irregular heartbeat of human heart where the whole cardiac system can be modelled as a working Van der Pol Oscillator.

Standard Equation: $\frac{d^2x}{dt^2} + \mu \frac{(-1+x^2)dx}{dt} + x = 0$

where 'x' is the dynamical variable and $\mu > 0$ a parameter.

When $\mu = 0$, the equation becomes Simple Harmonic Equation, $\frac{d^2x}{dt^2} + x = 0$

Regular Perturbation Method for Van Der Pol Oscillator:

$$\ddot{x} + \mu \frac{(-1+x^2)dx}{dt} + x = 0$$

For $\mu = 0$, $\ddot{x} + x = 0$

We have

$$x_0 = A \sin t + B \cos t$$

where A and B are determined by initial conditions.

$$x = x_0 + \epsilon x_1 + \epsilon^2 x_2 + \epsilon^3 x_3 \dots$$

$$x = x_0 + \epsilon x_1 + O(\epsilon^2) \text{ (Neglecting other higher orders)}$$

Hence, we get the equation,

$$\ddot{x}_0 + \epsilon \ddot{x}_1 + \epsilon (x_0^2 + \epsilon^2 x_1^2 + 2 \epsilon x_0 x_1 - 1)(\dot{x}_0 + \epsilon \dot{x}_1) + x_0 + \epsilon x_1 = 0$$

$$\ddot{x}_0 + x_0 + \epsilon [(x_0^2 - 1)\dot{x}_0 + \ddot{x}_1 + x_1] + O(\epsilon^2) = 0$$

$$O(\epsilon^0) = \ddot{x}_0 + x_0 = 0$$

$$\Rightarrow x_0 = A \sin t + B \cos t$$

$$O(\epsilon^1) = (x_0^2 - 1)\dot{x}_0 + \ddot{x}_1 + x_1 = 0$$

Substituting the value of x_0 we get,

$$O(\epsilon^1) = \ddot{x}_1 + x_1 + (A^2 \sin^2 t + B^2 \cos^2 t - 2AB \sin t \cos t - 1)(A \cos t - B \sin t) = 0$$

$$\Rightarrow \ddot{x}_1 + x_1 = -[A^2 - 1 + (B^2 - A^2) \left(\frac{1 + \cos 2t}{2} \right) - AB \sin 2t](A \cos t - B \sin t)$$

$$\Rightarrow \ddot{x}_1 + x_1 = C \sin t + D \cos t + E \sin 3t + F \cos 3t$$

$$\therefore x_1 = G \sin t + H \cos t + It \sin t + Jt \cos t + K \sin 3t + L \cos 3t$$

So,

$$x = A \sin t + B \cos t + \epsilon (G \sin t + H \cos t + It \sin t + Jt \cos t + K \sin 3t + L \cos 3t)$$

Equation becomes unstable at higher values of t .

For that,

$$\epsilon t < 1$$

$$t < \frac{1}{\epsilon}$$

$$\therefore t = O\left(\frac{1}{\epsilon}\right)$$

Corrections:

We know that,

$$O(\epsilon^0) = \ddot{x}_0 + x_0 = 0$$

$$x_0 = R \cos(t + \phi)$$

$$\text{Also, } O(\epsilon^1) = (x_0^2 - 1)\dot{x}_0 + \ddot{x}_1 + x_1 = 0$$

$$\Rightarrow \ddot{x}_1 + x_1 - [R^2 \cos^2(t + \phi) - 1]R \sin(t + \phi) = 0$$

$$\Rightarrow \ddot{x}_1 + x_1 = [R^2 \cos^2(t + \phi) - 1]R \sin(t + \phi)$$

$$\Rightarrow \ddot{x}_1 + x_1 = \left[\frac{R^2}{2} - 1 + \frac{R^2}{2} \cos(2t + 2\phi) \right] R \sin(t + \phi)$$

$$\Rightarrow \ddot{x}_1 + x_1 = \left(\frac{R^2}{2} - 1 \right) R \sin(t + \phi) + \frac{R^3}{2} \cos(2t + 2\phi) \sin(t + \phi)$$

$$x_1 = A \sin(t + \phi) + \cos(t + \phi) + \sin 3(t + \phi) + \cos 3(t + \phi)$$

$$\therefore x = R \cos(t + \phi) + A \sin(t + \phi) + \cos 3(t + \phi) + \sin 3(t + \phi) + \cos 3(t + \phi)$$

The above solution gives a better idea of the Van Der Pol oscillator as the large values of “t” do not hamper the stability of the equation.

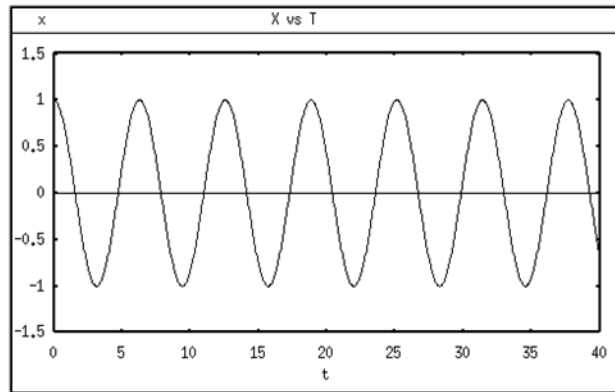
Graphical Analysis of Damping in Van der Pol Oscillator

Say $\mu \ll 1$, then $\mu \frac{(-1+x^2) dx}{dt} \rightarrow 0$

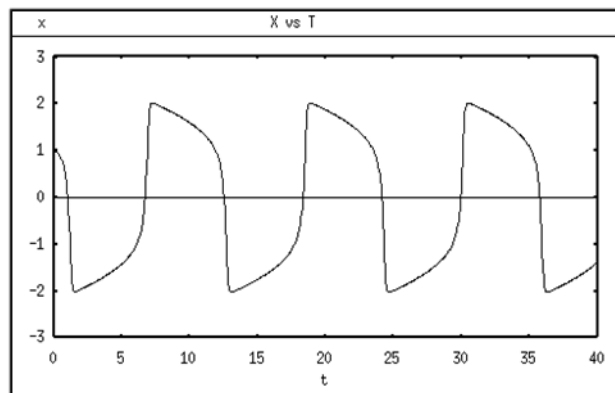
The equation reduces to $\ddot{y} = x$, where $y = \frac{dx}{dt}$. (small damping)

Hence, the plot of ‘x’ vs. ‘t’ approximately becomes a sinusoidal curve because the parameter $\mu \ll 1$, as the van der pol equation reduces to

$$\frac{d^2x}{dt^2} = x$$



When the value of ‘μ’ was increased, it was observed that the period ‘x’ also increased with loss of sinusoidal character in the plot of ‘x’ vs. ‘t’ and ‘y’ vs. ‘t’. The value of ‘μ’ was increased to 5 and the subsequent dynamics of ‘x’ vs. ‘t’ and ‘y’ vs. ‘t’ were observed respectively.



Equilibrium and Stability Analysis of the Van der Pol Oscillator

Considering the Van der Pol Oscillator, $\frac{d^2x}{dt^2} + \mu \frac{(-1+x^2) dx}{dt} + x = 0$

Say, $y = \frac{dx}{dt}$

We get $\frac{dy}{dt} = -x - \mu(-1 + x^2) y$; $\frac{dx}{dt} = y$

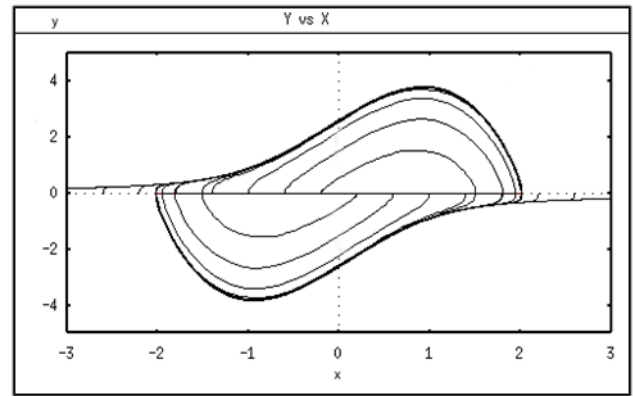
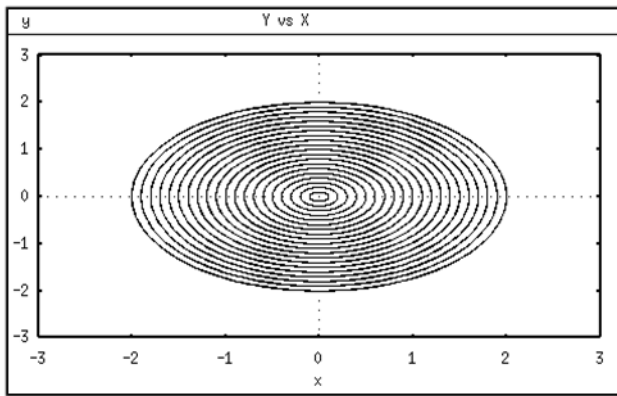
There is equilibrium at origin, and it is obvious from the slope vector that there are no other equilibria.

Eigenvalues:

$$\left\{ \frac{1}{2}(\mu - \sqrt{\mu^2 - 4}), \frac{1}{2}(\mu + \sqrt{\mu^2 - 4}) \right\}$$

We see that the equilibrium point $(x = 0, \dot{x} = 0)$ is an unstable spiral equilibrium if $0 < \mu < 2$.

For $\mu > 2$, the equilibrium is an unstable node. Hence, the dynamics of the oscillator are bound to a restricted area around the origin.



DUFFING OSCILLATOR

The unforced duffing oscillator is given by:

$$\ddot{x} + ax + \beta x^3 + \gamma x^5 = 0$$

General Application of the Oscillator:

Duffing's equation is used to model conservative double-well oscillators, which can occur, for example, in magneto-elastic mechanical systems. The system consists of a beam placed vertically between two magnets with the top end fixed and the bottom end free to swing. With velocity applied to the beam, the beam starts to oscillate between the two magnets. The beam finally comes to rest at a fixed point and remains in equilibrium.

Equilibrium Analysis:

The autonomous dynamical system can be written as,

$$\dot{x} = y,$$

$$\dot{y} = -(ax + \beta x^3 + \gamma x^5)$$

For equilibrium, $\dot{x} = 0 \Rightarrow y = 0$, and
 When $\dot{y} = 0$, $x(\alpha + \beta x^2 + \gamma x^4) = 0$

$$\Rightarrow x = 0 \text{ or } (\alpha + \beta x^2 + \gamma x^4) = 0$$

$$\Rightarrow x = 0 \text{ or } x_{\pm} = \pm \sqrt{\frac{-\beta \pm \sqrt{\beta^2 - 4\gamma\alpha}}{2\gamma}}$$

Equilibrium exists under the conditions:

- a) $-\beta \pm \sqrt{\beta^2 - 4\gamma\alpha} \geq 0$
- b) $\beta^2 - 4\gamma\alpha \geq 0$

The eigen values satisfy the equation: $\lambda^2 = -\alpha - \beta x_o^2 - \gamma x_o^4$

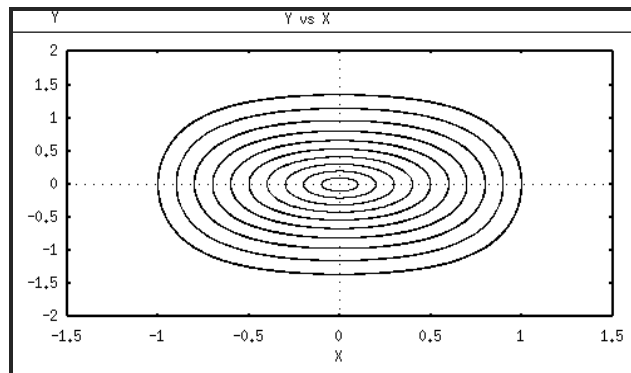
Where x_o is the X co-ordinate of the equilibrium point.

- The equilibrium points in the unforced Duffing oscillator are thus of the form $(0, 0)$ and $(x_{\pm}, 0)$.
- Varying the values of α, β and γ causes the behaviour of the solution $x(t)$ to change, as depicted in some upcoming bifurcation diagrams. Equilibria can be either saddles or centers. The former are unstable points, whereas the latter are linearly stable.

The Phase Plane trajectories and analysis of Duffing's Oscillator is explained in the coming sections.

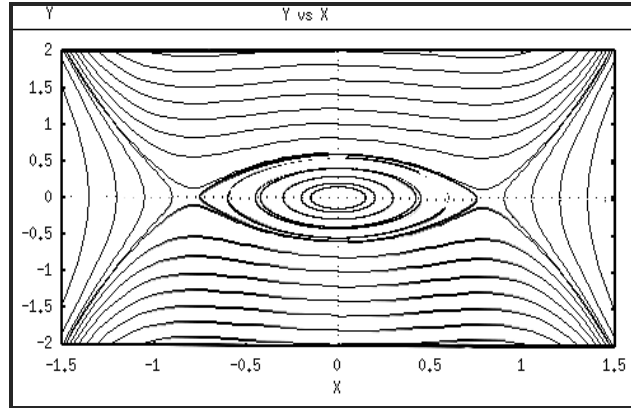
Dynamics of Duffing Oscillator with varying Parameters:

1. The phase plot of 'y' vs 'x' as shown in the adjacent figure shows the behaviour of the oscillator when $\alpha = 1, \beta = 1 \& \gamma = 1$. The oscillator behaves periodically with a center $(0,0)$.



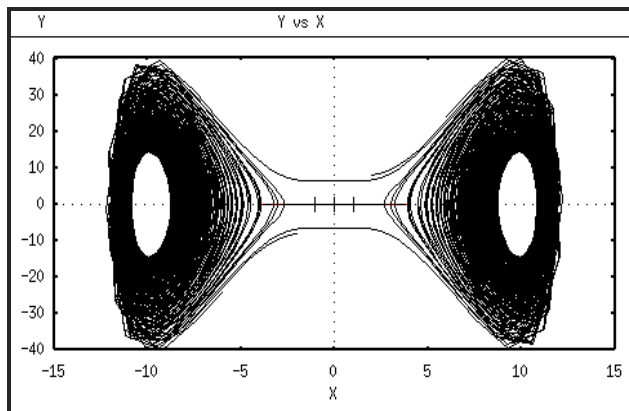
2. The phase plot of 'y' vs 'x' as shown in the adjacent figure shows the behaviour of the oscillator when $\alpha = 1, \beta = -1 \& \gamma = -1$. We notice three equilibrium points from the phase plot. There is a center at $(0,0)$ and there are two saddles present:

- a) $(+0.79, 0)$
- b) $(-0.79, 0)$



3. The phase plot of 'y' vs 'x' as shown in the adjacent figure shows the behaviour of the oscillator when $\alpha = 1, \beta = -1$ & $\gamma = 0.01$. Five equilibrium points are observed in the phase plot. There are three centers:

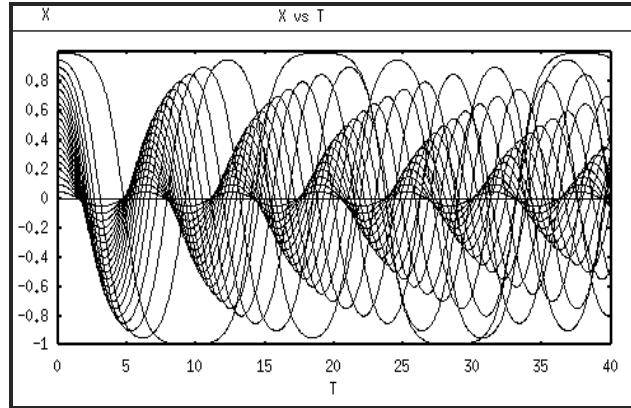
- a) (0, 0)
- b) (+1.005, 0)
- c) (-1.005, 0)



We also observe two saddle points in the same phase plot:

- a) (+9.95, 0)
- b) (-9.95, 0)

The corresponding 'x' vs 't' curve is as shown.



III. METHOD OF MULTIPLE SCALES

Say an oscillator be defined as,

$$\ddot{x} + \epsilon a_1(x^2 - 1)\dot{x} + \epsilon a_2 x^3 + x = 0$$

$$T_0 = t \text{ (Actual time)}$$

$$T_1 = \epsilon t \text{ (Slower time)}$$

$$T_2 = \epsilon^2 t \text{ (Still slower time) and so on.}$$

$$\ddot{x} + \epsilon a_1(x^2 - 1)\dot{x} + \epsilon a_2 x^3 + x = 0$$

$$x(t) = x(T_0, T_1, T_2 \dots)$$

$$\frac{dx}{dt} = \frac{\partial x}{\partial T_0} \frac{dT_0}{dt} + \frac{\partial x}{\partial T_1} \frac{dT_1}{dt} + \dots$$

$$\frac{d}{dt} = \left(\frac{\partial}{\partial T_0} + \epsilon \frac{\partial}{\partial T_1} + \epsilon^2 \frac{\partial}{\partial T_2} + \dots \right) = (D_0 + \epsilon D_1 + \epsilon^2 D_2 + \dots)$$

$$\frac{d^2}{dt^2} = \frac{d}{dt} \cdot \frac{d}{dt} = D_0^2 + \epsilon (D_0 D_1 + D_1 D_0) + \epsilon^2 (D_0 D_2 + D_1^2 + D_2 D_0) + O(\epsilon^3) + \dots$$

Substituting in the oscillator equation till $O(\epsilon^1)$ terms, we get,

$$D_0^2 x + 2 \epsilon D_0 D_1 x + \epsilon a_1(x^2 - 1)D_0 x + \epsilon a_2 x^3 + x = 0$$

$$\text{Now, let } x = x_0 + \epsilon x_1 + O(\epsilon^2) + \dots$$

$$D_0^2 x_0 + \epsilon D_0^2 x_1 + 2 \epsilon D_0 D_1 x_0 + \epsilon a_1 D_0 x_0 (x_0^2 - 1) + x_0 + \epsilon x_1 + \epsilon a_2 x_0^3 + O(\epsilon^2) = 0$$

$$O(\epsilon_0) = D_0^2 x_0 + x_0 = 0$$

$$\Rightarrow x_0 = R(T_1) \cos(T_0 + \phi(T_1))$$

$$O(\epsilon_1) = D_0^2 x_1 + 2D_0 D_1 x_0 + a_1 D_0 x_0 (x_0^2 - 1) + x_1 + a_2 x_0^3 = 0$$

Equating coefficients of $\sin(T_0 + \phi(T_1))$ and $\cos(T_0 + \phi(T_1))$ to Zero, we get,

$$\begin{aligned} \Rightarrow 2 \frac{\partial R}{\partial T_1} - a_1 R + a_1 \frac{R^3}{4} &= 0 \\ \Rightarrow 2R \cos(T_0 + \phi(T_1)) \frac{\partial \phi}{\partial T_1} - 3a_2 \frac{R^3}{4} &= 0 \\ \therefore \frac{\partial R}{\partial T_1} = D_1 R &= \frac{a_1}{2} \left(R - \frac{R^3}{4} \right) \\ \therefore \frac{\partial \phi}{\partial T_1} = D_1 \phi &= \frac{3a_2 R^2}{8} \end{aligned}$$

METHOD OF AVERAGING

$f(x, t + T) = f(x, t)$, for some T

Average value of 'x' is defined as:

$$\begin{aligned} x_{av} &= \frac{1}{T} \int_{t-\frac{T}{2}}^{t+\frac{T}{2}} x dt = \frac{1}{T} \int_{t-T}^t x dt = \frac{1}{T} \int_0^T x dt \\ x_{av} &= \lim_{T \rightarrow \infty} \frac{1}{T} \int_{t-\frac{T}{2}}^{t+\frac{T}{2}} x dt \end{aligned}$$

Say, $\dot{x} = \epsilon f(x, t)$ where $0 < \epsilon \ll 1$

$$\Rightarrow \dot{x}_{av} = \frac{\epsilon}{T} \int_{t-\frac{T}{2}}^{t+\frac{T}{2}} f(x_{av}, t) dt$$

Application of Method of Averaging in an Oscillator

$$\dot{x} = \epsilon \sin t [1 + x(2 - x)\sin t]$$

$$T = 2\pi$$

$$\dot{x}_{av} = \frac{\epsilon}{T} \int_{t-\frac{T}{2}}^{t+\frac{T}{2}} f(x_{av}, t) dt$$

$$\Rightarrow \dot{x}_{av} = \frac{\epsilon}{2\pi} \int_{t-\pi}^{t+\pi} [\sin t + x_{av}(2 - x_{av})\sin^2 t] dt$$

$$\Rightarrow \dot{x}_{av} = \frac{\epsilon}{2\pi} x_{av}(2 - x_{av}) \int_{t-\pi}^{t+\pi} \frac{1}{2} (1 - \cos 2t) dt$$

$$\Rightarrow \dot{x}_{av} = \frac{\epsilon}{2\pi} x_{av}(2 - x_{av}) \left[\frac{t + \pi}{2} - \frac{t - \pi}{2} - \frac{\sin 2t}{4} + \frac{\sin 2t}{4} \right]$$

$$\Rightarrow \dot{x}_{av} = \frac{\epsilon}{2\pi} x_{av}(2 - x_{av})$$

where, $x_{av} = \lim_{T \rightarrow \infty} \frac{1}{T} \int_{t-\frac{T}{2}}^{t+\frac{T}{2}} x dt$

IV. CONCLUSION

Hence, the multiple scale method solution has the advantage that it provides a closed form solution with a good physical insight, whereas the averaging method does not provide a closed form solution and lacks this type of physical insight. The most important advantage of this method is that, by identification of a non-dimensional small parameter, which has a physical interpretation and by using several time scales, one can obtain a complete physical understanding about the behaviour of the system and the influence of different parameters and terms on the final response of the system. For complex equations and functions where the order of the differential equation reaches 2 or more, it becomes a very perplex situation to get the solution using the method of averaging. As a consequence, effects of nonlinearities are determined less accurately. Therefore, method of multiple scales proves out to be a better option to solve the oscillators instead of method of averaging.

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Health Risks Associated With Workers in Cement Factories

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Abstract- The aim of this study was to investigate the health risks associated with the man power working in the cement factories at Kashmir, India. In order to study the health hazards of cement factory on workers, three cement factories were considered for the studies which includes; JK Cements Ltd. Khrew, Saifco Cements Ltd. Khonmoh and Khyber cements Ltd. Khonmoh Kashmir, India. Total of 10% of employees in three cement factories were considered for the studies. The workers were administered with the standard format questionnaire which was followed by personal interviews. The results indicate a visible impact on health of workers and during summers the health related problems increases.

Index Terms- Cement factory; health risk; Questionnaire; workers

I. INTRODUCTION

Cement manufacture has caused environmental impacts at all stages of the process in the area. These include emissions of airborne pollution in the form of dust, gases, noise and vibration when operating machinery and during blasting in quarries, and damage to countryside from quarrying. Generally cement plants are known to be associated with exposure to quartz, cement, and dust, which can potentially contribute to Chronic Bronchitis, Silicosis and Interstitial lung diseases.

The impacts of cement industry are countless and it even did not spare humans from its deteriorating impacts and have adversely impacted health of workers. Exposure to cement pollution has been linked to a number of different health outcomes, starting from modest transient changes in the respiratory tract and impaired pulmonary function, continuing to restricted activity/reduced performance, emergency room visits and hospital admissions and to mortality (Schuhmacher *et al.*, 2004; Aydin *et al.*, 2010; Zeleke *et al.*, 2010; Vestbo *et al.*, 1900). There is also increasing evidence for adverse effects of cement pollution not only on the respiratory system, but also on the cardiovascular system (Dockery and pope, 1993). The most severe effects in terms of the overall health burden include a significant reduction in life expectancy of the average population of workers by a month or more (Samet *et al.*, 2000), which is linked to the long-term exposure to high levels of air pollution with PM from these cement industries (Sheppard, 1990; Pope and Dockery, 2006; Grau, 2009)).

II. STUDY SITES

Three factories were taken in consideration namely JK Cements Ltd. at Khrew (Administrative district Pulwama) Kashmir, India and Saifco and Khyber cements Ltd. at Khonmoh (administrative district Srinagar) Kashmir, India lying in the same geographical area. The sites are located in the satellite image.



III. METHODOLOGY

All subjects were served with a questionnaire and posed with interviews based on work of various organizations mostly University of Virginia questionnaires, American Thoracic Society - Division of Lung Diseases, California institute of technology, medical questionnaires, Environmental questions (ACE), department of health and ageing and enHealth council, health and safety services and health questionnaires, WHO, traditional herbal medicine which were edited after going through literature (Maureen *et al.*, 1860; Hofmeister *et al.*, 1983; Dinah *et al.*, 1990; Lesliam *et al.*, 2005; Winston *et al.*, 2005; Sengupta. S., 2006; UNEP, 2008) according to the need.

The workers working in the cement industry were administered with the questionnaire and total of 10% of

employees in cement factories were studied. Later interviews were conducted. The questionnaire and interview questions posed are given below.

IV. WORKERS HEALTH QUESTIONNAIRE

To be completed by employee

Name (Please print) _____

Employee ID# _____

No. of years since working in the factory -----

Age-----

Marital status-----

1. Do you smoke tobacco?		
2. If yes, how many packs per day? ____ Number of years ____		
Yes	No	
2. Have you ever had any of the following conditions? (indicate yes or no for each)	Yes	No
a. Seizures (fits)		
b. Diabetes (sugar disease)		
c. Allergic reactions that interfere with your breathing		
d. Trouble smelling odors		
3. Have you ever had any of the following pulmonary or lung problems?	Yes	No
a. Asbestosis		
b. Chronic bronchitis more than 3 episodes in the last year		
c. Emphysema		
d. Lung cancer		
e. Silicosis		
f. Chest injuries or surgeries		
g. Asthma as an adult		
h. Pneumonia in the last month		
i. Tuberculosis (active disease)		
j. Any other lung problem that you've been told about:		
4. Do you currently have any of these symptoms of pulmonary or Lung illness?	YES	NO
a. Shortness of breath		
b. Shortness of breath with light activity		
c. Shortness of breath with strenuous activity		
d. Cough that produces thick sputum or blood		
e. Cough lasting longer than 3 weeks		
f. Wheezing		
g. Wheezing that interferes with work		
h. Any other symptoms that may be related to lung problems:		
5. Have you ever had any of the following cardiovascular or heart problems?	YES	NO
a. Heart Attack		
b. Stroke		
c. Angina (chest pain)		
d. Heart failure		
e. Irregular heart beat		

f. Swelling in your legs or feet (not caused by walking)		
g. High blood pressure		
h. Any other heart problems:		
6. Have you ever had any of the following cardiovascular or heart symptoms?	YES	NO
a. Frequent pain or tightness in your chest		
b. In the past two years, have you noticed your heart skipping or missing a beat?		
c. Heartburn or indigestion that is not related to eating		
d. Any other symptoms that may be related to heart or circulation problems		
7. Do you currently take medication for any of the following problems?	YES	NO
a. Breathing or lung problems		
b. Heart trouble		
c. Blood pressure		
d. Seizures (fits)		
8. Do you use respirator during work.		
9. If you've used a respirator, have you ever had any kind of problem?	YES	NO
a. Eye irritation		
b. Skin allergies or rashes		
c. Anxiety		
d. General weakness or fatigue		
e. Any other problem that interferes with your use of a respirator		
10. Which health specialist do you visit most frequently? A) What kind of medicine do you use mostly?		
11. How much a day.		

Employee Signature _____ Date: _____ Comments: _____

Thank you for your help!

Interview Questions asked to workers

- Name
- Age
- Working as
- Do you smoke? If yes, how many packs?
- For how many years have you been working in the cement factory?
- Do you think cement industry is causing any health problem?
- Are you suffering from any health problem?
- If, yes what?
- Have you ever consulted a doctor for your problems?
- Which specialist do you visit most frequently?
- Which medicines do you take most frequently?
- Do you use any safety devices such as masks, respirator etc.

- If, yes what?
- If, no why?
- Does the owner provide you with safety devices?
- Do you think cement industry is causing any kind of pollution or problem in area?
- Are there any pollution control devices installed?
- If, yes, are they functional?
- Do you have any family history for any diseases?

V. RESULTS

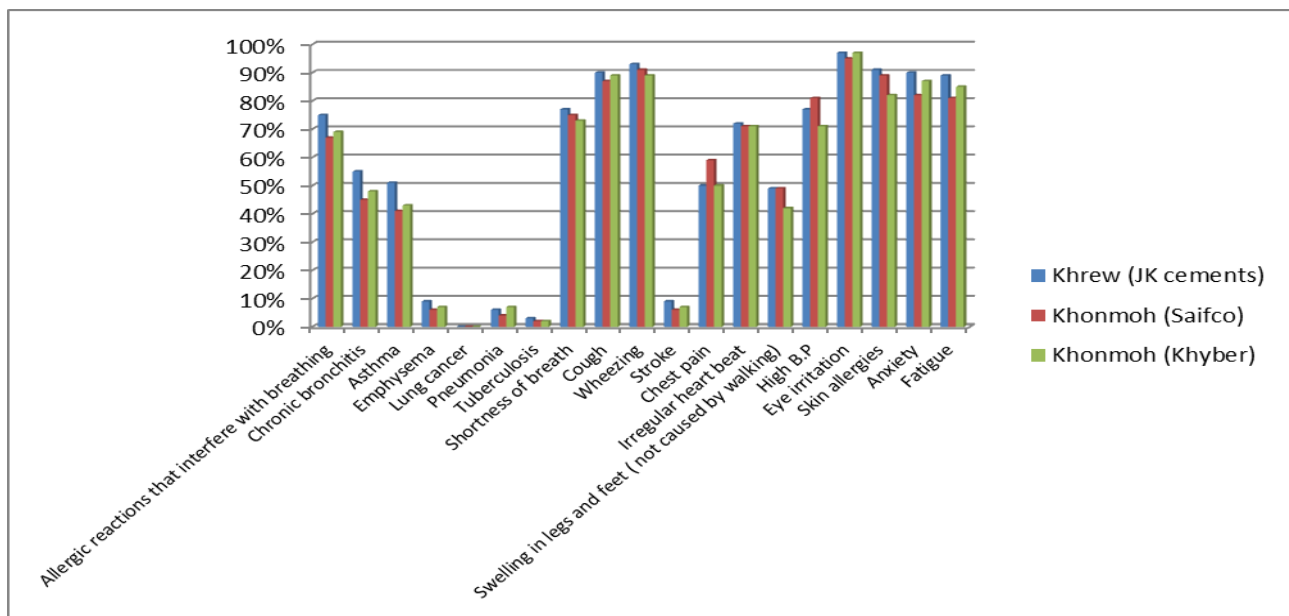
Response to questionnaire

Nineteen kinds of ailments (Fig.1) were recorded from the manpower serving as workers in the cement factories of the study area. These included: Allergic reactions that interfered with breathing, chronic bronchitis, asthma, emphysema, Lung cancer, pneumonia, tuberculosis, shortness of breath, cough, wheezing, stroke, Chest pain, irregular heartbeat, swelling in legs and feet (not caused by walking), High B.P, eye irritation, skin allergies, anxiety and fatigue.

93% of the workers in Khrew, JK Cements Ltd. complained of wheezing problems while 91% and 89% were found to be suffering from skin allergies in the Saifco cements of Khonmoh and Khyber cements Khonmoh respectively.

Irregular heart beating in the workers of the three factories ranged between 71% and 72%. 87% to 90% were found to be suffering from cough. Chest pains were complained by 50% to 59% with high among Khyber cement workers and low in JK cement workers. Asthma problems was between 41% and 51% with high in JK cements Ltd, Khrew workers and low in workers of Saifco cements, Khonmoh. 97% workers were suffering from eye irritation. The prevalence of various other diseases was also found high in cement factory workers.

Figure 1: Representation of incidence / occurrence of nineteen types of diseases as identified in workers in cement factories of Khrew and Khonmoh.



Response to interviews

The workers responded very well to the interview and replied that they were mostly suffering from skin, respiratory and eye irritations. They were not given any safety devices during work. The workers generally received treatment by the health care center of the factories. During summers the health related problems increased.

VI. DISCUSSION AND CONCLUSIONS

The diameter of cement particles makes it a potential health hazard as these are respirable in size and reaches in internal organs particularly lungs leading to occupational lung diseases. This size distribution would make the trachea-bronchial respiratory zone, the primary target of cement deposition. The main route of entry of cement dust particles in the body is the respiratory tract and/ or the gastrointestinal tract by inhalation or

swallowing respectively (Green, 1970). Both routes, especially the respiratory tract are exposed numerous to potentially harmful substances in the cement mill environment. Besides cement dust various gaseous pollutants are also contributed by cement factories which cause pollution and ultimately affect human health. The various organ systems which get affected because of cement factories include: Allergic reactions that interfere with breathing, Chronic bronchitis, Asthma, Emphysema, Lung cancer, Pneumonia, Tuberculosis, Shortness of breath, Cough, Wheezing, Stroke, Chest pain, Irregular heartbeat, Irregular heart beat and Chest pain usually occurs when cardio vascular system gets affected.

89%-93% of the workers in cement factories complained of wheezing problems while 89%-91% were found to be suffering from skin allergies. Irregular heart beating in the workers of the three factories ranged between 91% and 92%. 87% - 90% were found to be suffering from cough. Chest pains were complained by 50% to 59% with highest among Khyber cement workers and lowest in JK cement. Workers were suffering from asthma between 41% and 51% with high in JK cements Ltd, Khrew factories and lowest in Saifco cements, Khonmoh. 97% were suffering from eye irritation. The prevalence of various other diseases among workers was also found high in the JK cements Ltd. when compared with Saifco and Khyber cements this may be because JK cements Ltd. is not using pollution control equipments or they are mostly not in a workable condition and Saifco and Khyber cements were using pollution control equipments to some extent. Most of the workers in the factory were given medical facilities inside the factory health care centers.

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Cytological Effects of Blitox on Root Mitosis of *Allium cepa* L.

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Abstract - The genotoxic potential of blitox (fungicide) was investigated by using chromosome aberration in *Allium cepa* root tip cells. *Allium cepa* roots were treated with 2g/lit., 3g/lit. and 4g/lit. concentrations of blitox and distilled water as control at 4 hours, 8 hours and 12 hours duration. The results indicated that blitox significantly increased the genetical abnormalities at all concentrations and treatment periods when compared with their controls and this increase was dose-dependent for the 4, 8 and 12 hours treatments. On the other hand, blitox significantly decreased the mitotic index (MI) in all treatments when compared with their controls. This study indicates that blitox decreased the mitotic index and produced clastogenic and aneugenic types of abnormalities in *Allium cepa* root tip cells. The data obtained in this study showed that chromosomal aberrations assay can be used as an important test battery to detect possible genotoxicity of chemicals in *Allium cepa*.

Index Terms - *Allium cepa*, blitox, chromosomal aberrations, fungicide, genotoxic effect, Mitotic index

I. INTRODUCTION

Fungicides are most commonly used against diseases of agricultural crops in many countries of the world. Although fungicide application results in quick and high control of the diseases, the widespread use of these chemicals may cause environmental and food contaminations (Fisun and Rasgele, 2009; Tort and Turkyilmaz, 2003). Pollution is a major problem which lowers the quality of life in various aspects. Environmental pollutions may be mutagenic or toxic for all living organisms (Yuzbasioglu et al., 2008; Grover, 1999). Constant use of these chemicals may result in changing the hereditary constitution of an organism (Wuu and Grant, 1967; Wu and Grant, 1966). When some chemicals accumulated within food chain to a toxic level, these chemicals affect directly the public health (Fisun and Rasgele, 2009). In context, Dryanowska (1987) and Cantor et al. (1992) showed that the frequency of cancer increases among people who have been exposed directly or indirectly to pesticides or fungicides. So those should be screened before the use in order to select which are least toxic (Mann, 1977). Generally, toxic effects of environmental pollutants cause genetic damage on plant cells. But toxicity is not always correlated with genotoxicity (Fisun and Rasgele, 2009; Kovalchuk et al., 1998)

The fungicide blitox is a commercial form of copper oxychloride 50 and is used extensively in the agricultural area. Blitox is effective in control of bacterial blight, leaf spot, early and late blight, brown rot, bacterial canker, leaf curl, downy mildew and powdery mildew diseases. There is no study

available on the cytogenetic effects of this chemical in the plant systems. Induction of mitotic abnormalities on root tip cells of plants may cause a decrease in mitotic index (Panneerselvam et al., 2012; Bushra et al., 2002; Kovalchuk et al., 1998).

The aim of this study was to investigate the chromosomal aberration induced by fungicide blitox in the root tips of *Allium cepa* L. and also to determine the relation between mitotic chromosomal aberration with mitotic index.

II. MATERIAL AND METHODS

The fungicide used in this work was copper oxychloride 50 contains a group of M² fungicide, whose trade name is blitox. Its molecular formula is CuCl₂• 3Cu (OH)₂ and molecular weight is 427.2 .

The plant used as test material was *Allium cepa* L. (2n= 16). Ten clean and healthy bulbs of *A. cepa* were chosen for each treatment group. Before starting the experiments, dry scales of bulbs were removed and then the onion bulbs were induced to root by placing them on culture tubes filled with distilled water with the base of the onion touching the surface of the water at room temperature. When the roots reached 1.5 - 2 cm in length, they were treated with different concentrations of fungicide blitox dissolved with distilled water (2 g/lit., 3 g/lit. and 4 g/lit.) for 4, 8 and 12 hours. Controls were also treated with distilled water for the same time periods. The concentrations were chosen according to their dose of application in agricultural field to control different diseases.

For mitotic studies, the root tips of *A. cepa* were fixed in 1:3 acetic acid – ethyl alcohol mixture for overnight, followed by 5-7 minutes treatment in 45% acetic acid. Then root tips were hydrolyzed in 1 (N) HCl at 60°C for 5 minutes, followed by staining with 2% aceto-orcein following the methods described by Sharma and Sharma (1980).

After proper fixation and staining, appropriate squash preparations were made for each of the treatment and control. Effect of chemical treatment and control on different chromosome plates were observed under light microscope. To determine the effects of this chemical on mitotic index, 2000 cells were scored in control group and in each treated group. The mitotic index (MI) was calculated for each treatment as a number of dividing cells/100 cells. Cytological abnormalities were also observed and scored.

In this study a statistical analysis was done to estimate standard error (SE) of the results. Photomicrographs of cells showing chromosomal aberrations as well as showing normal mitosis were taken using Olympus microscope.

III. RESULTS

Microscopic examination of squashed *Allium cepa* L. root tip meristem cells showed that blitox treatments induced a number of mitotic abnormalities when compared with control. The increase of mitotic abnormalities was dependent on the increasing treatment periods and concentrations (Figure-2). The most common chromosomal abnormalities were stickiness, laggards, c-mitosis, bridges, multipolarity, picnosis, star-anaphase, star-telophase, clumping and fragmentation (Figure-3).

Blitox caused a decrease in mitotic index (MI) at all the treatment groups. MI decreased in treated plants with different concentrations and treatment periods (Table-1, Figure-1).

IV. DISCUSSION AND CONCLUSION

Fungal diseases cause extensive crop losses each year. The fungicide blitox is widely used to control fungal diseases in onion and other crops. According to Pest Control Products Act (23-Dec-2008-4320) copper oxychloride 50 is a warning poison. There is no published data available on the cytogenetic effects of copper oxychloride in plant systems. Chromosomes of *Allium cepa* L. can be used for testing the potential poison in mitotic cells (Yuzbasioglu, 2003; Celik, 2006; Smaka-Kinel et al., 1996; Grant, 1982).

Mitotic index is an acceptable measure of cytotoxicity for all living organisms (Smaka-Kinel et al., 1996). The cytotoxicity level can be determined by the decreased rate of mitotic index. A decrease of mitotic index below 50% usually has lethal effects (Panda and Sahu, 1985). If mitotic index decreases below 22% of control, that it causes sub lethal effects on test organism (Antonsie-Wiez, 1990). According to many investigators, abnormalities due to inhibition of spindle formation such as c-mitosis, multipolarity, stickiness reflects high toxicity of pollutants (Lazareva et al., 2003; Kovalchuk et al., 1998; Haliem 1990; Amer and Ali, 1974).

In the present study, blitox decreased the mitotic index at all concentrations and at all treatment periods when compared with control. Similar type of result is also found by Fisun and Rasgele (2009) on *Allium cepa* by using fungicide raxil. The decrease of mitotic index was dose dependent. At all treatment periods, the highest concentration of blitox decreased mitotic activity more than other used concentrations. The percentage of mitotic index decreased with the increase of cells with c-mitosis, stickiness, laggards, anaphase and telophase bridges etc. Since it decreased the MI in root tip cells of *Allium cepa* L. Blitox can be accepted as a toxic agent in this study.

Blitox significantly increased the percentage of abnormal cells at all concentrations and treatment periods in mitotic cell divisions when compared with control. It has been shown by many investigators that several other fungicides induce chromosomal abnormalities in different plants (Badr, 1998; Pandey et al., 1994; Armbruster et al., 1991; Badr, 1983; Behera et al., 1982; Mann, 1977). In this study, the most common abnormalities were stickiness, laggards, c-mitosis, bridges, multipolarity, picnosis, star-anaphase, star-telophase, clumping and fragmentations in cell division.

Chromosomal stickiness is characterized by chromosomal clustering during any phase of the cell cycle. Stickiness and clumping may be caused by genetic and environmental factors.

Several agents have been reported to cause chromosomal stickiness (Panneerselvam et al., 2012; Caetano-Pereira et al., 1998; Badr and Ibrahim, 1987). Gaulden (1987) postulated that sticky chromosomes result from the defective functioning of one or two types of specific non-histone proteins involving chromosome organization which are needed for chromatid separation and segregation. The altered functioning of these proteins is caused by mutation in the structural genes coding for them or by the direct action of mutagens (Turkoglu, 2007). The primary cause and biochemical basis of chromosomal stickiness are still unknown (Pagliarini, 2000). C-mitosis is one of the consequences of inactivation of spindle apparatus connected with delay in the division of centromere (Mann, 1977). Disturbed metaphase, anaphase and telophase may be due to disturbance of spindle apparatus which allows that the chromosomes to spread irregularly over the cell; results c-mitosis, star-anaphase and star-telophase respectively (Amer and Ali, 1974).

In this study, occurrence of several types of chromosomal abnormalities, such as stickiness, laggards, c-mitosis, bridges, multipolarity, picnosis, star-anaphase, star-telophase, clumping and fragmentation of *Allium cepa* L. root tip cells clearly shows that the accumulated effect of blitox results inactivation of spindle formation, deformation of non-histone chromosomal proteins and mutation of the structural genes.

As a result, the present study shows that blitox, commercial formula of copper oxychloride 50, reduced mitotic index of cells because of its cytotoxic activity. Blitox also induced chromosomal abnormalities in mitotic cell division. A linear relationship was observed between the percentage of mitotic abnormalities and mitotic index. These results indicated that blitox should be regarded as an mutagenic agent for plants. Hence, the use of this fungicide should be under control in agricultural fields.

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Table-1: Mitotic Index (MI), type and percentage of mitotic abnormalities in the root tip cells of *Allium cepa* L. exposed to blitox

Time of Treatment (hrs)	Conc. (g/lit.)	Mitotic Index (Mean ± SE)	Mitotic abnormalities %										% Total Abnormalities	
			S	L	C-M	B	M	P	S-A	S-T	CL	F		
4	Control	18.17 ± 2.4	0	0	2.45	0	0	0	0	0	0	0	0	2.45 ± 1.1
	2	15.23 ± 2.2	0	0	2.72	0	0	0	1.8	0	0.04	0	0	4.56 ± 2.0
	3	11.33 ± 2.1	0.05	1.5	2.98	1.2	0.05	2.4	3.5	0.68	4.6	0	0	16.96 ± 6.7
	4	9.92 ± 1.3	1.06	0.65	3.5	0.4	0.43	0	4.3	0.71	5.5	4.2	0	20.75 ± 7.3
	Control	15.37 ± 1.6	0	0	0	0	0	0	0	0	0	0	3.5	3.5 ± 1.52

8	2	10.91 ± 2.1	3.6	0.3	4.2	1.2	0	3.2	2.4	0.69	1.2	1.1	17.89 ± 3.5
	3	9.91 ± 2.4	4.1	1.2	4.9	3.3	2.3	4.1	2.75	1.48	3.4	2.7	30.23 ± 9.2
	4	8.74 ± 2.1	5.2	2.5	5.1	3.9	3.2	4.8	3.9	5.05	3.9	3.6	41.15 ± 8.4
12	Control	15.42 ± 1.3	0	0	4.5	0	0	0	0	0	0	0	4.5 ± 2.03
	2	9.28 ± 2.0	2.0	1.2	2.9	2.44	1.43	2.3	4.2	1.7	2.4	1.6	22.17 ± 8.1
	3	8.52 ± 1.9	4.9	2.3	5.8	4.8	4.7	2.9	2.5	2.6	4.9	3.75	39.15 ± 9.7
	4	6.24 ± 1.8	7.2	3.5	6.2	5.46	5.1	3.24	3.9	4.1	6.44	5.6	50.74 ± 9.8

abbreviations: S: Stickiness; L: Laggards; C-M: C-mitosis; B: Bridges; M: Multipolarity; P: Picnosis; S-A: Star-Anaphase; S-T: Star-Telophase; CL: Clumping; F: Fragmentations.

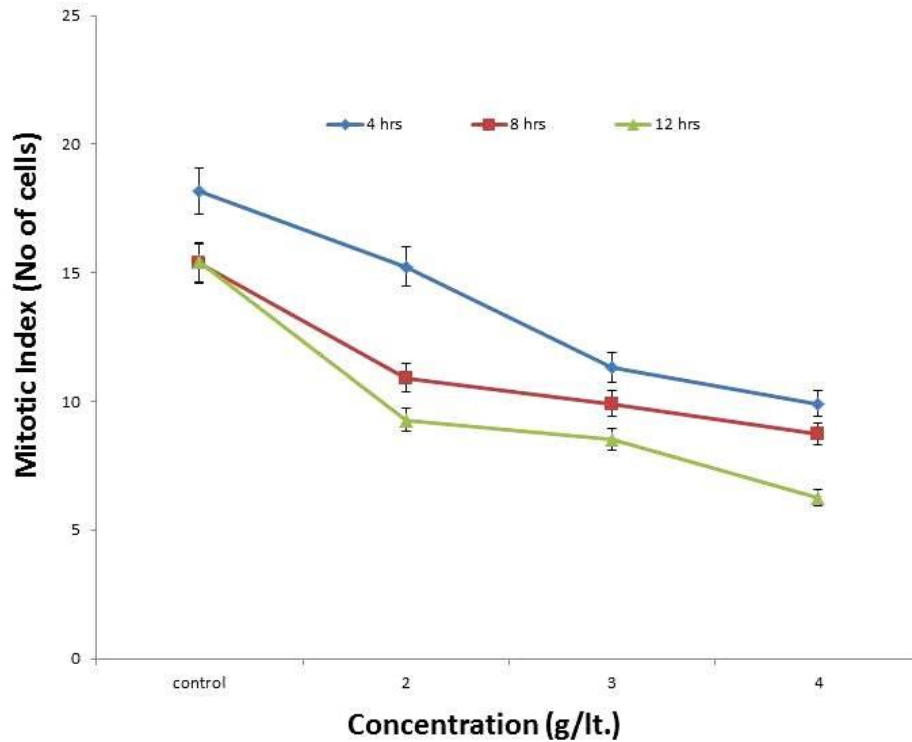


Figure-1: Mitotic Index of *Allium cepa* L. root meristem cells treated with blitox at different times and concentrations

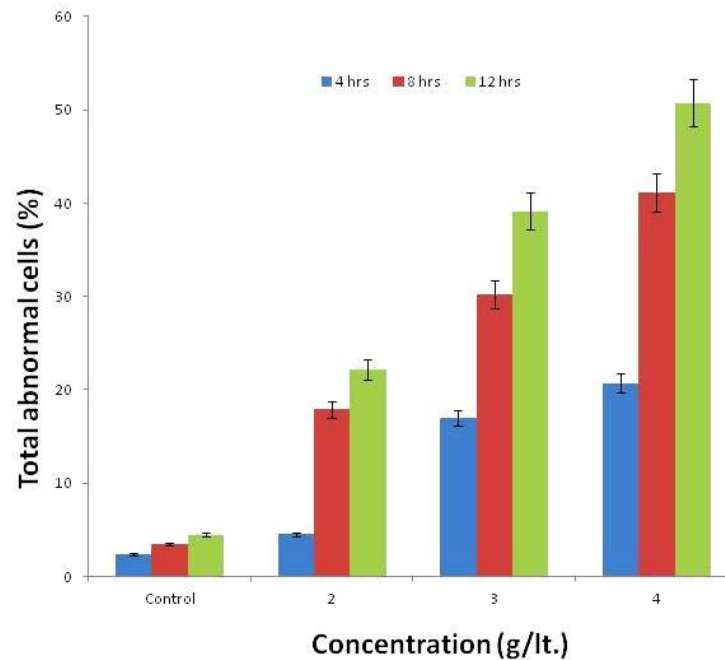


Figure-2: Cytotoxic effects of blitox at different times and concentrations in *Allium cepa* L. root tip cells

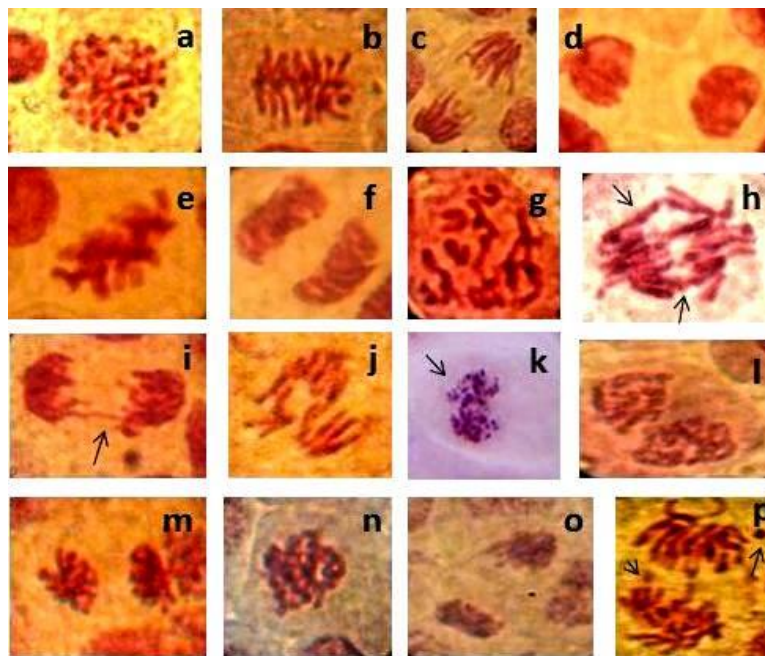


Figure-3: Normal and Abnormal Stages of Mitosis in the Root Tip Cells of *Allium cepa* L. treated with blitox. a-p: a: Normal Prophase; b: Normal Metaphase; c: Normal Anaphase; d: Normal Telophase; e: Stickiness; f: Telophase laggard; g: c-mitosis; h: Anaphase bridge; i: Telophase bridge; j: Multipolarity; k: Picnosis; l: Star-anaphase; m: Star-telophase; n: Metaphase clumping; o: Telophase clumping; p: Fragmentations.

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Livestock Husbandry and Environmental Problems

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Abstract- Livestock husbandry is one of the significant agricultural sub-sector that competing overall economic expansion as it contributes 1.5 percent to GDP globally. About 29 percent of the world's land surface is used for livestock production, either by permanent pasture for grazing or croplands for animal fodder and feed. In a world where a growing number of consumers and producers have instant access of livestock products we have a moral mandate to guide the expanding and rapidly changing global livestock sector so as to minimize its negative environmental impacts and maximize the potential benefits both economically and environmentally. Thus researcher tried to analyse the growth of livestock and their possible impacts on environment in India. The secondary sources were used for analysis. The data were collected from different national and international journals, reports, magazines etc. and processed and with simple statistical techniques. It is found that Indian livestock is growing rapidly and there are both positive and negative effects of livestock husbandry on environment.

Index Terms- Livestock, Economy, Growth, Environment

I. INTRODUCTION

Livestock are omnipresent economic resource in poor communities across the developing world. Two-third of resource-poor rural households estimated to keep several types of livestock in the world (Livestock in Development, 1999). Livestock husbandry practice is having varied reasons like producing food to produce a regular supply of nutrient-rich animal source food that provide a critical supplement and diversity to staple plant-based diets, generate income to meet an urgent need of cash, to provide manure so as to contribute a greater crop production for food and income, to provide traction power for transportation and crop production, to serve as financial instruments and enhance social status as an indicator of social importance within the community, (either based on the size of a family's livestock holdings or in their sharing of livestock with others) to strengthen social bonds (including the use of livestock as dowry or bride price) etc. Thus the multiple objectives of livestock husbandry suggest that it is false to view livestock as a conventional, independent production activity rather it is integrated within household production and consumption decisions, making the role of animals to play in household well-being.

However, the utility of livestock has been undergoing a steady transformation due to structural changes in agriculture and food consumption patterns. The uses of livestock in non-food functions are becoming weaker and weaker. Mechanization of agricultural operations is the important cause of declining the use of livestock as a source of draught power. Use of dung manure is

increasingly being replaced by chemical fertilizers. While their importance as a source of quality food has increased. Consequently, the consumption of animal food products increased rapidly due to sustained income and economic growth, a fast-growing urban population, burgeoning middle income class, changing lifestyles, increasing proportion of women in workforce, improvements in transportation and storage practices and rise of supermarkets especially in cities and towns.

Livestock husbandry is an important agriculture sub-sector of Indian economy. It significantly contributes to the agricultural GDP in India. Livestock generated outputs worth Rs 2075 billion (at 2004-05 prices) in 2010-11 which comprised 4% of the total GDP and 26% of the agricultural GDP. The total output worth was higher than the value of food grains (12th five year plan, 2012-17). Livestock-derived food items (meat, milk and eggs) are the great contributor in the Indian economy. This sector is an integral component of Indian agriculture supporting livelihood of more than two-thirds of the rural population. There are various types of services of animals such as to provide nutrient-rich food products, draught power, dung as organic manure and domestic fuel, hides & skin, and are a regular source of cash income for rural households in India. They are a natural capital, which can be easily reproduced to act as a living bank with offspring as interest, and an insurance against income shocks of crop failure and natural calamities.

Livestock employed a good percentage of agricultural work forces and promotes gender equity. More than three-fourth of the labour demand in livestock production is met by women. A number of states in India like Punjab, Haryana, Jammu & Kashmir, Himachal Pradesh, Kerala, Gujarat, and Rajasthan show less stress of rural poverty where livestock accounts for a sizeable share of agricultural income as well as employment (12th five year plan, 2012-17).

Livestock industries are also a significant source of livelihoods at global level. They are organized in long market chains that employ at least 1.3 billion people and directly support the livelihoods of 600 million poor smallholder men and women in the developing world (Perry and Sones, 2007). At the same time livestock systems occupy 45 percent of the global surface area (Reid *et al.*, 2008). Land is inextricably linked from livestock to natural resource management. Different types of livestock systems have different impacts on land use and its changes. There are several types of livestock transition like transition from pastoral to agro-pastoral systems, from agro-pastoral systems to mixed crop-livestock systems with different degrees of intensification, from mixed crop-livestock systems to specialized industrial landless systems etc (Frans Swanepoel, Aldo Stroebel and Siboniso Moyo, 2010).

Nonetheless, there are a number of environmental challenges and socio-economic problems that need to be overcome through appropriate policies, technologies and

strategies in order to harness the pro-poor potential of livestock. The problems may include insufficient productivity in low-producing animals, huge gap between the potential and the realized yields in Indian livestock, limited extent success in crossbreeding of indigenous species with exotic stocks to enhance genetic potential of different species, quantitative and qualitative deterioration of common grazing lands, frequent outbreaks of diseases like FMD, BQ, PPR, Influenza etc. to affect livestock health and productivity and a large share of ruminants in greenhouse gases (Methane and Nitrous oxide to global warming, the mitigation of which is a major challenge). The important livestock – environment challenges are land degradation particularly of semi-arid region, extensive grazing and large-scale forest degradation, and loss in biodiversity, animal waste products which exceeds the absorption capacity of land and water, emission of greenhouse gases from livestock

wastes, groundwater contamination and pollution, involution of mixed farming system, and slaughterhouses etc.

II. OBJECTIVE

Keeping in view the significance and of livestock husbandry researcher tried to

- i. Present a trend of livestock growth in India and
- ii. To show the relationship of livestock with environment.

III. METHODOLOGY

Data were collected from published record, annual report of livestock census, and different journals and articles. These data were processed and analyzed with simple statistical techniques.

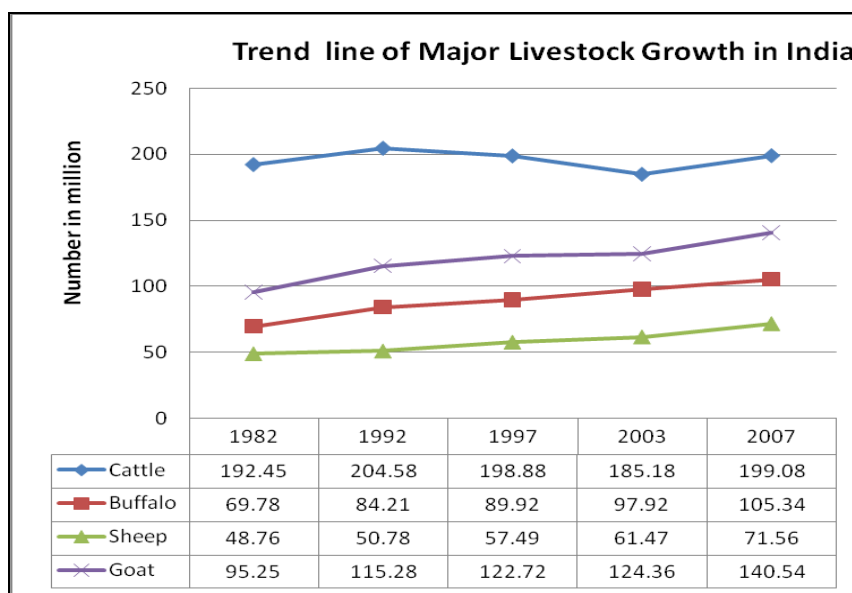


Figure 1
Source: 12th five year plan (2012-17)

IV. DISCUSSION

Growth of Livestock Heads in India

Livestock production is a permanent and growing component of global agriculture. Due to rapidly increasing incomes and high income elasticities in India, consumption of meat and milk and their products are increasing rapidly as shown in table 2 since 1981-82. As a result, this sector has been growing at a faster rate considerably than the other agriculture sector except crop sector. Figure 1 shows the growth in major livestock in different census year. All livestock species showing almost positive trend of growth from the year 1982 to 2007 with slight fluctuation in buffalo population. While trend of cattle head production has a big fluctuation between 1992 and 2003 showing a negative trend of growth. However after 2003, cattle show a big leap of production with positive trend of production. It is mainly because of the high level of mechanization of agriculture, low productivity of cows for milk production as well as

prohibition of cow slaughter on religious ground especially in India (Khan N and Iqbal M.A, 2008).

Buffalo, the second important big ruminant, also exhibited an improving nature of growth in their head number. Their numbers rose up at rather high rate. Goat and sheep the small ruminants, shot up at very fast and steady rate in the study area India. The increase in their numbers is on account of increasing demand of mutton (meat) in Indian states due to high level of social acceptability among all religious groups unlike beef and pork. They are usually reared at household level by female members and poors who have small amount of capital to invest for big ruminants like cattle and buffalo. Their rearing is also preferred especially in Muslim families considering it as religious obligation as the most of the prophets reared goats in their lives. Besides, the goats are also sacrificed every year by same community on the occasion of EID-UL-AZHA in abundant number (Khan N et al, 2008).

This trend is expected to continue at commercial level. The increase of animal numbers at traditional level need expanding of grazing area but horizontal expansion of the area is not possible

anymore due to urbanisation and industrialisation. According to Khan's study livestock number is also intensifying per human head and per hectare of land. This intensification can have negative impact on environment. The pressure of livestock production has gone beyond the adsorptive capacity of the resource base, polluting water and air. Intensive production can

have heavy strain on the water and air quality. Intensification of crop and livestock production in some of the semi-arid and tropical highlands of India is leading to extensive soil degradation.

Production of Major Livestock Products in India

	Milk	Wool	Meat
	Million Tonnes	Million Kgs.	Million Tonnes
1981-82	34.3	33.1	-
1991-92	55.7	41.6	-
1996-97	69.1	44.4	-
2002-03	86.2	50.5	2.1
2006-07	102.6	45.1	2.3
2010-11	121.8	43	4.8

Source: 12th five year plan (2012-17)

Note: Meat Production from Commercial Poultry Farm is included from 2007-08.

V. IMPACT OF LIVESTOCK HUSBANDRY

Positive Impacts

However, Livestock are beneficial as well as harmful both for human beings and environment. In other words livestock husbandry and their production processes have both positive and negative effects on environment. The positive effects on environment can be realised when there is managed grazing system which improves species (flora) wealth, mixed farming (crop cultivation and livestock keeping) enhances water infiltration and recharges groundwater reserves, sustains the resource base and effects resource enhancement and support resource sparing etc. The use of livestock in mixed farming saves fossil fuel. Livestock contributes to soil fertility maintenance through manure and enabling rotation with N fixing plants. Livestock grazing can improve biodiversity. Contrary to this, livestock contribute to enhance the economic power of various rural people and now a day this sector has been industrialized. Providing nutrition rich food is another benefit of livestock to human beings. Organic farming and gobar gas plant also contributes to the environment.

Negative Impacts

In spite of that livestock contributes to environmental problems/climate change both at local and global level. The most important source of methane emissions in India is enteric fermentation from domestic livestock, which is showing steady increase over a period of time. During 1980–81 it was 9820 Gg (Giga grams), which has increased to 11,790 Gg during 1997–98. The share of enteric fermentation from livestock was more than 68 per cent of the total methane emissions from the agricultural sector during 1996–97 (Syed Ajmal Pasha). Methane gas is 23 times more aggressive in causing global climate change than carbon dioxide. Methane is the by-product of animal production and manure management, rice cultivation, production and distribution of oil and gas (pipelines), coal mining, and landfills. Every year, livestock and manure management are estimated to

emit 80 teragrams of methane, representing 25% of man-made sources. Methane is produced as a by-product of the feed digestion of mainly ruminants and, on average, about 6 percent of the feed energy is lost in methane. Methane emission is the direct result of the capacity of ruminants to digest large amounts of fibrous grasses and other feeds which cannot be used for human consumption. Nitrous oxide is the most aggressive greenhouse gas produced by livestock (296 times CO₂). It is produced from animal manure. Every year, livestock emit approximately 0.5 teragrams of nitrous oxide, representing 6% of man-made sources (FAO, Briefing Notes).

Some of the health problem is directly related to human beings due to the association of human beings with livestock. It also caused by the poor techniques of animal husbandry influenced by local customs and traditions and the hazards of climate. These problems coupled with lack of proper land use management, poor conservation practice and absence of regulations which led to a series of environmental problems. Spraying large amounts of manure sends dust particles into the air that can penetrate the lungs of humans nearby. The particles carry toxic gases such as ammonia, which can impede the lungs from clearing dust particles, and hydrogen sulphide, which can prevent cells from using oxygen and causes loss of consciousness, coma, or death at high exposure levels.

The environment becomes worse in the rural areas where livestock are allowed to wander free in search of food and water. The animals have helped to spread diseases of various kinds to both humans and domestic animals. In addition livestock (directly or indirectly) are an important source of land degradation, deforestation (loss of bio-diversity), waste production, pollution of land, water and air which are some of negative effects on environment.

VI. CONCLUSION

Livestock husbandry is growing in India very fast since last two decades. There are number of causes such as rapidly increasing incomes and high income elasticities in India,

consumption of meat and milk, rapid urbanisation, population growth, increase in middle income class families, changing food habits, migration from village to urban areas etc. However, there are many livestock-environment focus areas which need careful attention, otherwise environment / ecology and the livestock production systems would be collapse. The area includes land degradation particularly of semi-arid region, extensive grazing and large-scale forest degradation, and loss in biodiversity, excessive animal waste production etc. Livestock waste emits greenhouse gases such as methane and nitrous oxide, contributing to global warming, groundwater contamination, and pollution, involution of mixed farming system, etc.

On the other hand, contribution of livestock in sustainable agriculture is recognisable and can be greatly enhanced, provided the appropriate enabling environment is created. Some systems, especially in the arid zones are much more resilient. In systems, where livestock does contribute to environmental degradation, such as soil degradation and global warming, the share of livestock in causing these phenomena is also accountable. Thus the livestock sector needs more attention to mitigate the potential negative effects of increased intensification of livestock on environment.

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Design of Fuzzy Logic Controller for Auto Landing Applications

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Abstract- It is a well-known fact about the degree of difficulty associated during the landing phase of an Aircraft. An efficient and a reliable auto-landing controller are therefore specially needed for auto landing purpose. A good number of parameters have to be controlled during the landing phase like the approach velocity, Heading, Heading offset, vertical velocity, flare, altitude, alignment of the aircraft etc., which makes the application of conventional controllers expensive for the purpose. This is precisely where fuzzy logic can be used. Using fuzzy sets and fuzzy set operation, it is possible to design a fuzzy reasoning system, which can act as a controller. Potentially, applications of such knowledge-based approach to controller design can result in efficiency, time and cost savings. The aircraft used in this project is a Personnel launching system (PLS) model given in the Aerosim adds in Matlab. The model of the PLS itself is unstable and before any simulation is made with it, there is a need to stabilize it. The stabilization of the Aerosim add model in MATLAB is performed by using classical techniques and the errors has been corrected and obtained smooth landing using fuzzy controller techniques.

I. INTRODUCTION

The scope of this paper is to design a fuzzy logic controller for landing of an air vehicle with various rule sets using program languages and to perform a design simulation that is done by MATLAB programming. The idea is to design and display the simulation of fuzzy logic controller for landing system control and the result of this will be display by using Rule viewer and Surface viewer which are parts of the graphical user interface (GUI) in Fuzzy Logic Toolbox in MATLAB program. This paper is designed to make use of the advantages of the Fuzzy Logic Toolbox and integrate it with SIMULINK which is also in MATLAB programmed.

This controller, based on fuzzy logic has been designed for a flight vehicle where it tracks the predetermined path trajectory for safe landing. This fuzzy logic tool box has the ability to take fuzzy systems into Simulink directly and test them in a simulation environment. This will display the animation of the landing phase for all the given parameters that controlled based on the rules of fuzzy sets. This system will be also tested with the Personal launching system by using various methods and different membership functions. The main purpose is to find the best way to get the result as close as the requirement for stability of the level control for the landing system.

Introduction to PLS: The Personnel Launch System (PLS), also known as HL-20, is a lifting body re entry vehicle designed to complement the Space Shuttle orbiter. It was developed originally as and a limited cargo. Low-cost solution for getting to and from low Earth orbit. It can carry up to 10 people a limited cargo.

The HL-20 lifting body can be placed in orbit either by launching it vertically with booster rockets or by transporting it in the payload bay of the Space Shuttle orbiter. Using a small onboard propulsion system the HL-20 lifting body deorbits. Its reentry profile is nose first, horizontal, and unpowered. Although the HL-20 program is not active currently, NASA projects used the aerodynamic data from HL-20 tests.

II. FUZZY LOGIC CONTROLLER

A. Basic idea

The basic idea of a fuzzy logic controller (FLC) is to imitate the control actions of a human operator, which can generally be represented as a collection of if-then rules. As an example, consider the rule:

If error1 is negative medium and error2 is zero, **then** control action is positive small.

The first part of the rule specifies the conditions under which the rule holds, called antecedent. The second part, called the consequent, prescribes the corresponding control action. Both parts contain vague, linguistic terms like small, medium, low, etc., that reflect the operators knowledge of the process. In the fuzzy control, the linguistic terms are represented by fuzzy sets, while **AND**, **OR** operations are used for combing the linguistic terms.

B. Fuzzy sets

A fuzzy set is an ordered set which associates each value of a variable to its grade of membership in the set. The grades of membership are represented by the membership function. The position and shape (typically triangular or trapezoidal shaped) of the membership function depend on the particular application.

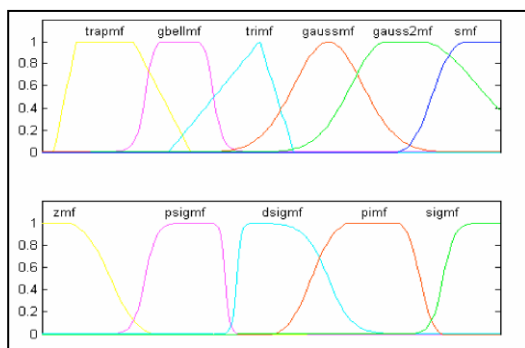


Fig 2.1: Various types of membership functions

C. Fuzzy set operations

Fuzzy set operations are performed by logical connectives such as **AND** (conjunction), **OR** (disjunction), or **NOT** (compliment). The most commonly used conjunction operators are the minimum and the product operators. Usually the maximum operator is used for the disjunction.

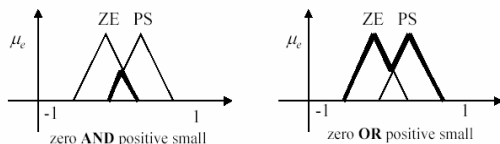


Fig 2.2: Conjunction and disjunction of 2 fuzzy sets by minimum and maximum operator

D. Fuzzy logic control

Using fuzzy sets and fuzzy set operation, it is possible to design a fuzzy reasoning system, which can act as a controller. The control strategy is stored in the form of it-then rules in the rule base. They represent as an approximate static mapping from inputs (e.g. errors).

Typically, the computational mechanism of a linguistic controller or a Mamdani type of FLC proceeds in five steps:

- **Fuzzification:** the membership degrees of the antecedent variables are computes (e.g. small (e), $\mu_{\text{medium}}(\Delta e)$, $\mu_{\text{big}}(\Delta e)$).
- **Degree of fulfilment:** The degree of fulfilment for the antecedent of each rule is computed using fuzzy logic operators. The degree of fulfilment ' ω_i ' determines to which degree the ' i^{th} ' rule is valid.

- **Implication:** The degree of fulfilment is used to modify the consequent of the corresponding rule accordingly. This operation represents the **if-then** implication defines as a conjunction operator (e.g. product).
- **Aggregation:** The scale consequents of all rules are combined into a single fuzzy set. The aggregation operator depends on the implication function used; for the conjunctions, it is a disjunction operator (e.g. max).
- **Defuzzification:** The resulting fuzzy set is defuzzified to yield a crisp value. There exist a number of defuzzification methods, such as the centre of area method and others shown in the figure.

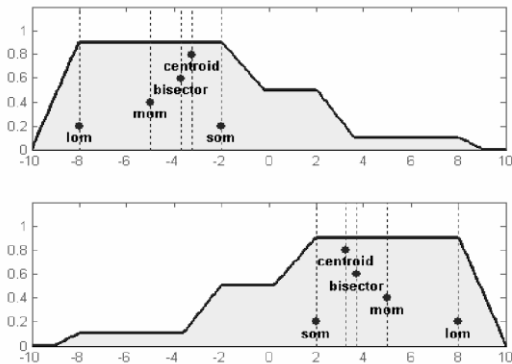


Fig2.3: Examples of Different Defuzzification Methods

For Mamdani-style inference, we can choose centroid, bisector, MOM (middle of maximum), SOM (smallest of maximum), LOM (largest of maximum), for a custom operation. For Sugeno-style inference, can choose either w_{taver} (weighted average) or w_{tsum} (weighted sum).

III. FUZZY LOGIC CONCEPT IN LANDING APPLICATION

To construct and simulation of the final descent and landing approach of an aircraft, the desired profile is shown in below Figure.

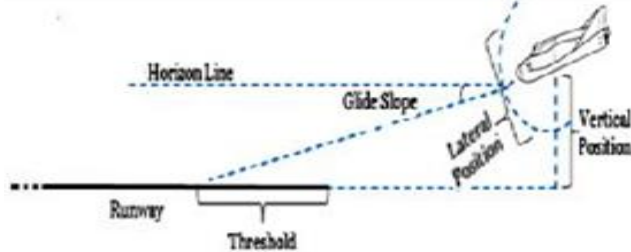


Fig3.1: Desired final approach path

The desired downward velocity is proportional to the square of the air vehicle height. So, at higher altitudes, a large downward velocity is desired. As the height diminishes, the required downward velocity gets smaller and smaller. In the limit, as the height becomes vanishingly small, the downward velocity also becomes zero. This is the way, the aircraft will descend from altitude promptly but will touchdown very gently to avoid damage.

The two state variables for this simulation will be the height above ground, h , and the vertical velocity of the aircraft, v . The control output will be a force that, when applied to the aircraft, will alter its height (h) and velocity (v). The differential control equations are loosely derived as follows. Mass m moving with velocity v has momentum p ($p=mv$). If there is no external force was applied, then the mass will continue in the same direction at the same velocity, v . If over a time interval Δt , a force f is applied then there is a change in velocity of $\Delta v=f\Delta t/m$ will result. If we let $\Delta t=1.0$ (sec) and $m=1.0$ (lb-sec²/ft), we obtain $\Delta v=f$ (lb), or the change in velocity is proportional to the applied force.

In difference notation we get

$$v_{i+1} = v_i + f_i$$

$$h_{i+1} = h_i + v_i(1)$$

Where v_{i+1} is the new velocity, v_i is the old velocity, h_{i+1} is the new height, and h_i is the old height. These two “control equations” define the new value of the state variables v and h in response to control input and the previous state variables

IV. FUZZY CONTROLLER DESIGN PROCEDURE

- Step 1: Define all the membership functions for state variables as shown in tables.
- Step 2: As shown in tables, define a membership function for the control output.
- Step 3: Define the rules and summarize them in an FAM table. The values in the FAM table are the control outputs.
- Step 4: Define the initial conditions, and then conduct a simulation for four cycles. Since the task at hand is to control the aircraft’s vertical descent during approach and landing, we will start with the aircraft at an altitude of 1000 feet, with a downward velocity of -20 ft/s. We will use the following equations to update the state variables for each cycle:.

$$v_{i+1} = v_i + f_i$$

$$h_{i+1} = h_i + v_i$$

TABLES AND FUNCTION OUTPUTS:

	Height (ft)										
	0	100	200	300	400	500	600	700	800	900	1000
(L)	0	0	0	0	0	0	0.2	0.4	0.6	0.8	1
(M)	0	0	0	0	0.2	0.4	0.6	0.8	1	0.8	0.6
(s)	0.4	0.6	0.8	1	0.8	0.6	0.4	0.2	0	0	0
(NZ)	1	0.8	0.6	0.4	0.2	0	0	0	0	0	0

[9]

TABLE 4.1: Membership values for height

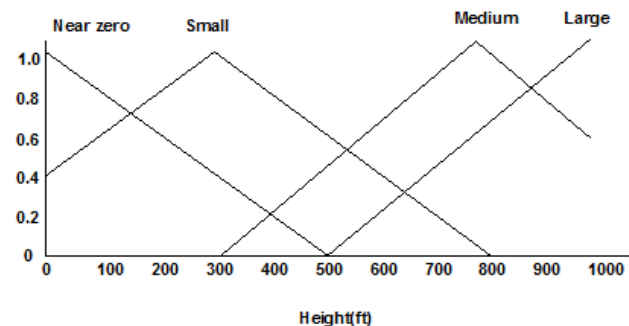


Fig 4.1: Membership Functions for Height

	Output force (lbs)												
	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
(UL)	0	0	0	0	0	0	0	0	0	0.5	1	1	1
(US)	0	0	0	0	0	0	0	0.5	1	0.5	0	0	0
(Z)	0	0	0	0	0	0.5	1	0.5	0	0	0	0	0
(DS)	0	0	0	0.5	1	0.5	0	0	0	0	0	0	0
(DL)	1	1	1	0.5	0	0	0	0	0	0	0	0	0

TABLE 4.2: Membership values for velocity

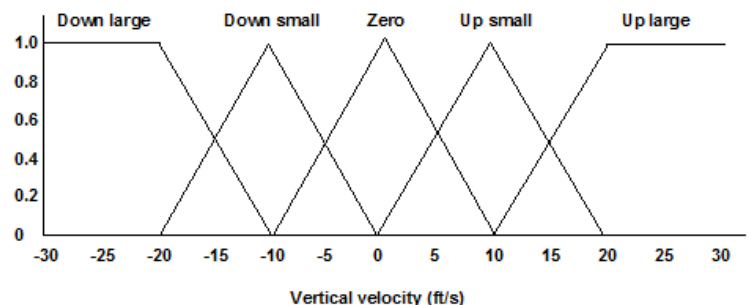
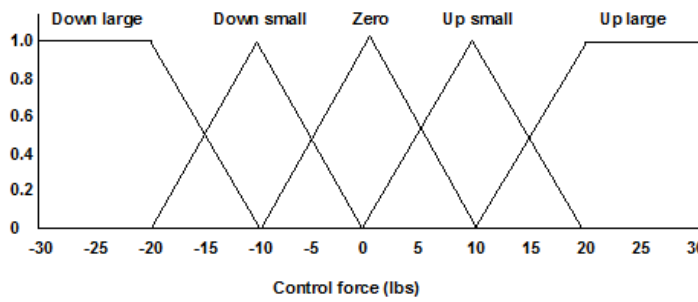


Fig 4.2: Membership Functions for Velocity

TABLE 4.3: Membership values for control force



	Output force (lbs)												
	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	30
Up Large(UL)	0	0	0	0	0	0	0	0	0.5	1	1	1	1
Up small(US)	0	0	0	0	0	0	0	0.5	1	0.5	0	0	0
Zero(Z)	0	0	0	0	0	0.5	1	0.5	0	0	0	0	0
Down small(DS)	0	0	0	0.5	1	0.5	0	0	0	0	0	0	0
Down large (DL)	1	1	1	0.5	0	0	0	0	0	0	0	0	0

Fig 4.3: Membership Functions for Control Force

Height	Velocity				
	DL	DS	Zero	US	UL
L	Z	DS	DL	DL	DL
M	US	Z	DS	DL	DL
S	UL	US	Zero	DS	DL
NZ	UL	UL	Zero	DS	DS

TABLE 4.4: FAM table

SUMMARY AND SIMULATION RESULT

	Cycle 0	Cycle 1	Cycle 2	Cycle 3	Cycle 4
Height,ft	1000.0	980.0	965.8	951.1	936.0
Velocity,ft/s	-20.0	-14.2	-14.7	-15.1	-14.8
Control force	5.8	0.5	-0.4	0.3	

TABLE 4.5: Summary of four-cycle simulation results

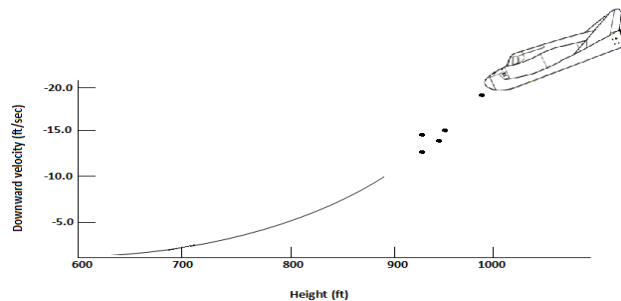


Fig 4.4: The profile of downward velocity, v , vs. height, h , using fuzzy logic control

V. FUZZY LOGIC CONTROL DESIGN USING MATLAB

Fuzzy inferences systems can be create and edit with Fuzzy Logic Toolbox software. We can create these systems using graphical tools or command-line functions, or we can generate them automatically using either clustering or adaptive neuro-fuzzy techniques. If we have access to Simulink software, we can easily test our fuzzy system in a block diagram simulation environment.

The toolbox also let us runs our own stand-alone C programs. This is made possible by a stand-alone Fuzzy Inference Engine that reads the fuzzy systems saved from a MATLAB session of the program. Then we can customize the stand-alone engine to build fuzzy inference into our own code. ANSI compliant code is provided. Because of the integrated nature of the MATLAB environment, we can create our own tools to customize the toolbox or harness it with another toolbox, like a Control System Toolbox, Optimization Toolbox software, Neural Network Toolbox.

A. FIS EDITOR

The FIS Editor GUI tool allows us to edit the fuzzy inference system highest level features, such as the number of output and input variables, the defuzzification method used, and so on. The FIS Editor is the high-level display for any fuzzy logic inference system. It allows calling the various other editors to operate on the FIS. This allows convenient access to all other editors with an emphasis on maximum flexibility for interaction with the fuzzy system.

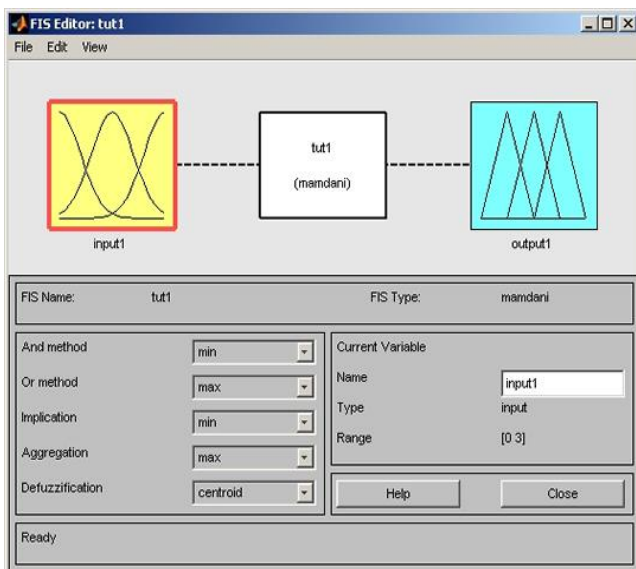


Fig5.1: FIS Editor

1. The diagram

The diagram displayed at the top of the window shows a central fuzzy rule processor, inputs and outputs, . Click one of the variable boxes to make the selected box the current variable. We should see the box highlighted in red. Give a Double-click on one of the variables to bring up the Membership Function Editor. Then Double-click the fuzzy rule processor to bring up the Rule Editor. A variable exists but is not mentioned in the rule base, in that case it is connected to the rule processor block with a dashed rather than a solid line.

2. Menu items

The FIS Editor displays a menu bar that allows us to open related GUI tools, open and save systems, and so on.

- Under **File** select

New FIS > Mamdani to open a new Mamdani-style system with no variables and no rules called *Untitled*.

New FIS > Sugeno to open a new Sugeno-style system with no variables and no rules called *Untitled*.

Import > From workspace to load a system from a specified FIS structure variable in the workspace.

Import > From file to load a system from a specified .fis file.

Export > To workspace. to save the system to a FIS structure variable in the workspace.

Export > To file to save the current system to a .fis file.

Print to print what is displayed in the GUI.

Close to close the GUI.

- Under **Edit** select

Undo to undo the most recent change.

Add variable > Input to add another input to the current system.

Add variable > Output to add another output to the current system.

Remove Selected Variable to delete a selected variable.

Membership functions to invoke the Membership Function Editor.

Rules to invoke the Rule Editor.

- Under **View** select

Rules to invoke the Rule Viewer.

Surface to invoke the Surface Viewer.

3. Interface method pop-up menus

And method: Choose min, prod, or Custom, for a custom operation.

Or method: Choose max, probor (probabilistic or), or Custom, for a custom operation.

Implication: Choose min, prod, or Custom, for a custom operation. This selection is not available for Sugeno-style fuzzy inference.

Aggregation: Choose max, sum, probor, or Custom, for a custom operation. This selection is not available for Sugeno-style fuzzy inference.

Defuzzification: For Mamdani-style inference, choose centroid, bisector, MOM (middle of maximum), SOM(smallest of maximum), LOM (largest of maximum), or Custom, for a custom operation. For Sugeno-style inference, choose between wtaver (weighted average) or wtsum (weighted sum).

B. RULE EDITOR

On the Rule Editor, there is a menu bar that allows to open related GUI tools, open and save systems, and so on. The **File** menu for the Rule Editor is the same as the one found on the FIS Editor.

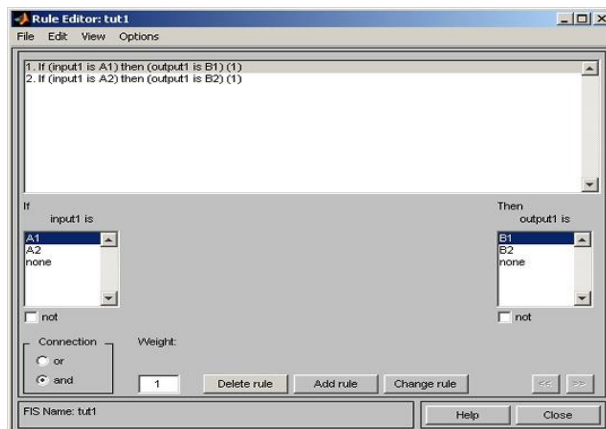


Fig 5.2: Rule Editor

C. RULE VIEWER

On the Rule Viewer, there is a menu bar that allows to open related GUI tools, open and save systems, and so on. The **File** menu for the Rule Viewer is the same as the one found on the FIS Editor. Refer to *fuzzy* for more information.

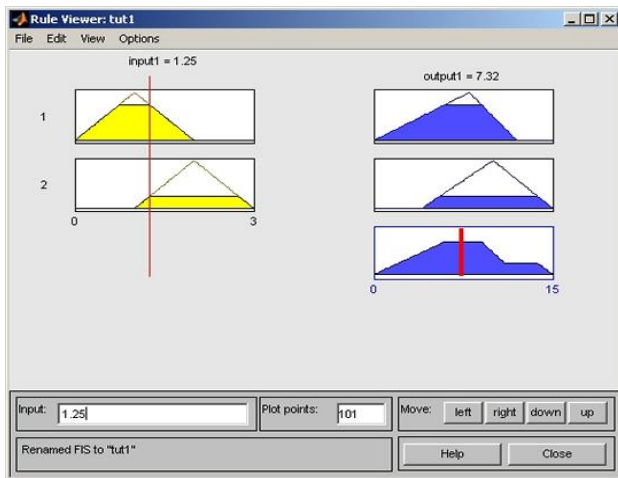


Fig5.3 : Rule Viewer

- Use the **Edit** menu items:
Undo to undo the most recent action
FIS properties to invoke the FIS Editor
Membership functions to invoke the Membership Function Editor
Rules to invoke the Rule Editor
- Use the **View** menu item:
Surface to invoke the Surface Viewer
- Use the **Options** menu item:
Format to set the format in which the rule appears: **Verbose**, **Symbolic**, or **Indexed**

D. SURFACE VIEWER

Upon opening the Surface Viewer, we can see a three-dimensional curve. This curve represents a two-input one-output case, from this we can see the entire mapping in one plot. If we move beyond three dimensions overall, then we start to encounter trouble displaying the results.

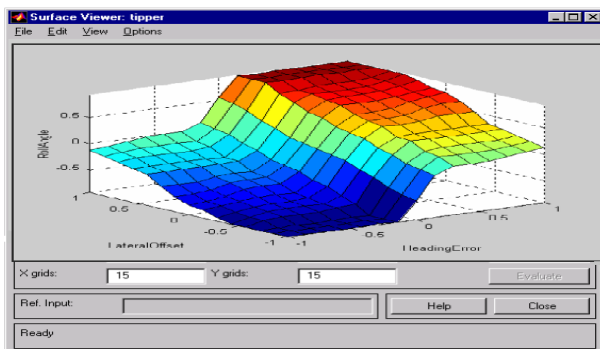


Fig 5.4: Surface Viewer

Accordingly, the Surface Viewer is equipped with drop-down menus X (input): Y (input): and Z (output): that let us select any two inputs and any one output to plot. Below these menus are two input fields X grids: and Y grids: that let us specify how many x-axis and y-axis grid lines you want to include in it. This capability allows you to keep the calculation time reasonable for complex problems.

If we want to create a smoother plot, we can use the Plot point's field to specify the number of points on which the membership functions are evaluated in the output or input range. By default, the value of this field is 101. Clicking Evaluate initiates the

calculation, then the plot is generated after the calculation is complete. In order to change the x-axis or y-axis grid after the view, change the appropriate input field, press Enter. The surface plot is updated to reflect the new grid settings.

The Surface Viewer has a special capability that is very helpful in cases with two (or more) inputs and one output: you can grab the axes, by using the mouse and reposition them to get a different three-dimensional view on the data we have. The Reference Input field is used in situations when there are more inputs required by the system than the surface is mapping. We can edit this field to explicitly set inputs not specified in the surface plot.

Suppose we have a four-input one-output system and would like to see the output surface. Surface Viewer can generate a three-dimensional output surface where any two of the inputs vary, but the two of the inputs must be held constant because computer monitors cannot display a five-dimensional shape. If such a case occurs, the input is a four-dimensional vector with NaNs holding the place of the varying inputs while numerical values indicates those values that remain fixed. Here NaN is the IEEE® symbol for Not a Number.

The menu items allow us to open, close, save and edit a fuzzy system using the five basic GUI tools. We can access information about the Surface Viewer by clicking Help and close the GUI using Close.

VI. COORDINATE SYSTEM FOR MODELLING PLS

The model for airframe incorporates several key assumptions and limitations:

- Here the airframe was assumed to be rigid and have constant mass, centre of gravity, and inertia, since the model represents only the unpowered re entry portion of a mission.
- HL-20 is taken as a laterally symmetric vehicle.
- Compressibility (Mach) effects are to be assumed negligible.
- Control effectiveness is assumed to vary nonlinearly with angle of attack and linearly with angle of deflection. and Control effectiveness is not dependent on sideslip angle.

Coordinate system allows us to keep track of an aircraft or spacecraft's position and orientation in space. Aerospace Block set coordinate systems are based on these underlying concepts from astronomy, geodesy and physics.

Modelling aircraft and spacecraft is simplest if we use a coordinate system fixed in the body itself. In case of aircraft, the forward direction is modified by the presence of wind, the craft's motion through the air is not the same as its motion relative to the ground.

A. BODY COORDINATES

The non inertial body coordinate system is fixed in both origin and orientation to the moving craft. This craft is assumed to be rigid.

The orientation of the flight body coordinate axes is fixed in the shape of body.

1. The x-axis points the aircraft through the nose.
2. The y-axis points the right of the x-axis (facing in the pilot's direction of view), perpendicular to the x-axis.
3. The z-axis points down through the bottom the aircraft, perpendicular to the xy plane and satisfying the RH rule.

TRANSLATIONAL DEGREES OF FREEDOM

These are defined by moving along these axes by distances x , y , and z from the origin.

ROTATIONAL DEGREES OF FREEDOM

Rotations are defined by the Euler angles (given P , Q , R or Φ , Θ , Ψ) They are:

- P or Φ Roll about X-axis
- Q or Θ Roll about Y-axis
- R or Ψ Roll about Z-axis

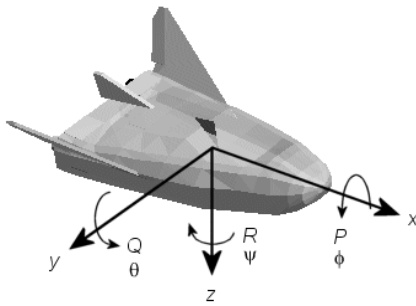


Fig6.1: Body Co-ordinate System

B. WIND COORDINATES

The non inertial wind coordinate system has its origin fixed in the rigid air vehicle. The coordinate system orientation is defined relative to the craft's velocity V .

The different orientation of the wind coordinate axes is fixed by the velocity V .

- X-axis points in the direction of V .
- Y-axis is points to the right of the x-axis (facing in the direction of V), perpendicular to the x-axis.
- Z-axis is point's perpendicular to the xy plane in whatever way needed to satisfy the RH rule with respect to the x- and y axes.

TRANSLATIONAL DEGREES OF FREEDOM

The Translations are defined by moving along these axes by distances x , y , and z from the origin.

ROTATIONAL DEGREES OF FREEDOM

Rotations are defined by the Euler angles (given Φ , γ , χ). They are:

Φ Bank angle about the x-axis

Γ Flight path about y-axis

X Heading angle about z-axis.

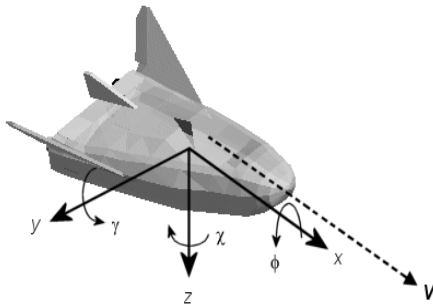


Fig6.2: Wind Co-ordinate System

C. COORDINATE SYSTEM FOR NAVIGATION

Modelling aerospace trajectories requires positioning and orienting the aircraft or spacecraft with respect to the rotating Earth. The Navigation coordinates are defined with respect to the centre and surface of the Earth.

GEOCENTRIC AND GEODETIC LATITUDES

The λ , geocentric latitude on the Earth's surface is defined by the angle subtended by the radius vector from the Earth's centre to the surface point with the equatorial plane.

The μ , geodetic latitude on the Earth's surface is defined by the angle subtended by the surface normal vector n and the equatorial plane.

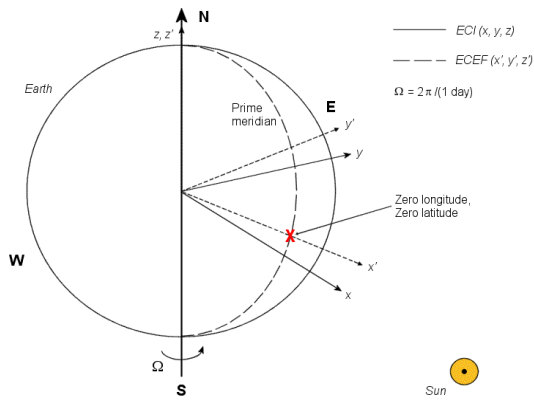


Fig6.3: Earth-centered coordinates

D. ECEF COORDINATES

The Earth-center, Earth-fixed (ECEF) system is a non inertial system that rotates with the Earth. The origin is fixed at the center of the Earth.

- The z' -axis points to northward along the Earth's rotation axis.
 - The x' -axis points to outward along the intersection of the Earth's equatorial plane and prime meridian.
- The y' -axis points into the eastward quadrant that is perpendicular to the x - z plane so as to satisfy the RH rule

E. COORDINATE SYSTEM FOR DISPLAY

Different display tools are available for use with the Aerospace Block set product, which has a specific coordinate system for rendering motion.

F. MATLAB GRAPHICS COORDINATES

MATLAB Graphics uses the default coordinate axis orientation:

- The x -axis points out of the screen.
- The y -axis points to the right.
- The z -axis points up.

G. FLIGHTGEAR COORDINATES

Flight Gear is an open-source, third-party flight simulator with an interface supported by the block set. The Flight Gear coordinates form a special body-fixed system, which rotated from the standard body coordinate system about the y -axis by -180 degrees:

- The x -axis is +ve toward the back of the vehicle.
- The y -axis is +ve toward the right of the vehicle.
- The z -axis is +ve upward, e.g., wheels typically have the lowest z values.

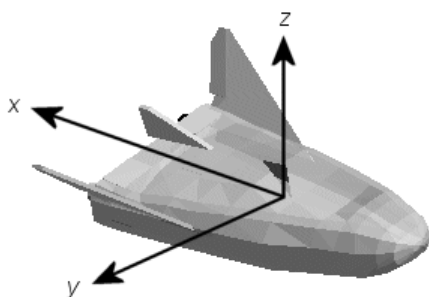


Fig6.4: Flight Gear Co-ordinates

VII. INTEGRATING FUZZY CONTROLLER WITH

PLS

A. BASIC IDEA

The Fuzzy Controller was integrated to PLS model for performance and robustness evaluation. Evaluation was made for landing phase. An Auto-land button was provided, initialization of which activates the fuzzy controller to take over and make a safe landing.

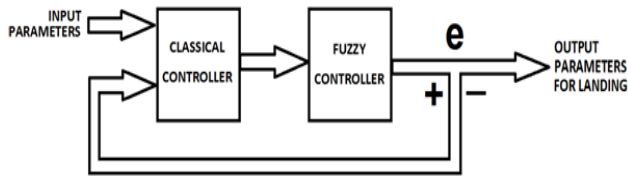


Fig7.1:Basic idea

In this paper, a controller based on fuzzy logic methodology has been designed for a flight vehicle that enables it to track pre-determined path trajectory for the safe landing. The controller has been designed with the available conventional autopilot. The fuzzy controller will compare the error of the classical controller during landing with the pre setup program and it will correct the errors for safe landing.

B. INTEGRATION TECHNIQUE

Fuzzy Logic Toolbox software is a collection of functions built on the MATLAB technical computing environment itself. It provides tools to create and edit fuzzy inference systems within the framework of MATLAB. We can integrate our fuzzy system into simulations with Simulink software. We can even build stand-alone C programs that call on fuzzy systems we build with MATLAB tool box. This toolbox relies heavily on graphical user interface (GUI) tools to help us to accomplish work, although we can work entirely from the command line if we prefer.

This toolbox provides three categories of tools:

- Command line functions
- Graphical interactive tools
- Simulink blocks and examples

The first category of tools is made up of functions that we can call from the command line or from our own applications. Most of these functions are MATLAB M-files, and series of MATLAB statements that implement specialized fuzzy logic algorithms. Here we can view the MATLAB code for these functions using the statement.

We can change the way any toolbox function works by copying and renaming the M-file, it then modifying our copy. We can also extend the toolbox by adding our own M-files.

Secondly, the toolbox provides a number of interactive tools that let us access many of the functions through GUI. The GUI-based tools provide an environment for fuzzy inference system design, its analysis, and implementation.

The third category of tools is a set of blocks for use with Simulink. Those are specifically designed for high speed fuzzy logic inference in the Simulink environment.

What makes the toolbox so powerful is the fact that most of human reasoning and concept formation is linked to the use of rules of fuzzy. By providing a systematic framework for computing with fuzzy rules, that toolbox greatly amplifies the power of human reasoning. The amplification results from the use of MATLAB and graphical user interfaces, areas in which The Math Work has unparalleled expertise.

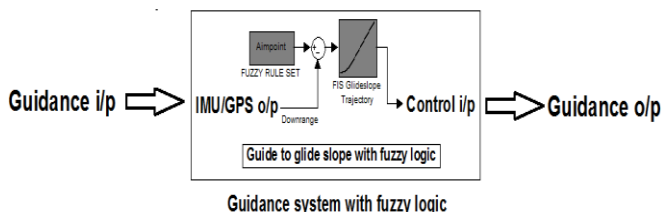


Fig7.2: Integration of Fuzzy logic guidance system

C. GUIDANCE SYSTEM WITH FUZZY LOGIC

The Fuzzy Logic Controller block implements a fuzzy inference system (FIS) in Simulink. The Fuzzy Logic Controller with Rule viewer block implements a fuzzy inference system (FIS) with the Rule Viewer in Simulink.

To build your own Simulink systems that use fuzzy logic, copy the Fuzzy Logic Controller block out of sltank (or any of the other Simulink demo systems available with the toolbox) and place it in your own block diagram. Here you can also find the Fuzzy Logic Controller blocks in the Fuzzy Logic Toolbox library. In this you can open the library by selecting Fuzzy Logic Toolbox in the Simulink Library Browser window, otherwise by typing Fuzblock at the MATLAB prompt.

The Fuzzy Logic Toolbox library contains the Fuzzy Logic Controller and Fuzzy Logic Controller with Rule Viewer blocks. Also it includes a Membership Functions sub library that contains Simulink blocks for the built-in membership functions.

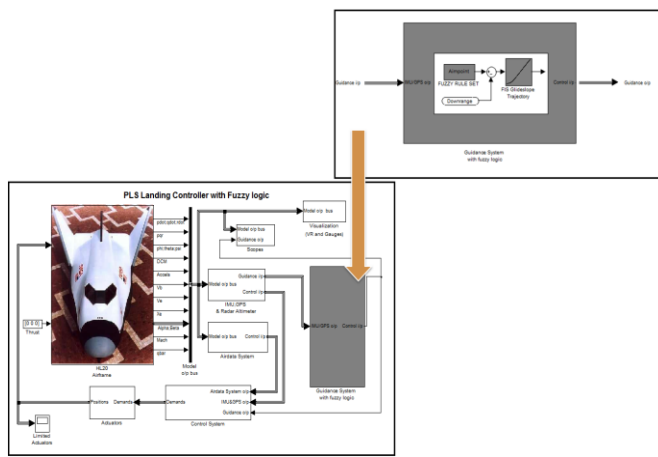


Fig7.3: PLS Landing Controller with Fuzzy Logic

VIII. SIMULATION

In addition to computer modelling of vehicle controllability during entry, flight simulator was set up at Langley to permit pilots to study the final landing phase of aircraft. Starting at an altitude of 4,600 meters, the simulation presented the pilot with a realistic view of the approach to a runway landing.

Simulation A duplication, working replica, or representation of a system or complex equipment in controlled environments for purpose of evaluation, analysis of problems,

Demonstration or training - at no risk to man or machine.

Flight Simulator Creates realistic cockpit environment, pilot feel and external world cues to enable the pilot to interact realistically with the flying controls.

IX. RESULT

From simulation we find that fuzzy controllers have given us better results than conventional controllers.

➤ We achieved good result for roll, Angle of attack and Angle of sight against demand by using fuzzy logic concept. In the scope named "demand versus achieved" shows the result.

➤ From them Guidance Performance, we had taken the parameters of Height, Flight path angle, Velocity and Vertical speed as inputs shown in the "Guidance Performance" scope.

➤ We got the smooth values of Attitudes Accelerations and Mach number with the fuzzy logic controller.

Addition to computer modeling of vehicle controllability starting at an altitude of 10,000 m, the simulation presented the realistic view of the approach to a runway landing.

X. CONCLUSION

A fuzzy logic based controller has been designed and tested on the HL20 PLS for the landing phase in the simulation using Aerospace block set of MATLAB. The results are adequate and quite promising.

Present evaluation was made for HL 20 PLS and the evaluation of the same for different aircraft can be taken up in the future.

This fuzzy logic concept can be useful for the developing Personnel Launching System designs and it can be a mile stone for the space applications.

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Hazardous Effect of Coal Ash

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Abstract- This paper deals with the pollution originating from one of the by product of the coal called ash in Indian thermal power stations. Ash is obtained by the combustion of coal. This ash is again divided into two types based on its characteristics namely- fly ash, bottom ash. Mainly this ash can be used but not 100%. So rest of the ash which is not used is mixed with water. This mixture is called as slurry which is pumped to the ash pond. Some pollution is created during this process and after. Pollution caused by this assessed by taking samples. samples consists of the ash taken as soon as combustion takes place, other set of samples from ash pond. Samples extracted with Deionized water, a solution of potassium chloride and a solution of hydrochloric acid, the differences were compared in order to predict potential pollution.

Index Terms- pollution, ash, elements, emission

I. INTRODUCTION

The power generation units, and in particular one of it is coal fired power plants, has been effecting the atmosphere greatly. there are mass emissions of solid particles and gases with high temperatures into the atmosphere and also discharge of contaminated water, chemicals, ash and slag during the process[1]. During coal combustion physical and chemical transformations takes place, often changing its solubility and association patterns of different elements [2]. By decrease in the practical size, the concentrations of copper, molybdenum, lead and zinc increases. The elements feature differ its distribution patterns among the mineral obtained after coal combustion, it is completely different if compared to the original associations. According to Bern, the physical and chemical properties of fly ash vary depending on the type of coal burned, boiler type and particle size and degree of weathering [3]. Generally, Ash is usually stored in huge ash dumping, either in dry or wet state [4]. Storage of wet ash usually protects from spreading when ever wind comes, but decreases the time for extracting of various elements [5], due to this extraction it can be destructive to the life forms, and it can imperil water resources and fertility of the soil, also cause radioactive contaminations. In ash, most of the elements examined and had enrichment factor <1, while arsenic, sodium, titanium and iron had enrichment factors ranging from 1 to 10 [6, 7]. Toxic constituents of coal ash are blowing and spilling from storage units will always leads to the great damage to the environment and also effect people's health living close to these coal fired thermal power plants.

II. DETAILS OF INDIAN COAL

India has huge reserves of coal of order of 270 billion tonnes so, 59% of the power generation is from coal fired thermal power plants [8]. But at the same time , coal available in India does not contain high sulphur like coal in many other countries, and the resistivity in india is lower compared to other countries. Indian has coal reserves of large proportion of ash content of order 40 to 45% . Due to lower resistivity the ESPs in India, despite being much larger, have lower collection efficiencies compared to other country [9]. To analyze the elements which effect the environment, we have collected some ash samples.

Solubility of different elements often changes with coal combustion. So the portions of chemical constituents may become mobilized when ash is introduced into terrestrial, aquatic atmospheric environment [10]. The average characteristics of Indian coal are tabulated in Table I. The chemical composition of fly ash is tabulated in Table II. The chemical composition of bottom ash is tabulated in Table III. In general half of the fly ash is used in cement industries, Bricks manufacturing, Rest of the fly ash and bottom ash are mixed with water named as slurry which is sent to ash pond. The block diagram of ash disposal is shown in Figure 1.

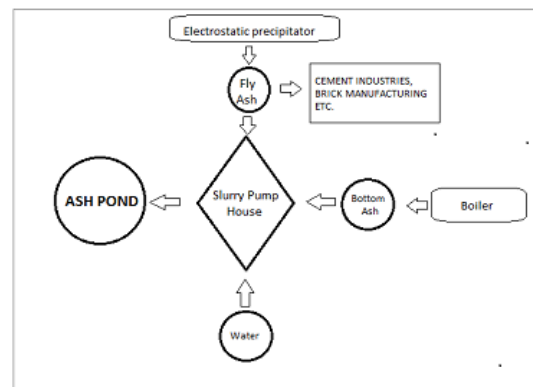


Figure 1
Block diagram of ash disposal

Table I

Average characteristics of Indian coal

SNO	CHARACTERISTICS	VALUES (%)
1	Moisture	9.6
2	Ash	40
3	Sulphur	0.363
4	Silicon dioxide	59.35
5	Aluminium oxide	22.04
6	Calcium oxide	8.05
7	Magnesium oxide	5.57

Table II
Chemical composition of Indian fly ash

SNO	FLY ASH COMPOUNDS	VALUES (%)
1	Silicon dioxide	60.83
2	Aluminium oxide	26.63
3	Iron oxide	4.19
4	Magnesium oxide	0.80
5	Calcium oxide	3.03
6	Potassium oxide	0.90

Table III
Chemical composition of bottom ash

SNO	BOTTOM ASH COMPOUNDS	VALUES (%)
1	Silicon dioxide	53.6
2	Aluminium oxide	25.3
3	Iron oxide	3.98
4	Calcium oxide	2.98
5	Magnesium oxide	4.2

III. EXPERIMENT OF EXTRACTION

To estimate the pollution caused by extraction of some chemical constituent elements after ash is being pumped to ash pond. Here we are going to take samples and were subjected to extract. The first kind consisting of ash taken as soon as combustion takes place .While other is taken at the ash pond. these samples were extracted by using deionized water, A 1.6mol/L solution of potassium chloride, and 0.0017mol/L solution of hydrochloric acid .the differences in extractability are compared in order to predict the pollution .the ratio of liquid with solid is 10:1 and kept it for 20 hours in the closed glass vessel .

After both extractions the residues were cleaned with deionized water, and the combined extracts and cleaning were analyzed by using shimadzu AAS. The following wave lengths were used: 284.2nm (Magnesium), 765.5nm (potassium), 423.7nm (Calcium), 214.19nm (Zinc), 356.9nm (Chromium), 194.7nm (Arsenic), 226.98nm (Cadmium), 217.0nm (lead).

Table IV
Concentration details after extraction (mg kg⁻¹)

Sample	Coal ash			Ash pond		
	H ₂ O	KCL	HCL	H ₂ O	KCL	HCL
Cr	3.7	2.8	36.7	0	3.2	37.65
Zn	0	2.30	15.42	0	1.75	16.34
As	4.56	13.5	5.40	6.75	11.32	10.91
Cd	0	0	0	0	0	0
Pb	0	0	0	0	0	0
Ca	2195	896 9	1093	1237	8838	1182
Mg	1.55	189 9	135.8	0.39	1916	138.4
K	103.4	----	487.6	62.43	-----	405.5

IV. RESULT ANALYSIS

The Concentrations of extraction are tabulated in Table IV. After analysis of samples we have found that Pb and Cd were not detected in any of the extraction and other elements revealed the following behaviour. Cr is one of the elements which are extensive pollutants, considering exchangeable fractions only [11, 12]. These results have shown that chromium is already released during and after pumping to ash pond.

Where Zinc has not present in water extraction, but showed its behaviour in the case of kcl extraction so dry ash contain more extractable zinc than the samples of ash pond. Half of the ion exchangeable Zn is released during the ash pumping to ash pond.

Where coming to Arsenic it can be extractable from all samples, but here we observed that there is unexpected increase of water extraction at ash pond, so after mixing with water and at the time of pumping mobility of As increased.

Alkaline earth and alkaline major elements show similarity in their behaviour Calcium, potassium and Manganese are significantly extracted during the ash pumping. Here in river water extraction of ash have only slight influence on ion-exchangeable fractions Ca. Where K was not analyzed because extraction was performed with KCL. At the time of pumping Ca seems to be the largest pollutant. Near ash pond Cr is the largest pollutant.

V. CONCLUSION

Zn, Cr and Ar are elements were extracted during and after pumping. Cr is the largest pollutant which is toxic and danger to the environment. If human exposes to chromium it leads to lung cancer or respiratory problems [15]. Exposure to lower levels of arsenic cause nausea, abnormal heart rhythm, decreased

production of red and white blood cells and also may increase the damage to developing fetus. Ca, K and Mg were extracted which will also cause great damage to the human kind & environment. Cd and Pb are not extracted from the samples, so from these conclusion we came to know that since some of these are inorganic compounds due to these pollutants there will be a great impact and danger to the environment and also on future generations.

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Application of Nanostructured Materials in Lasers and Display

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Abstract- It is well known that new nanoscale materials useful for laser, medicine, display, etc. Applications have been carefully studied last decade. In the current paper the search for the effective nanostructured materials has been revealed in two directions: to optimize the mechanical and laser features of the inorganic systems and to improve the surface properties of the organics polaroid films with nanoobjects. It has been testified that the surface mechanical properties of the inorganic materials via nanotubes treatment process can be drastically improved. For example, the surface mechanical hardness of the UV and IR range “soft” inorganic materials can be increased up to 2-10 times under the conditions of oriented nanotubes placement. It has been obtained that the surface mechanical hardness of the organic polaroid films can be increased saving the spectral features.

applied in order to orient the nanotubes during the deposition. It should be mentioned, that some structures have been additionally treated with surface electromagnetic waves in order to obtain homogeneous surface and to decrease the roughness. The spectral characteristics of the nanotubes-treated materials have been tested using Perkin-Elmer Lambda 9 instrument. Surface mechanical hardness has been revealed using the CM-55 instrument, when the test has been made applying the silicon glass K8 as etalon. This etalon permits to obtain abrasive hardness close to zero at 3000 cycle with forces on indenter close to 100 g.

Iodine-polyvinyl alcohol films coated with carbon nanotubes has been chosen as matrix systems to develop and study new thin film polarizers with high relation between transmission level of parallel and orthogonal part of the electromagnetic wave.

I. INTRODUCTION

At present time both the fullerenes and carbon nanotubes as well as the quantum dots can be considered as the good candidates to improve the structural, mechanical, spectral, photoconductive and photo refractive features of the different inorganic and organic materials operated in the UV, VIS and IR spectral ranges [1-3]. These nanoobjects have unique energy levels, high value of electron affinity energy, and strong hardness of their C—C bonds. These nanoobjects influence the bulk and surface properties of the optical materials. A special accent has been given to carbon nanotubes because the carbon nanotubes imaginary part of the dielectric constant is close to zero in the near and middle infrared spectral range that permits to save or improve the spectral properties of the matrix materials after nanoobjects treatment.

In the current paper some way to improve or optimize the mechanical, spectral and polarization properties of the inorganic and organic materials via nanoobjects treatment have been shown.

II. EXPERIMENTAL CONDITIONS

Different materials of the UV, VIS and IR spectral range, such as model system of MgF₂, have been chosen as inorganic matrixes. The single- and multiwall carbon nanotubes have been used as promising nanoobjects. These nanotubes have been placed on the material surface using IR CO₂-laser with *p*-polarized irradiation at wavelength of 10.6 μm and power of 30 W. Moreover, when nanotubes have been placed at the materials surface, the electric field close to 100-200 V×cm⁻¹ has been

III. RESULT AND DISCUSSION

It is the complicated complex task to modify the optical materials operated as output window in the UV lamp and laser resonators, as polarizer in the telecommunications, display and medicine systems. Many scientific and technological groups have made some steps to reveal the improved characteristics of optical materials to obtain good mechanical hardness, laser strength, and wide spectral range. Our own steps in this direction have been firstly shown in paper [4]. In order to reveal the efficient nanoobjects influence on the materials surface it is necessary to choose the model system.

It should be noticed that magnesium fluoride has been considered as good model system. For this structure the spectral characteristics, atomic force microscopy data, measurements to estimate the hardness and roughness have been found in good connection. The main aspect has been made on interaction between nanotubes (their C—C bonds) placed at the MgF₂ surface via covalent bonding [5]. Table 1 presents the results of surface mechanical hardness of MgF₂ structure after nanotubes placement; Table 2 shows the decrease of MgF₂ roughness.

Table 1

Structures	Abrasive surface hardness (number of cycles before visualization of the powder from surface)	Remarks
Pure organic glasses	200-400 cycles	CM-55 instrument has been used. The test has been made using silicon glass K8 as etalon. This etalon permits to obtain abrasive hardness close to zero at 3000 cycle with forces on indenter close to 100 g.
organic glasses+nantotubes	1500-3000 cycles	
MgF ₂	1000 cycles	
MgF ₂ +nanotubes	3000 cycles	
MgF ₂ +vertically oriented nanotubes	more than zero hardness	

One can see from Table 1 that the nanostructured samples reveal the better surface hardness. For example, after nanotubes placement at the MgF₂ surface, the surface hardness has been better up to 3 times in comparison with sample without nanoobjects. It should be noticed that for the organic glasses this parameter can be increased up to one order of magnitude. Moreover, the roughness of the MgF₂ covered with nanotubes and treated with surface electromagnetic waves has been improved essentially. Really, R_a and S_q roughness characteristics have been decreased up to three times. One can see from Table 2 that the deposition of the oriented nanotubes on the materials surface and surface electromagnetic waves treatment decreases the roughness dramatically. Indeed this process is connected with the nature of the pure materials; it depends on the crystalline axis and the defects in the volume of the materials.

In order to explain observed increase of mechanical hardness we compared the forces and energy to bend and to remove the nanotubes, which can be connected with magnesium fluoride via covalent bond MgC. Thus, the full energy responsible for destruction of the surface with nanotubes should be equal to the sum of W_{rem} (energy to remove the layer of nanotubes) and of W_{destr}

It should be noticed that magnesium fluoride has been considered as good model system. For this structure the spectral characteristics, atomic force microscopy data, measurements to estimate the hardness and roughness have been found in good connection. The main aspect has been made on interaction between nanotubes (their C—C bonds) placed at the MgF₂ surface via covalent bonding [5]. Table 1 presents the results of surface mechanical hardness of MgF₂ structure after nanotubes placement; Table 2 shows the decrease of MgF₂ roughness.

Table 2

Parameters	Materials	Roughness before nano treatment	Roughness after nano treatment	Remarks
R _a	MgF ₂	6.2	2.7	The area of 5000×5000 nm has been studied via AFM method
S _q	MgF ₂	8.4	3.6	

(energy to destroy the magnesium fluoride surface). Due to the experimental fact that nanotubes covering increases drastically the surface hardness of MgF₂ [5], the values of W_{rem} and W_{destr} can be close to each other. Under the conditions of the applied forces parallel to the surface, in order to remove the nanotubes from MgF₂ surface, firstly, one should bend these nanotubes, and secondly, remove these nanotubes. In this case W_{rem} are consisted of W_{elast} (elasticity energy of nanotube) plus W_{MgC} (energy to destroy the covalent MgC binding). The energy of elasticity can be estimated as follow:

$$W_{elast} = F_{rem}^2 \times L^3 / 6E \times I \quad (1)$$

where E=1.5 TP [3,6] is the modulus of elasticity, I = π · r³ · Δr – is the inertia moment of the nanotube cross section at its wall thickness Δr=0.34 nm, r=4 nm; and L=50 nm is the nanotube length. The force F_{rem} can be estimated as follows:

$$F_{rem} = F_{MgC} \times 2r / L, \quad (2)$$

where F_{MgC} is close to 2 nN.

Based on our calculation we should say that in order to broke the relief with nanotubes, we should firstly bend the nanotubes with energy that is 5 times more than the one, which can be applied to simply remove the nanotubes from surface after the destroying MgC binding. This fact is in good connection with the experimental results.

This calculation can be used to explain the results of dramatically increased mechanical surface hardness of the MgF₂ covered with nanotubes. The experimental data testified that the surface mechanical hardness of MgF₂ materials covered with nanotubes can be compared with the hardness of etalon based on silicon glass K8.

As a result of this process, the refractive index can be modified which explains the increase in transparency in the UV. Moreover, the spectral range saving or increasing in the IR range can be explained based on the fact that the imaginary part of

dielectric constant of carbon nanotubes, which is responsible for the absorption of the nanoobjects, is minimum (close to zero) in the IR range. The UV-VIS and near IR-spectra of the magnesium fluoride is shown in Fig. 1.

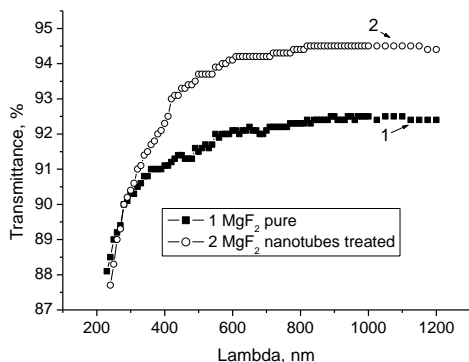


Fig.1. UV-VIS-near IR spectra of MgF₂ before (curve 1) and after single wall nanotubes deposition (curve 2). The thickness of the sample close to 2 mm.

It should be noticed that the drastic increase in the transparency at wavelength of 126 nm has been observed. Really, for the 5 units of MgF₂ sample, the transparency *T* has been changed after nanotubes deposition as follows: sample №1. *T*=61.8% → *T*=66.6%l №2. *T*=63.6% → *T*=69%; №3. *T*=54.5% → *T*=65.8%; №4. *T*=58.1% → *T*=67.5%; №5. *T*=50.9% → *T*=65%.

Regarding polarizers based on iodine-polyvinyl alcohol thin films, one can say that we have obtain increase of transmission for parallel light component and good relation between transmittance of parallel and orthogonal light component. The results are shown in Fig.2.

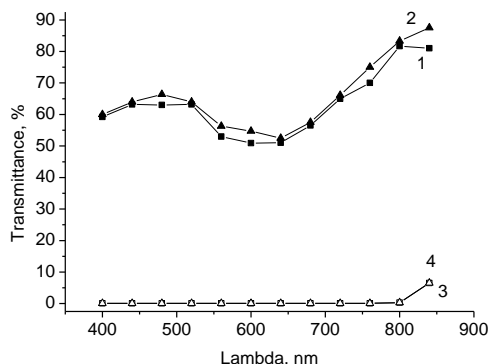


Fig.2. Dependence of transmittance on wave length for parallel (curve 1 and 2) and orthogonal (curve 3 and 4) components of electromagnetic wave. Curves 1 and 3 correspond to non-treated polarizer films; curves 2 and 4 connected with polarizer films covered by carbon nanotubes.

Analyzing results, it should be notices that the transmittance of the parallel component of the electromagnetic wave can be increased up to 2-5% in the VIS spectral range. It can be explained via small value of refractive index of nanotubes that is close to 1.1. This process decreases the Fresnel loses from one and second polarizer film surfaces. Really, the refractive index of

the polyvinyl matrix structure is located in the range of 1.49-1.53. Let us to choose the middle value close to 1.5. The Fresnel loses from one pure surface can be calculated as follow:

$$(n-1)^2/(n+1)^2=(1.5-1)^2/(1.5+1)^2=0.04, \text{ thus } 4\% \text{ from one surface and approximately } \sim 8\% \text{ from two pure surfaces.}$$

After nanotubes placement on the films surfaces the Fresnel loses can be:

$$(n-1)^2/(n+1)^2=(1.1-1)^2/(1.1+1)^2=0.00226, \text{ thus } 0.2\% \text{ from one surface and approximately } \sim 0.4\% \text{ from two nanotubes-treated surfaces.}$$

Thus, it permits to develop the effective nanotubes coating with eliminated interface between matrix structure and coating with effective value of refractive index.

It should be mentioned that saving or improving the spectral range, the mechanical hardness of the polaroid films increases that provokes to use nanotreatment process instead famous lamination one. That can be useful in spatial light modulator technique and to optimize the display elements [7] operated in the crossed polarizers.

IV. CONCLUSION

In conclusion, the influence of the nanoobjects based on carbon nanotubes on mechanical, spectral and polarization features of some model optical materials have been shown The dramatic increase of surface mechanical hardness has been observed via nanotubes placement under condition of spectral range saving or improvement. As the result of this investigation, new area of applications of the nanoobjects-treated materials can be found in the optoelectronics and laser optics, for example, for development of transparent UV and IR window, for gas storage and solar energy accumulation, as well as in telecommunications systems and in display and medicine.

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Effectiveness of Gravity Separation Methods for the Beneficiation of Baban Tsauni (Nigeria) Lead-Gold Ore

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Abstract- The response of Baban Tsauni (Nigeria) lead-gold ore to gravity separation methods was investigated in this research work. Value addition to run-off mines is always necessary in order to reduce downstream metal extraction costs. Gravity separation methods (the focus of this work) are the cheapest beneficiation methods. This study applied three gravity separation methods: jigging, multi-gravity and shaking table and measured the grades/ recoveries of the valuable minerals. Beneficiation of this ore by jigging method yielded the highest lead recovery of 86.9% at a grade of 56% for a geometric mean particle size of 421.31microns. Shaking table separation produced high grades but very low recoveries while the multi-gravity method gave the best combination of grade and recovery. Beneficiation by jigging method gave good lead recovery (above 75%) when particle size was bellow 1000 μ m but above 250 μ m while in multi-gravity separation particle size was bellow 500 μ m but above 125 μ m.

Index Terms- jigging, multi-gravity, grade, recovery, mineral.

I. INTRODUCTION

Production of metals from their ores usually requires some form of energy (heat, electrical or chemical) and the energy consumption depends on the mass of feed (valuable mineral plus gangue). This implies that feeds of higher grades cost less to extract [10]. Thus grades of ores required for metallic extraction by the known metallurgical routes are much higher than their cut-off grades [7]. Lead extraction by pyrometallurgical process requires feed grades of 40% to 70% while copper extraction requires 20% to 30% [3]; [1]. Moreover the cost of transportation decreases with increase in ore grade [10]. Thus the mineral grade must be increased above that of the run-off-mine to the value required by extraction plants. It was indicated that the lead and gold grades of Baban Tsauni run-off-mine are 27.79% and 0.02938% respectively [4].

Beneficiation is the process by which the concentration of the valuable constituent in an ore is increased while impurities are reduced to practically acceptable levels. As applied to metallic minerals, it involves upgrading of the valuable metal while reducing the gangue and other minerals (which are deleterious to subsequent extraction process) to acceptable levels in the ore. Minerals which can be separated by gravimetric methods must have measurable difference in density. A concentration criterion was stated [6] as,

$$\text{Concentration criterion (CC)} = \frac{H_{MRD} - F_{RD}}{L_{MRD} - F_{RD}} \quad 1$$

where H_{MRD} = relative density of heavy mineral, F_{RD} = relative density of fluid and L_{MRD} = relative density of light mineral. It was submitted that the concentration criterion should generally be greater than 2.5 for effective gravity separation [10]. Fully liberated galena has a relative density of 7.5 [6], while that of quartz is 2.61 [10], which give a CC of 4.34 in water medium. It is not always necessary to attain full liberation before separation. Moreover gravimetric separation is sensitive to particle size; hence CC is a function of particle size of the mineral [6]. The results of a gravity separation of Itakpe (Nigeria) iron ore by jigging indicated that the iron recovery increased with decrease in particle size [8]. This present study investigated the response of Baban Tsauni (Nigeria) lead-gold ore to jigging separation, multi-gravity and shaking table separation.

The responses often considered in beneficiation of metallic minerals are recovery and grade of the valuable minerals [8]; [9]; [6]; [10]; [2]; [4]. Recovery is the measure of the percentage of metal in the raw ore that is recovered to the concentrate through beneficiation while grade is the assay or concentration of a metal in a sample [5]. It was indicated [10] that recovery is calculated by applying Equation 2;

$$R = 100 \frac{Cc}{Ff} \quad 2$$

where R= recovery of valuable metal, C = the mass of the concentrate, c= the concentration of metal in concentrate, F = the mass of feed sample and f = concentration of metal in feed sample.

II. EXPERIMENTAL METHODS

2.1 Sample Preparation

About 80kg of ore samples were collected from four mining pits at Baban Tsauni, Gwagwalada, Nigeria. All the samples collected were mixed together before crushing. An initial sample preparation aimed at ensuring a homogeneous feed for subsequent test runs was carried out. The crushed samples from the jaw crusher /roll crusher (in that order) were subjected to the same grinding conditions of mill speed, ore mass to ball mass

ratio, ball size and grinding time of 15minutes. The products of this batch milling operations were subjected to particle sizing to generate sets of close sized particles based on ratio $1/\sqrt{2}$ between the consecutive sieve sizes. Each set of close sized particles from all the batch sieving operations were mixed thoroughly and passed through a Jones riffing sampler, until sets of 500g samples were obtained for subsequent tests.

2.2 Gravity separation by jigging

Batch jigging of the samples was carried out on a laboratory jig (Denver jig) that was powered by 0.5hp motor. A screen that is slightly bigger than the size of materials to be jigged was laid in the jig. Steel balls of size 5mm diameter were arranged as raggings on the floor of the screen in three layers. 500g of each close sized sample were weighed and transferred to the jig. Water was supplied to the jig and the motor was switched on while addition of hutch water continued intermittently. Jigging was stopped after 5minutes and the hutch was opened to discharge the concentrate. Collection of the overflow was continuous through out the jigging cycle. The concentrates and tailings for each batch operation were dried at 110°C, to constant weight, in well labelled trays. The mass of the concentrates and tailings were measured and recorded. Samples of concentrates and tailings were taken for energy dispersive x-ray fluorescence (EDXRF) analyses to determine the concentrations of all the elements in them.

2.3 Multi- gravity separation

The multi- gravity separation is a batch process in which an inclined bucket was subjected to linear oscillation and circular rotation. The inclination of the bucket was kept at 20° to the horizontal. 500g of close sized particles was kept in the bucket and 1.5litres of water was added. Additional water was supplied at the rate of 500ml/minute. The tailing discharged continuously onto a bow while the concentrate was removed at the end of the process. The concentrates and tailings for each batch operation were dried at 110°C, to constant weight, in well labelled trays. The mass of the concentrates and tailings were measured and recorded. Samples of concentrates and tailings were taken for EDXRF analysis to determine the concentrations of all the elements in them.

2.4 Shaking table separation

The inclination of the table was set at 45°. Five hundred grams of each close sized sample was fed gradually to the feed trough of the shaking table at a rate of about 50g/minute. The feed water was supplied at a rate of about 250ml/minute. Collection of concentrates and tailings was continuous throughout the process. The concentrates and tailings for each size fraction were dried to constant weight in well labelled trays. The mass of the concentrates and tailings were measured and recorded. Samples of concentrates and tailings were taken for EDXRF analyses to determine the concentrations of all the elements in them.

III. RESULTS AND DISCUSSION

Table 1 shows the results of chemical analysis on samples of concentrates for typical close sized particles subjected to jigging while Table 2 shows the results for the concentrates of a typical multi-gravity separation. The results on concentrates and tailings of a typical shaking table separation are shown in tables 3 and 4 respectively. All the results revealed that the major valuable mineral in the concentrates is lead mineral with a lead grade of 61% for jigged samples at particle size of -1400µm +1000µm, 59% for multi-gravity (particle size of -355µm +250µm) and 57% for shaking table at particle size of -710µm +500µm. The detailed results showed that the major valuable mineral that reported to the tailings is gold. The results in Table 4 indicate a gold grade of 0.11%. The foregoing indicate that beneficiation by shaking table resulted in gold enrichment of 3.744 at a particle size of -710µm +500µm [Table 4] while lead enrichment in the concentrates was 2.051 [Table 3]. Thus a higher gold enrichment was achieved than lead even though a lead grade of 57% is generally acceptable for smelting.

Table 1: XRF analysis results of jigged sample (-1400 + 1000µm) - concentrate assay.

Element	Energy (keV)	Concentration %	Error %
Pb	10.540	61	± 0.835
Sr	14.142	0.139	0.04955

Table 2: Assay of multi-gravity (-355+250mic concentrate) test.

Oxides	Concentration (%)	Elements	Concentration (%)
PbO	63.66	Pb	59.051
CuO	0.478	Cu	0.382
ZnO	0.069	Zn	0.055
Al ₂ O ₃	1.7	Al	0.899
SiO ₂	15.5	Si	8.680
CaO	0.33	Ca	0.236
Cr ₂ O ₃	0.11	Cr	0.075
MnO	0.02	Mn	0.015
Fe ₂ O ₃	1.86	Fe	1.300

NiO	0.063	Ni	0.050
CdO	2.9	Cd	2.537
BaO	1.53	Ba	1.371
WO ₃	0.2	W	0.159
Re ₂ O ₇	0.1	Re	0.077
OsO ₄	0.1	Os	0.075

Table 3: Assay of shaking table (-710 +500mic -concentrate) test.

Oxides	Concentration (%)	Elements	Concentration (%)
PbO	61.5	Pb	57.047
CuO	0.159	Cu	0.127
Al ₂ O ₃	1.4	Al	0.741
SiO ₂	27.4	Si	15.344
SO ₃	2.9	S	1.160
CaO	0.22	Ca	0.157
Cr ₂ O ₃	0.044	Cr	0.030
MnO	0.006	Mn	0.005
Fe ₂ O ₃	0.787	Fe	0.550
NiO	0.028	Ni	0.022
CdO	4	Cd	3.500
BaO	0.578	Ba	0.518
WO ₃	0.54	W	0.428
OsO ₄	0.15	Os	0.112
HgO	0.27	Hg	0.250

The EDXRF analysis of tailings (Table 4) showed that gold reported to the tailings and this occurred in all cases. This occurred because the gold is finely disseminated in the quartz. Liberated gold (free gold) is heavier than galena and would not

have been preferentially floated in jigging operation involving lead and gold. However when bound in quartz matrix the relative density of the composite became lower than that of galena and it reported to the tailings.

Table 4: Assay of shaking table (-710 +500mic -Tailing) test.

Oxides	Concentration (%)	Elements	Concentration (%)
PbO	9.74	Pb	9.035
CuO	0.052	Cu	0.042
Au	0.11	Au	0.110
Al ₂ O ₃	5.89	Al	3.116
SiO ₂	80.3	Si	44.968
K ₂ O	0.497	K	0.412
CaO	0.539	Ca	0.385
TiO ₂	0.059	Ti	0.035
Cr ₂ O ₃	0.043	Cr	0.029
MnO	0.02	Mn	0.015
Fe ₂ O ₃	0.535	Fe	0.374
NiO	0.013	Ni	0.010
BaO	0.49	Ba	0.439

WO3	0.087	W	0.069
OsO4	0.088	Os	0.066
IrO2	0.04	Ir	0.034
HgO	0.19	Hg	0.176
P2O5	0.8	P	0.349
Ga2O3	0.01	Ga	0.007
ZrO2	0.5	Zr	0.370

Applying Equation 2 for the jigging products of size -1400µm to +1000µm (Table 5), the lead recovery became,

$$R = 100 \frac{Cc}{Ff} = 100 \frac{109.41 \times 61}{484.49 \times 20.9} = 65.91\%$$

The lead recoveries for the remaining sieve fractions were calculated in the same way. The summaries of lead recoveries for jigging, multi-gravity and shaking table are presented in Tables 5, 6 and 7 respectively.

Table 5: Summary of lead assays and recoveries for samples subjected to gravity separation by jigging.

Sieve size	Lead assay in feed (f)	Concentrates		Tailings		Lead recovery (%)
		Mass (g)	Lead (%)	Mass (g)	Lead assay (%)	
-1400 +1000µm	20.9	109	61	355.08	8.93	65.91
-1000 +710µm	19.2	142	54	335.4	5.8	83.63
-710 +500µm	27.3	183	59	296.43.4	9.3	81.88
-500 +355µm	25.2	185	56	289.8	7.4	86.9
-355 +250µm	25.5	165	56	311.52	9.52	75.76
-500 +355µm	7.4	22.21	48.88	267.59	3.96	50.62

The results showed that one step jigging of Baban Tsauri ore yielded lead recovery which was highest at a particle size of less than 500µm to +355µm while the assay was highest at the coarsest particle size of -1400 to +1000µm. Thus the grade of lead ore dropped as the recovery increased due to the fact that more gangues were also recovered to the concentrates. Plate I shows typical samples of concentrate, midlings and tailings from jigging operation. The last row of Table 5 shows the results of a

second stage jigging of tailing samples for -500 to +355µm. The total lead recovery from the two stages of jigging operations was found to be 95.66% and a weighted mean lead grade of 55.237%. The lead recoveries from shaking table experiments were obtained by substitution into Equation 2 in the same way as it was done for jigging. The summary of these recoveries are presented in Table 6.

Table 6: Summary of lead assays and recoveries for samples subjected to gravity separation by shaking table.

Sieve size	Lead assay in feed (f)	Concentrates		Tailings		Lead recovery (%)
		Mass (g)	Lead assay (%)	Mass (g)	Lead assay (%)	
-710 +500µm	22.45	80.4	57.1	398	9.035	42.71
-500 +355µm	29.13	61.91	66.8	435	23.02	29.797
-355 +250µm	32.19	79.45	69.5	395	23.6	36.15
-250 +125µm	37.615	87.58	70.4	387	29.75	34.56
-125 +90µm	37.1	98.54	61.2	335	28.52	37.51

The lead recoveries obtained for the shaking table method were generally low while the lead ore grades were higher than those obtained by jigging and multi-gravity methods. This implied that shaking table requires more stages of operation in order to achieve a reasonable level of recovery. Higher premium is placed on recovery than ore grade when pre-concentration operation is in view. The objective is to remove bulk gangue at fairly coarse particle size, at reduced cost and generate products which may further be treated by froth flotation method. Thus a

pre-concentration treatment of Baban Tsauni lead ore by jigging method is preferred to shaking table method. However when production of finished concentrates is in view the grades of products become very important and a compromise must be struck between ore recovery and grade [10]. Under such consideration the shaking table offers the best beneficiation approach even though several stages of tailing cleaning are required.

Table 7: Summary of lead assays and recoveries for samples subjected to multi-gravity separation (shaking and rotating bucket).

Sieve size	Lead assay in feed [%]	Concentrates		Tailings		Lead recovery (%)
		Mass (g)	Lead assay (%)	Mass (g)	Lead assay (%)	
-500 +355 μ m	25.22	159.89	61.5	324	7.8	80.67
-355 +250 μ m	25.5	185.02	59.1	291	3.91	90.09
-250 +125 μ m	24.9	145.24	62.9	327	7.86	77.71
-125 +90 μ m	24	124.36	52	352	13.95	56.59

The best lead grade and recovery combination of 59.1% and 90.09% respectively, was obtained at a particle size of less than 355 μ m to +250 μ m (that is, geometric mean size of 297.91microns).

The effectiveness of lead separation is higher with multi-gravity separation than jigging method (Figures 1 and 2). On the other hand, shaking table gave the worst recovery (Figure 1) but the best grade (Figure 2). The results showed that combination of lead recoveries and grades were highest with multi-gravity method (Figures 1 and 2). The results also revealed that beneficiation by

jigging method gave good lead recovery (above 75%) when particle size was bellow 1000 μ m but above 250 μ m while in multi-gravity separation particle size was bellow 500 μ m but above 125 μ m. Plate II shows typical samples of concentrate and tailings from multi-gravity operation.

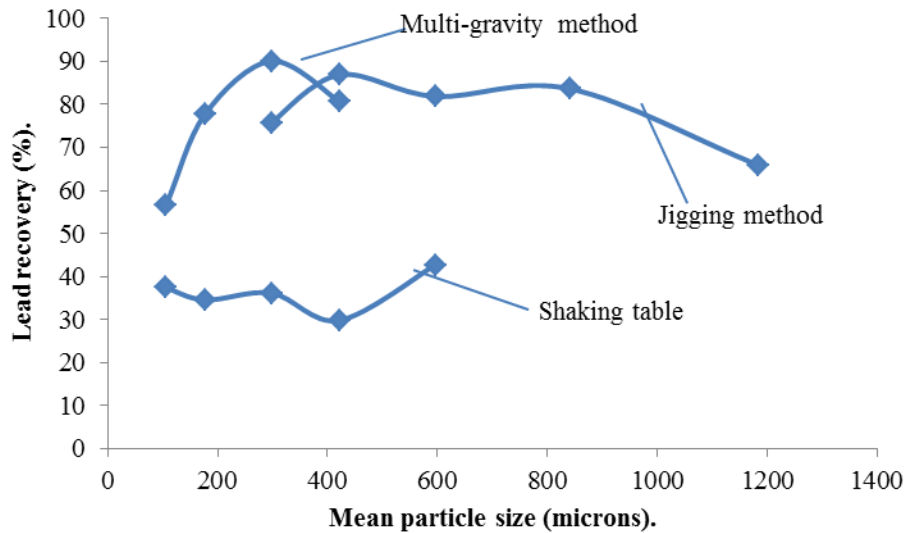


Figure 1: Lead recovery plotted against mean particle size

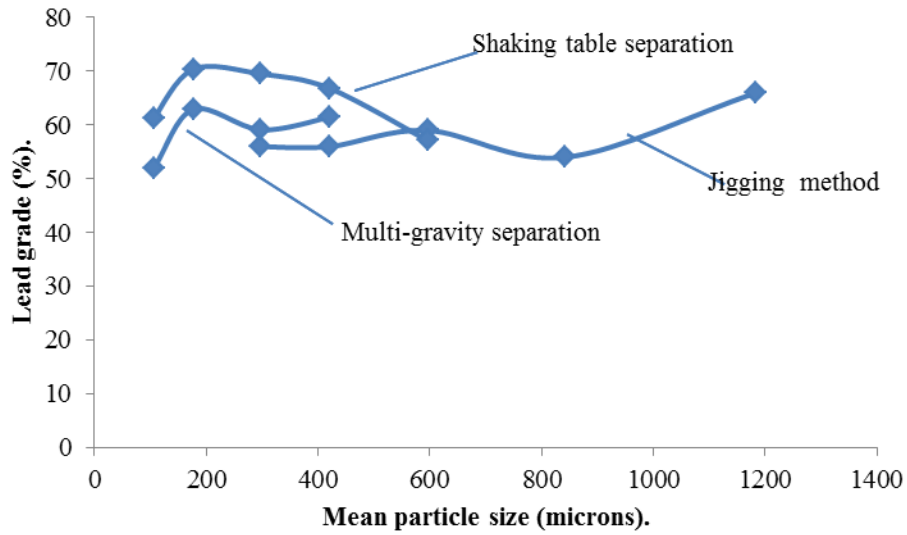


Figure 2: Lead grade plotted against mean particle size

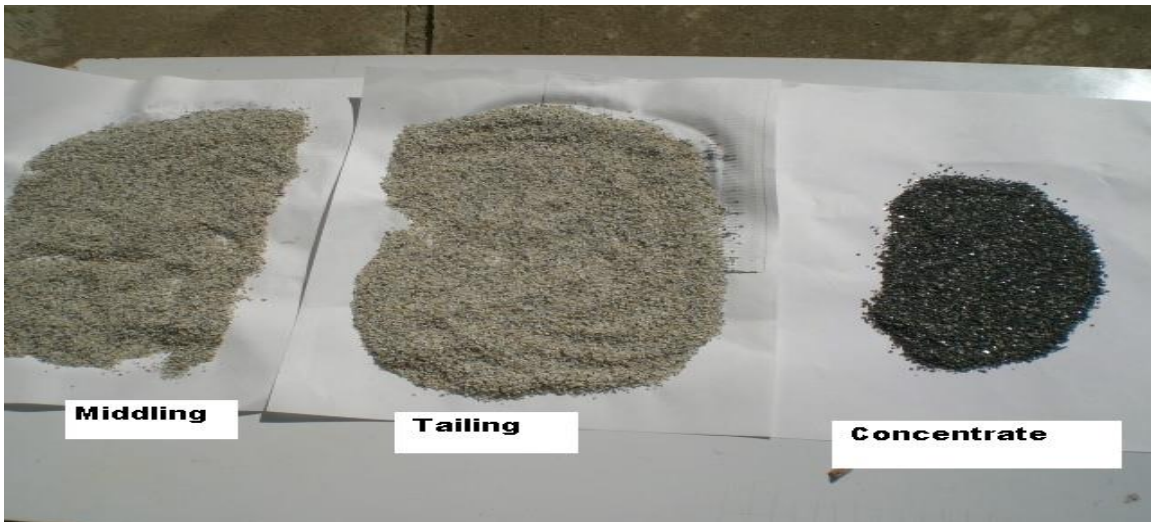


Plate I: Typical beneficiation products from jigging.



Plate II: Typical products of multi-gravity separation.

IV. CONCLUSION

The results from this study indicated that Baban Tsauni (Nigeria) lead-gold ore responded well to beneficiation by jigging, multi-gravity and shaking table separations. The best combination of grade and recovery was obtained with multi-gravity and followed by jigging separation. Higher lead grades could be achieved by subjecting the products of gravity separation to froth flotation. The gravity separation methods increased the value of gold in the tailings. Further work is required to extract free gold from the tailings.

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e-Learning: Learning for Smart Generation Z

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Abstract- Today's students have been raised in a world of instant access to knowledge and information, a world of automation, remote controls, and simulation capabilities to stimulate the mind. Although schools are embedded in this technological culture, the education system is largely unchanged. In other words, students are far more technologically savvy than the institutions that support them. Unless educational institutions catch up, students are likely to feel rigid, uninteresting, and possibly alienated.

A knowledge society aims to achieve societal transformation and ethical wealth generation. As a third dimension emerges as a country transforms itself into a knowledge superpower, knowledge protection becomes a critical factor. India is well placed at the dawn of knowledge era. For India to become a knowledge society, it has to be a learning society first. For life long learning, it is not only the settings of formal education that are important, but also the settings of home, the work place, the community and the society at large are important. The research has shown that cutting-edge technologies have enabled universities to implement distance education to reach more diverse populations and increase the availability of Web-based learning environments. The Web holds several advantages over traditional learning. The Web allows interactive delivery with multimedia content that helps overcome the limitations of static resources. Distance education definitely makes education convenient.

I. INTRODUCTION

E-Learning stands for electronic learning which means learning through electronic media. It refers to a form of learning in which the tutor and students are not close to each other, but are at a distance apart and this gap is bridged by the use of technology.

Successful e-learning programs provide structure in the form of timelines and goals for potential learners. Flexibility that makes self-study so convenient for learners can be a double edge sword because it allows learners the freedom to take classes in their own time as well as the opportunity to abandon it as other things begin taking up their time and attention. This is why it is really important for online universities to employ monitoring devices and assessments to ensure all learners complete the courses on time. There needs to be a variety of learning approaches to enhance the design for e-learning. These approaches are most successful when structures and roles are well defined. These designs include structured course content, weekly activities, and technical/instructor support for learners .

Like other regions, e-learning is also catching fast in India. Young generation of India is very eager to set their career and

make money sideways. For them e-learning is a boon. It is an excellent way to pursue or upgrade studies along with work as physical attendance in classes is not mandatory.

Indian e-learning market is still at a nascent stage. But thanks to an increasing emphasis on honing individual skills, e-learning is slowly becoming popular in India.

II. OBJECTIVE

For a pervasive life long learning movement in India, we will have to strengthen the learning foundations, provide a broad range of learning opportunities and recognize and reward learning regardless of why, where and how it takes place. Policy initiatives should focus on strengthening the knowledge society. e-learning permits the delivery of knowledge and information to learners at an accelerated pace, opening up new vistas of knowledge transfer. Early adopters are companies that have tried to supplement face-to-face meetings, demonstrations, training classes and lectures with this technology.

Countries without university education can access universities in other countries via the Web, a solution much cheaper than building university infrastructure. In underdeveloped countries, e-learning can raise the level of education, literacy and economic development. This is especially true for countries where technical education is expensive, opportunities are limited, and economic disparities exist.

Significant quality gains and teaching and learning improvements are expected with the use of e-learning. Despite the obvious advantages, the degree of adoption of e-learning within a university and among universities varies to a great extent. Teachers are found to be important decision makers in the adoption of e-learning but we also need to consider the institutional strategies supporting the adoption and its acceptance by students. Through the conduct of interviews with students and surveys with teachers, this brief paper examines the effects of teachers' perceptions on e-learning. The current study also applies the theory of diffusion of innovations to investigate the extent and reasons as to why e-learning is adopted or not adopted.

III. REQUIREMENT OF E-LEARNING IN INDIA FOR SMART GENERATION

“The adoption of e-learning in all spheres—corporate, schools, universities, etc—is low at present. The Indian market is not substantial when compared to the international market which is worth about \$6 billion to \$7 billion,” says Harish Joshy, Vice-president of Lion Bridge Technologies, an e-learning player.

e-learning in India has been most successful in the corporate segment where it is seen as a means of achieving business goals and motivating employees.

However, one of the problems with e-learning in India is the lack of course content, especially outside the mainstream focus areas of IT education, English-language content, and tutorial-like courses. There will be high demand for people who can develop multi-lingual courseware that addresses various topics. Gartner says that one of the top 10 positions among Global 1000 companies of the future will be that of an online learning designer.

In a market such as India where the concept is still new, one crucial element that will make a difference in generating a good response is marketing. This not only holds true for segments such as government and education, but for the corporate sector as well. Experts are of the view that there needs to be a mindset for the adoption of e-learning.

IV. IMPACT OF E-LEARNING METHODS ON STUDENTS

Web teaching environments can also be differentiated by their interactive nature with synchronous (instructor facilitated) models providing a real time teaching experience, while less resource hungry asynchronous (self paced) approaches are more appropriate for “any time” learners.

At the macro level, these environments can be classified as web-assisted where web technology is used to support the traditional teaching environment, or web-based where the internet hosts the virtual classroom.

The diagram in Figure 1 is based on research performed into how people remember (Dale, 1969) and expanded by Van Dam (2003) to reflect its implications on online learning and instructional design. The diagram demonstrates how media rich, interactive learning environments can enhance the learning experience.

Dale’s work is fundamental to most modern constructivist teaching paradigms postulates that people are more likely to retain knowledge when it is delivered in a multi-sensory manner and, in particular, when it is applied to a real world context.

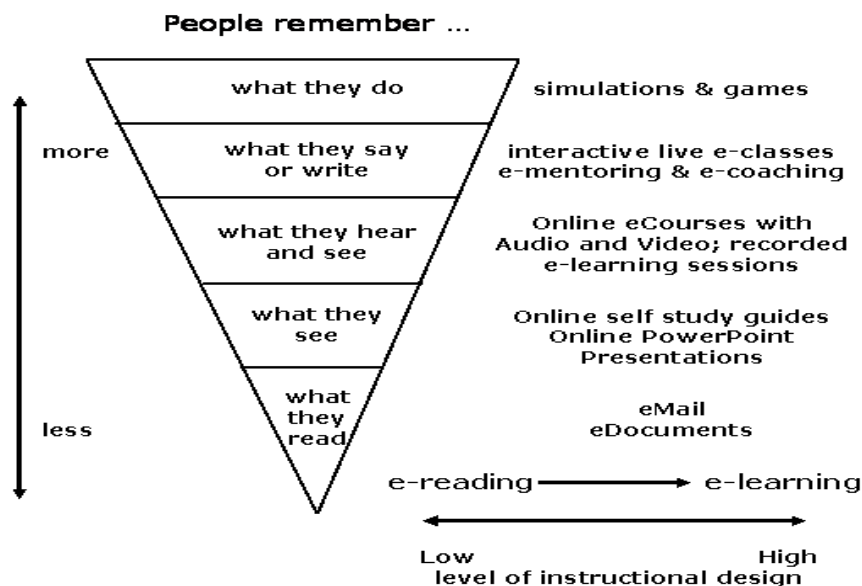


Figure 1: Mapping e-Learning methods to Levels of Learning (Van Dam, 2004)

Van Dam uses Dale’s hierarchy to illustrate how various e-learning applications can be used to support different levels of learning. He also cautions that as the level of instructional design increases from basic e-reading to a richer e-learning environment, there can be significant cost, time and resourcing implications.

V. E-LEARNING DELIVERY METHODS FOR GENERATION-Z

Another approach to categorizing e-learning technology in a residential teaching environment is to map how academics can

use the different delivery methods over the different facets of the educational experience. Current teaching practice tends to focus on four critical dimensions of teaching:

- Access to the body of knowledge (teaching)
- Process of knowledge assimilation (understanding)
- Evaluation and Feedback (assessment)
- Support

Given the need for group interaction to facilitate learning and support and the potential danger of isolation inherent in e-

learning environments, a fifth dimension, collaboration, is added to the list. These dimensions can be mapped against the three learning infrastructures available in a blended e-learning environment (Face to Face, Asynchronous and Synchronous) to

identify some of the main delivery mechanisms that can be used to address each dimension of the teaching experience.

Table 1: Mapping Learning Delivery Methods to Teaching Dimensions

Teaching Dimensions	Learning Delivery Methods		
	Traditional Face to Face	Asynchronous Self-paced elearning	Synchronous Online elearning
Teaching Acquire Knowledge	Lectures	Guides, Readings, Presentations	Online interactive classes
Understanding	Tutorials, Workshops	Computer based training modules	Online exercises
Evaluation and Feedback	Paper based Tests Marked Feedback	Online assessment and feedback	Live assessment and feedback
Collaborate	Group work, Classroom discussion	Email, Bulletin boards, List servers	Interactive chats, Instant messaging
Support and Reinforce	Hot Seat, Coaching and mentoring	Online help, Online KM systems	Online coaching and mentoring

In Table 1 the traditional approach includes the learning delivery methods long established in the higher education environment. Classroom lectures supported by tutorials or workshops are the main teaching mechanism. Tests and exams are paper-based and feedback provided by the return of marked scripts and review lectures. Collaborative work can take a number of forms, from structured group work in tutorials and workshops to classroom discussion and group projects. Finally each teaching approach should have a support structure. In the traditional delivery method this could take the form of a “hot seat” facility for students with particular problems, to special workshops and programmes where weaker students can get additional assistance.

Residential universities have an advantage over their virtual counterparts in that they are able to build on the strengths of face to face teaching approaches and incorporate e-learning tools and techniques where they are most suited. This mix of traditional and e-learning methods is often referred to as a blended approach to e-learning (Konrad 2003).

VI. TOOLS AND TECHNOLOGIES USED FOR SMART GENERATION-Z

A successful e-learning experience will use a combination of the technologies most appropriate for the practitioner, the learner group, the course content and course assessment. Central to e-learning success are communication technologies which are generally categorized as synchronous or asynchronous. Synchronous activities happen at the same time and involve the exchange of ideas and information with one or more participants.

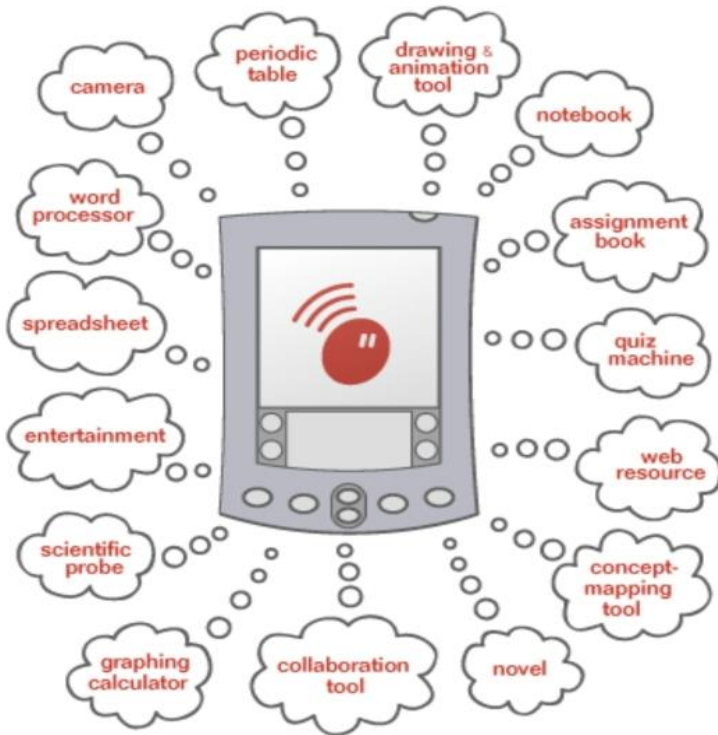
Synchronous activities occur with all participants joining in at once, as with an online chat session or a virtual

classroom. Virtual classrooms (also virtual conferences or web conferences) allow practitioners and students to interact in real time from their own computer using text chat, live voice, and interactive whiteboards.

Asynchronous activities are conducted with participants providing input at different times and use technologies such as blogs, wikis, discussion forums, and email.

A Learning Management System (LMS) is software for delivering content, tracking students and managing training. Practitioners set up a course web page to hold learning content and assessments, then track and manage their students with tools like grade books and activity reports.

M-Learning or mobile learning covers learning with portable technologies like mobile phones, or PDAs (personal digital assistant), where the focus is on the technology (which could be in a fixed location, such as a classroom); learning across contexts, where the focus is on the mobility of the learner, interacting with portable or fixed technology; and learning in a mobile society, with a focus on how society and its institutions can accommodate and support the learning of an increasingly mobile population that is not satisfied with existing learning methodologies.



Web 2.0 or social networking encompasses a number of tools that can be used to develop content and communication in an interrelated relationship. These tools are generally freely available to trainers and web users and include :-

- Virtual conferencing
- Learning Management Systems (LMSs)
- Blogs
- Wikis
- Web 2.0 or social networking tools
- Social bookmarking
- Virtual Worlds - Real Learning
- Mobile Learning

e-Learning Tools

E-learning Authoring tools :

MS Word, Power point, Macromedia DreamWeaver, Flash, Authorware, Director, XML Spy, and Visual Intradev

E-learning Programming languages :

Java, JSP, C++, visual basics, VB.net, ado.net, advanced java, Mobile VB

E-learning Database development :

Oracle, MS access, MS SQL, SQL server

E-learning Graphics production tools :

Photoshop, Sound forge, Premier, Flash, Illustrator, Corel Draw, and 3D studio Max, DirectorMX

VII. EMERGING WEB TECHNOLOGIES FOR SHAPING EDUCATION

Teachers are starting to explore the potential of blogs, media-sharing services and other social software - which, although not designed specifically for e-learning, can be used to empower students and create exciting new learning opportunities.

The traditional approach to e-learning has been to employ the use of a Virtual Learning Environment (VLE), software that is often cumbersome and expensive - and which tends to be structured around courses, timetables, and testing.

That is an approach that is too often driven by the needs of the institution rather than the individual learner. In contrast, e-learning-2.0 loosely joined' approach that combines the use of discrete but complementary tools and web services - such as blogs, wikis, and other social software - to support the creation of ad-hoc learning communities.

Blogging

Blogging is increasingly finding a home in education (both in school and university), as not only does the software remove the technical barriers to writing and publishing online - but the 'journal' format encourages students to keep a record of their thinking over time. Blogs also of course facilitate critical feedback, by letting readers add comments - which could be from teachers, peers or a wider audience.

Students use of blogs are far ranging. A single authored blog can be used to provide a personal space online, to pose questions, publish work in progress, and link to and comment on other web sources.

Teachers who are subject specialists are also using blogs to provide up-to-date information and commentary on their subject areas, as well as posting questions and assignments and linking to relevant news stories and websites.

Podcasting

Podcasting has become a popular technology in education, in part because it provides a way of pushing educational content to learners. However, **student-produced podcasts** are where it's at when it comes to educational podcasting. Swap 'user-generated content' for 'learner- generated content' and you soon get the picture. Apple, with its strong presence in the education market, has been quick to recognize the learning potential of student podcasting.

Immersive and Gaming Environments

With 3D virtual environments coming online at a steady pace, sophisticated virtual authoring software, and augmented reality beginning to take hold, learning in 3D is now more feasible than ever. Although it increases development time, the potential for improved learning transfer from virtual environments to the real world can no longer be ignored. And of course, there's the motivational factor too.

Cloud Computing

Cloud computing refers to delivering capabilities as an online service accessed from a web browser. The number of applications and services that rely on cloud computing seem to be growing exponentially, impacting both the development and delivery of online learning.

Open Source Software

Open Source software products for eLearning, for which the source code is freely available, are becoming widely accepted. An increasing number of organizations are taking advantage of Open Source products, like Moodle and Sakai, for Learning Management Systems and authoring tools, like Udutu, for course production. The advantages? Open Source apps are usually free to download, which makes online learning more affordable. Access to the source code makes the programs customizable.

Social Media

Social media technologies are exploding, providing an array of offerings for learning online. The prevalence of social networking, real-time search and discussion, and collaborative technologies increase the opportunities for informal and unstructured learning and can enhance structured learning strategies as well. Although organizations have been slow to adopt and promote social media technologies for learning, interest in these approaches is increasing. Individuals, rather than organizations, have been using social media technologies for self-directed and collaborative learning for quite some time.

VIII. CONCLUSION

The Web holds several advantages over traditional learning. The Web allows interactive delivery with multimedia content that helps overcome the limitations of static resources. Distance education definitely makes education convenient.

The Web will definitely play a major role as education and training grows and develops. The growth and access to the Internet has taken non-traditional education to a new level with the vast availability of Web-based courses in higher education. Educators have a responsibility to address their role in this trend of higher learning. It is evident that universities and other institutions of higher education are being challenged to examine their existing curriculum with respect to distance education and adjust their operations, philosophies, and structures accordingly.

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Dual Sensor Based Gesture Robot Control Using Minimal Hardware System

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Abstract-- This paper presents a Gesture Controlled robot which can be controlled by your hand gestures not by the usual method of keypad. Robots of the future should communicate with humans in a natural way. Hence we are especially interested in hand motion based gesture interfaces. A novel algorithm for gesture identification is developed for identifying the various gesture signs made through hand movement. This is implemented using mems sensor as well as using ultrasonic sensor for certain application. A program has been written and executed for the same purpose using microcontroller system. The observed experimentation proves that our gesture algorithm is more effective and it also improves the natural way of communication and built in a simple hardware circuit.

Index Terms- MEMS sensor, hand gesture recognition communication, microcontroller.

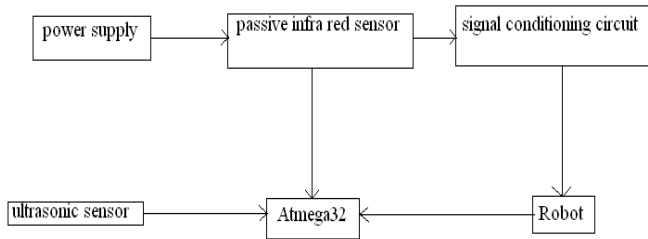
I. INTRODUCTION

Hand gestures control robots are extensively employed in human non-verbal communication. They allow to express orders (e.g. “stop”), mood state (e.g. “victory” gesture), or to transmit some basic cardinal information (e.g. “two”). In addition, in some special situations they can be the only way of communicating, as in the cases of deaf people (sign language) and police’s traffic coordination in the absence of traffic lights[1] R.H. Liang, M. Ouhyoung, a real-time continuous gesture recognition system for sign language Face and Gesture Recognition, 1998, pp.558–565. Thus, it seems convenient that human-robot interfaces incorporate hand gesture recognition capabilities. For instance, we would like to have the possibility of transmitting simple orders to personal robots using hand gestures. The recognition of hand gestures requires both hand’s detection and gesture’s recognition. Both tasks are very challenging, mainly due to the variability of the possible hand gestures (signs), and because hands are complex, deformable objects (a hand has more than 25 degrees of freedom, considering fingers, wrist and elbow joints) that are very difficult to detect in dynamic environments with cluttered backgrounds and variable illumination. Several hand detection and hand gesture recognition systems have been proposed. Early systems usually require markers or colored gloves to make the recognition easier.

Human-robot symbiotic systems have been studied extensively in recent years, considering that robots will play an important role in the future]. The use of intelligent robots encourages the view of the machine as a partner in communication rather than as a tool. In the near future, robots will interact closely with a group of humans in their everyday environment in the field of entertainment, recreation, health-care, nursing, etc.

In human-human interaction, multiple communication modals such as speech, gestures and body movements are frequently used. The standard input methods, such as text input via the keyboard and pointer/location information from a mouse, do not provide a natural, intuitive interaction between humans and robots. Therefore, it is essential to create models for natural and intuitive communication between humans and robots. Furthermore, for intuitive gesture-based interaction between human and robot, the robot should understand the meaning of gesture with respect to society and culture. The ability to understand hand gestures will improve the naturalness and efficiency of human interaction with robot, and allow the user to communicate in complex tasks without using tedious sets of detailed instructions.

II. BLOCK DIAGRAM



III. WORKING PRINCIPLE

The PIR sensor is normally used for motion detection, in our circuit the sensor is connected in the port D and the status of the pin is read, suppose the output of the sensor goes high then at once any motion in the form of gesture being detected is used to control an Electrical appliance for example in our case we have to chosen to switch of an servo motor. The ultrasonic sensor output signal is fed to the microcontroller ATMEGA32 via the serial interface. A suitable embedded 'c' program is written the algorithm here, read the different hand gesture sign senses by the ultrasonic sensor and becomes different control operation. The PIR sensor as interface through port D of the atmega32 and the high signal output is sensed and used for control application of motor when ever distance is detected the sensor act as substitute for image sensor and hand control ON/OFF operation of motor.

III A. PIR SENSOR



The PIR (Passive Infra-Red) Sensor is a piezoelectric device that detects motion by measuring changes in the infrared (heat) levels emitted by surrounding objects. When motion is detected the PIR Sensor outputs a high signal on its output pin. This logic signal can be read by a microcontroller or used to drive an external load. The PIR sensor as interface through port D of the ATMEGA32 and the high signal output is sensed and used for control application of motor when ever distance is detected the sensor act as substitute for image sensor and hand control ON/OFF operation of motor.

III B. FEATURES

- Detecting range : 360 degrees cone angle, 15-20 feet
- Single bit output
- Jumper selects single or continuous trigger output mode
- 3-pin SIP header
- Small size makes it easy to conceal
- Compatible with any microcontroller like Basic Stamp, Adriano, At mega, PIC, 8051, propeller.

III C. ULTRASONIC SENSOR



The ultrasonic sensor is utilized as substitute and the gesture is recognized in terms of different distances and the hand movements for various distance acts as gesture sign for control applications. The ultrasonic sensor output signal is fed to the microcontroller ATMEGA32 via the serial interface. A suitable embedded 'c' program is written the algorithm here, read the different hand gesture sign senses by the ultrasonic sensor and becomes different control operation.

III D. PICTURE OF ROBOT

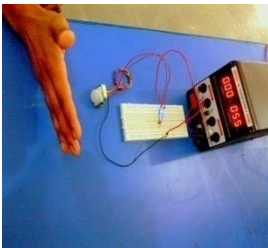
Hand Movements



III E. HAND CONTROL USING HAND GESTURE

Technique to acquire hand gestures and to control robotic system using hand gestures is:

- PIR sensor acquisition to get hand gestures.
- Extracting hand gesture area from captured frame.
- Generation of instructions corresponding to matched gesture, for specified robotic action.



IV. APPLICATIONS

1. In aero space for detection of obstacle during takeoff and landing upon air wings.
2. This eliminates the use of camera sensor and provides the low cost hardware.

V. CONCLUSION

The control algorithm developed is based on the larger distance measured by the ultrasonic sensor, the work can be further extended for small distance measurement and controlling applications which would eliminate the use of kinect sensor which are very costlier and this dual sensor system setup is very economical for small scale applications.

Mechatronics engineers already have programming languages such as ROBOTC (based on C) and RAIL (based on Pascal) that control robot actions and sensors. But these languages use the same fundamental line-by-line code I learned in the mid-1960s! The mechatronics capabilities of equipment and robots have expanded, but programmers still control them with old-fashioned languages. National Instruments' LabVIEW software provides a higher-level graphical programming approach that better abstracts engineers from languages. So we have taken a step in the right direction.

In the area of safety, for example, many machines require operators to place each hand on a control switch before the controller starts any action. Instead of having operators move their hands to special switches, why not simply let them hold up their hands or fingers in front of a gesture sensor? This type of control could improve productivity, reduce the effects of repetitive motions, and improve safety.

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Study on Surface Roughness and its Prediction in Cylindrical Grinding Process based on Taguchi method of optimization

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Abstract- This seminar presents the experimental work/project done on studying the working of cylindrical grinding machine and effect of its process parameters at Govt. Engineering College, Thrissur. Cylindrical grinding is one of the important metal cutting processes used extensively in the finishing operations. Surface finish is the important output responses in the production with respect to quantity and quality respectively.

The experiments are conducted on MILANO RICEN RUM 1 Cylindrical Grinding Machine with L9 Orthogonal array with input machining variables as work speed, depth of cut and hardness of material. Surface roughness is measured using MITUTOYO Surf test SJ-400 surface roughness tester. The developed model can be used by the different manufacturing firms to select right combination of machining parameters to achieve an optimal surface roughness (Ra). The results reveals surface roughness (Ra). It also formulates an empirical relationship between the surface roughness values and the input parameters. Taguchi parametric optimization is used for the optimization process. The results are further confirmed by conducting confirmation experiments

Index Terms- Cylindrical grinding machine, Taguchi, surface roughness, S/N ratio, depth of cut, design of experiments, analysis of variance

I. INTRODUCTION

Cylindrical grinding is an essential process for final machining of components requiring smooth surfaces and precise tolerances. The various process parameters of a cylindrical grinding machine include depth of cut, material hardness, work piece speed, grinding wheel grain size, and grinding wheel speed.

The present paper takes the following input processes parameters namely material hardness, work piece speed and depth of cut. The main objective is to predict the grinding behaviour in terms of surface roughness and achieve optimal operating processes parameters. For optimization process Taguchi optimization technique is used. [1]

II. OBJECTIVES

To understand the cutting mechanisms involved in cylindrical grinding. To study the effect of cutting speed, material hardness & depth of cut on surface roughness with other

parameters set constant. To create an empirical relationship between the surface roughness value obtained and the process parameters. To test the equations found out using experimental and analytical techniques.

III. EXPERIMENTAL PROCEDURE

E. Experiment

Study the effect of depth of cut, material hardness and work piece speed on surface roughness with other parameters set constant.

F. Procurement of material

Alloy steels of various compositions are brought from EMVEE Agencies, Coimbatore. EN 24, EN31 and EN 353 are the grades of alloy steels used. Alloy steels rods are of 32mm diameter and 300mm in length. Work pieces are centre drilled and turned in a universal lathe machine.

G. Grinding of work pieces

After turning, work pieces are grinded in cylindrical grinding machine. (MILANO RICEN RUM 1 MACHINE) Carborundum grinding wheel- AA46K5V40 is used as grinding wheel. Soluble oil used as cutting fluid. The various process parameters of a cylindrical grinding machine include depth of cut, material hardness, work piece speed, grinding wheel grain size, and grinding wheel speed. The present paper takes the following input processes parameters namely material hardness, work piece speed and depth of cut. The other parameters such as abrasive type and feed rate are kept constant. The number of experiments to be conducted can be reduced by using orthogonal array method of Taguchi optimization technique.

LEVEL	1(low)	2(mediaum)	3(high)
Depth of Cut	10	15	20
Speed	60	75	120
Hardness	50	60	64

Fig 1 Selected process parameters

Design of Experiments – L9 orthogonal array

Experiment No:	Hardness	speed	Depth of cut
1	50	60	15
2	50	120	20
3	50	75	10
4	60	60	10
5	60	120	15
6	60	75	20
7	64	60	10
8	64	120	20
9	64	75	15

Fig 2 L9 orthogonal array

H. Surface roughness measurements

Surface roughness values are obtained from MITUTOYO Surfptest SJ-400 Surface roughness tester for each experiment. The obtained values used for the Taguchi optimization process.

Experiment No:	Hardness	speed	Depth of cut	Surface Roughness
1	50	60	15	0.76
2	50	120	20	0.56
3	50	75	10	0.79
4	60	60	10	0.72
5	60	120	15	0.61
6	60	75	20	0.57
7	64	60	10	0.69
8	64	120	20	0.47
9	64	75	15	0.59

Fig 3 Figure showing surface roughness value obtained

Signal to Noise ratio is found out in each case using the criteria ‘ lower is better’ as surface roughness is the factor of consideration.

Lower is better $S/N = -10 \log [1/n (\sum y_i^2)] (n=1)$

Experiment No	SNRA1
1	2.383
2	5.036
3	2.047
4	2.853
5	4.293
6	4.882
7	3.223
8	6.558
9	4.582

Fig 4 Signal to noise ratio for various experiments

Average S/N ratio for each parameter at each level is found out. Similarly the average surface roughness values for each parameter at each level are also found out.

Level	Hardness	Speed	Depth of cut
1- Low	3.156	2.820	2.708
2- Medium	4.010	3.838	3.753
3- High	4.788	5.296	5.492
Delta	1.632	2.476	2.784
Rank	3	2	1

Fig 5 Average S/N ratios in each level

Signal to noise ratio is high when hardness value is in level three, speed is in level three and depth of cut is in third level. The difference between the largest and minimum signal to ratio is calculated and the factors effect are ranked based on it.

Level	Hardness	Speed	Depth of cut
1- Low	0.703	0.723	0.733
2- Medium	0.633	0.650	0.653
3- High	0.583	0.546	0.533
Delta	0.120	0.177	0.200
Rank	3	2	1

Fig 6 Average surface roughness values in each level

Surface Roughness (Ra value) is low when hardness value is in level three, speed is in level three and depth of cut is in third level. The difference between the largest and minimum surface roughness value is calculated and the factors effect are ranked based on it.

I. Main effects plots

Main effects plots for the experiments have been given below.

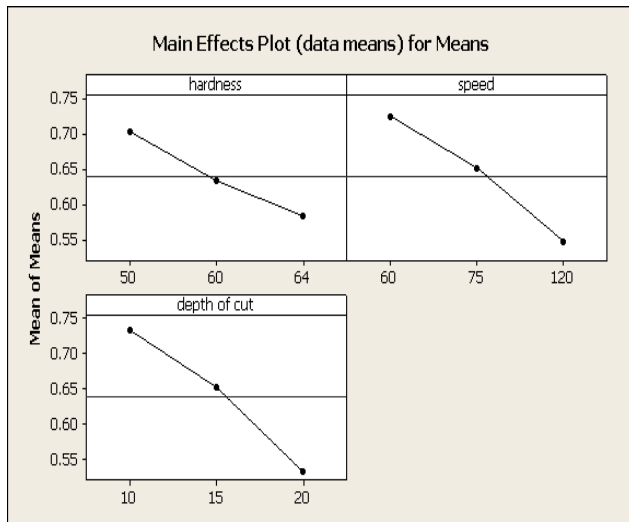


Fig 7 Response Graphs for Mean surface roughness

1. Level III for Hardness, H3 = 0.583 Ra indicated as the optimum situation in terms of Surface Roughness values.
2. Level III for Cutting Speed, W3 = 0.546 Ra indicated as the optimum situation in terms of Surface Roughness values.
3. Level III for depth of cut, D3 = 0.533Ra indicated as the optimum situation in terms of Surface Roughness values

Analysis of Variance

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	3	0.086819	0.028940	56.07	0.000
Residual Error	5	0.002581	0.000516		
Total	8	0.089400			

K. Mathematical regression Modelling

The obtained surface roughness values for each experiment are tabulated and empirical formula is formulated using mathematical regression modelling.

Regression equation obtained is

The regression equation is

$C5 = 1.45 - 0.00827 A - 0.00126 B - 0.0150 C$, where

C5 – Surface Roughness, A – Hardness, B – Speed, C – Depth of Cut

L. Taguchi optimization result

From main effects plotted, it is observed that there is decrease in surface roughness as material hardness increased. The surface roughness decreases when speed increases from 60 to 120 rpm, similarly when depth of cut increases from 10 to 20 surface roughness decreases.

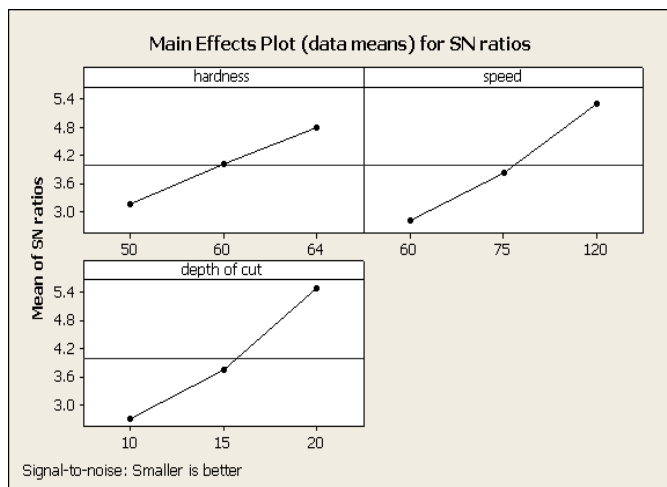


Fig 8 Response Graphs for S/N values for Surface Roughness

1. Level III for Hardness, S/N H3 = 4.788dB indicated as the optimum situation in terms of S/N values.
2. Level III for Cutting Speed, S/N W3 = 5.296dB indicated as the optimum situation in terms of S/N values.
3. Level III for depth of cut, D3 = 5.492 dB indicated as the optimum situation in terms of S/N values.

IV. MODELLING OF RESULTS

J. Annova test

One way Annova test is carried out and the result obtained is found to be significant from the F value obtained.

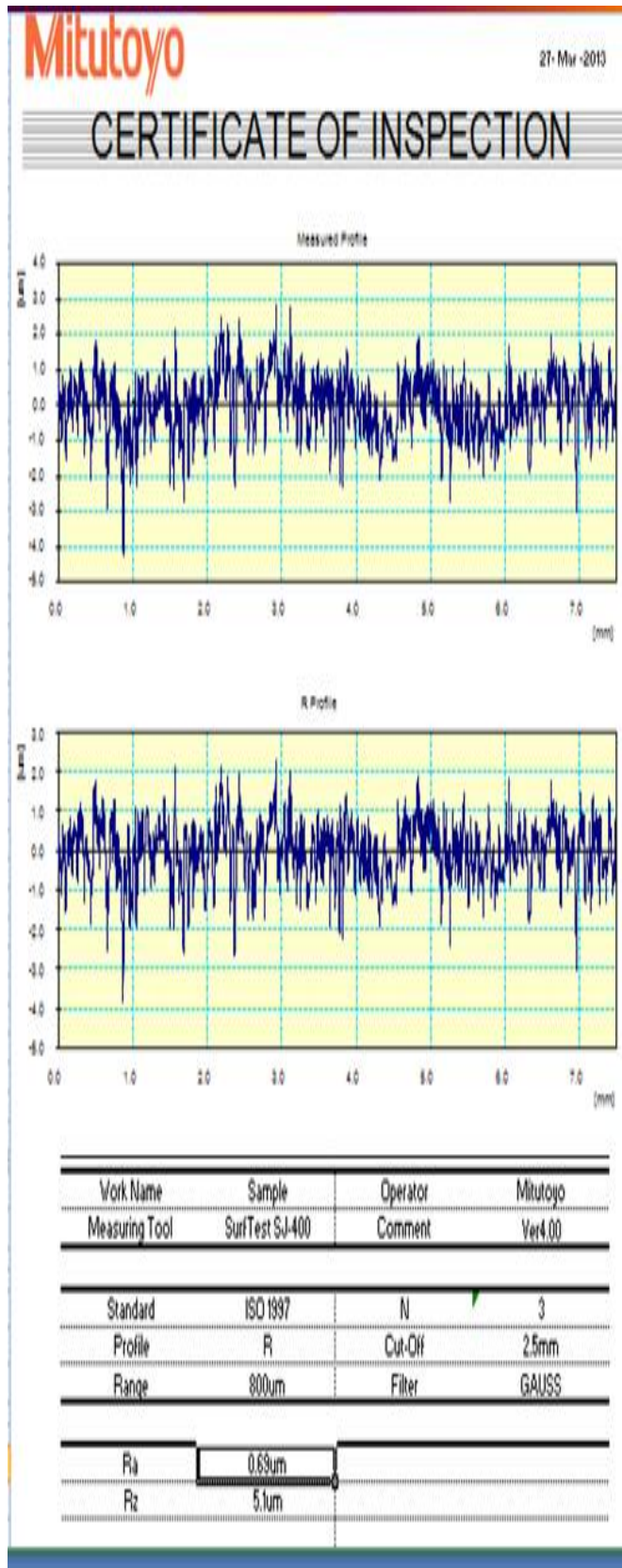


Fig 9 Reading obtained from MITUTYO SurfTest surface roughness tester for Experiment No:5.

M. Conformation of Experiment

To validate the optimum grinding conditions (H3, W3, D2) the combination of High Hardness (level – 3) (H3), High Work piece speed (level – 3) (W3) and High depth of cut (level – 3) (D3), then the Surface Roughness is minimum obtained

Table 1: Conformation of experiment

Surface roughness	S/N ratio found out
0.47	6.558

Comparison of results

Optimum surface roughness value obtained using Taguchi parametric optimization is 0.47 Ra. Confirmation experiments yields the result surface roughness equal to 0.47Ra. Surface roughness obtained using regression modelling equation is 0.469Ra.

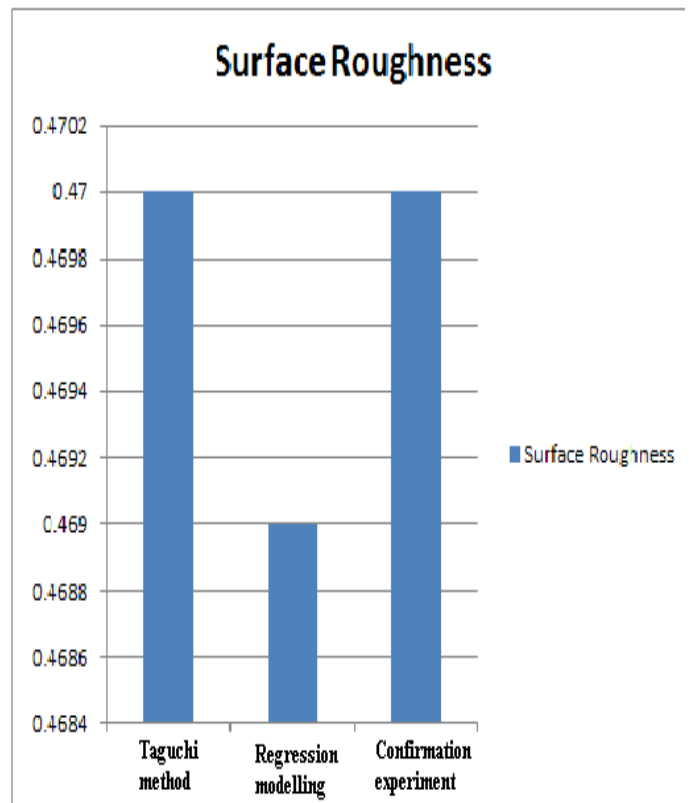


Fig 11 Comparison of results

V. CONCLUSIONS

This paper attempts to develop an analytical model for surface roughness in MILANO RICEN RUM 1 Cylindrical Grinding Machine. Based on the analytical and experimental results obtained in this study following conclusions can be drawn.

1. Grinding process and various parameters affecting surface roughness are studied and analyzed.
2. Surface roughness value measurement using MITUTYO surfstest surface roughness tester is studied.
3. Empirical equation relating various process parameters is formulated. Regression equation is formulated.
4. Optimum values of depth of cut, hardness, and speed which gives minimum surface roughness are found out using taghuchi optimization technique.

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Implementation of Network Traffic Classification by Using MLA

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Abstract- Network traffic classification is challenging task in high speed network. Network monitoring is required for quality of service and analysis, therefore it generate network traffic. Existing system has some drawback, to overcome that drawback we have develop our system i.e classification of network traffic using machine learning algorithm. According to generated traffic information by client we have constructed boosted classifier with high accuracy. This system is used to classify application like FTP, Skype, TCP ,etc. For constructing c5.0 classifier we have to provide unique dataset and training set to algorithm. This paper shows how we implement machine learning algorithm and how we use that algorithm for classification of network traffic.

Keywords- FTP, Skype, TCP, Network Monitoring, HTTP, Traffic, Browser Traffic, c5.0.

I. INTRODUCTION

Network traffic classification create challenge for whole network, network traffic increase the load of network, because of that one cant do work in proper or in fast way. Each network carries data for different applications, which have different usage. Therefore providing information about the quality level requires knowledge of what kind of data is flowing in the network at the present time. Generally, methods for traffic classification use a concept of flow defined as a group of packets having the same end IP addresses, using the same transport protocol, and its port numbers. Flows are considered bidirectional-packets going from the local machine to the remote server and from the remote server to the local machine are part of the same flow. Using application ports for traffic classification is a very simple idea widely used by network administrators to limit traffic generated by worms and unwanted services. This method is fast, and can be applied to almost all the routers existing on the market. This method is good to classify some protocols operating on fixed port numbers , but this method is not applicable for dynamic port no e.g skpe,gaming etc. because its operate on dynamic port no and one cant detect that application. Deep Packet Inspection (DPI) solutions are quite slow Furthermore they relay on inspecting the user data and therefore privacy and confidentiality issues can appear because user data is always in private manner. exiting methods like C4.5, J48, Random Forests have much wider coverage. They can be used in any point of the network, providing very fast statistical detection of the application, to which the traffic belongs. Achievable detection rate correctness is over 95The goal of machine learning is to design and develop algorithms that allow systems to use empirical data, experience, and training to evolve and adapt to

changes that occur in their environment. A major focus of machine learning research is to automatically induce models, such as rules and patterns, from the training data it analyses. Keeping that goal in mind, this paper describes previous related work and then focuses on implementation and evaluation of new machine learning algorithm i.e c5.0 algorithm which has more accuracy than previous.

II. RELATED WORK

There are many methods to classification of network traffic, they all tries for classify network traffic accurately but classification accuracy is less. In existing method like c4.5 algorithm, some packets are lost during capturing . that's why accuracy of correct classification is less. Classification based on well-known TCP or UDP ports is becoming increasingly less effective growing numbers of networked applications are port-agile (allocating dynamic ports as needed), end users are deliberately using non-standard ports to hide their traffic, and use of network address port translation (NAPT) is widespread (for example a large amount of peer-ton-peer file sharing traffic is using non-default ports).Payload-based classification relies on some knowledge about the payload formats for every application of interest: protocol decoding requires knowing and decoding the payload format while signature matching relies on knowledge of at least some characteristic patterns in the payload. This approach is limited by the fact that classification rules must be updated whenever an application implements even a trivial protocol change, and privacy laws and encryption can effectively make the payload inaccessible.

In exiting tool like Wireshark, it is a cross-platform analyser that does deep inspection of hundreds of protocols. It does live capture and capture save (for offline browsing), which can be viewed in GUI. when we use wireshark then we have to stop all running application. wireshark have to install on each machine this is the main drawback of wireshark. Another tool is Angry Ip scanner, it is one of the easiest to use of all the IP scanners. It has a user-friendly GUI that can scan IP addresses. Angry IP Scanner is cross platform and doesnt require installation, so you can use it as a portable scanner. In our proposed system we are using accurate data sets for both training and testing the boosted classifier. The classifier is able to distinguish traffic which appears to be similar, like web browser traffic and radio streamed via a web page. our system is used to extract the features of packet like application port no, direction of flow of packet,ip address etc.

III. SYSTEM OVERVIEW

1) Packet Capture

For capturing packets and extract features from that packet there are number of tools are present, but we are using jNetPcap and WinPcap. Because jNetPcap is latest version and it is used for supporting jdk environment. Before jNetPcap there was capturing tool which is known as jPcap. jPcap is not supported for capturing packets from high speed links, that's why it is not used in future. WinPcap is used for supporting to windows environment.

2) Training for live packets

After capturing live packets important task is to train that captured packets. In training phase, packet features are extracted in the form of information, after that packet data is converted into byte format and add dynamical into text file, which is used as training data.

3) Detection

In detection task, it match features of packet in present dataset, if it is not match then it detect as unknown packet.

4) Import Dataset

Import dataset is import the newly created training dataset into system. It load the training text file as input for classification.

IV. C5.0 ALGORITHM

The general algorithm for building decision trees is:

- (a) Check for base cases
- (b) For each attribute a: Find the normalized information gain from splitting on a
- (c) Let a best be the attribute with the highest normalized information gain
- (d) Create a decision node that splits on a best
- (e) Recurse on the sublists obtained by splitting on a best, and add those nodes as children of node

V. C5.0 CLASSIFIER

For constructing c5.0 classifier, we use concept of machine learning algorithm. Machine learning means machine learn itself by using different resultset. The goal of machine learning is to design and develop algorithms that allow systems to use empirical data, experience, and training to evolve and adapt to changes that occur in their environment. A major focus of machine learning research is to automatically induce models, such as rules and patterns, from the training data it analyzes.

For Training c5.0 classifier, we use text file that is already imported from import dataset. According to that text file machine learn itself about newly added packet features and check that features matched with kdd dataset. Kdd means knowledge discoverable dataset which is unique dataset. kdd discovery of previously unknown knowledge that evaluated with respect to know knowledge. While in typical kdd task, supervised method can not be used due to unavailability training data.

That training dataset used to classification of network traffic into two group class A and class B. That is class of allowed and blocked packets

VI. APPLICATION

Network planning and dimensioning
Performance evaluation
Charging and billing
QoS policies
Research purposes

VII. ADVANTAGES

1. Verifies success or failure of an attack: Since uses system logs containing events that have actually occurred, they can determine whether an attack occurred or not with greater accuracy and fewer false positives than a network based system.

2. Monitors System Activities: A sensor monitors user and file access activity including file accesses, changes to file permissions, attempts to install new executables etc.

3. Lower entry cost: C5.0- are far more cheaper than the network based IDS sensors.

VIII. EXPERIMENTAL RESULT

In our system, rules are generated by using packet capturing from client side. According to that dataset system classify the network traffic on the basis of c5.0 algorithm. classified result is as follows.

IX. CONCLUSION

The C5.0 MLA for distinguishing different kinds of traffic in computer networks. It was demonstrated that our method is feasible to classify traffic belonging to 7 different applications with an average accuracy of above 98%, when using accurate data sets for both training and testing the boosted classifier. Our results proved that the classifier is able to distinguish traffic which appears to be similar, like web browser traffic and radio streamed via a web page.

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A QoS based Vertical Handoff scheme for WiMAX/WLAN Networks

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Abstract- Recently, a number of wireless communication technologies are migrating toward heterogeneous overlay networks. The integration of Mobile WiMAX and WLAN seems to be a promising approach due to their homogeneous nature and complementary characteristics. In this paper, we investigate several important issues for the interworking of Mobile WiMAX and WLAN networks. We address a tightly coupled interworking architecture. Further, a seamless and proactive vertical handoff scheme is designed based on the architecture with aims to provide always the best quality of service (QoS) for users. Both the performance of applications and network conditions are considered in the handoff process. Moreover, we derive evaluation algorithms to estimate the conditions of both WiMAX and WLAN networks in terms of available bandwidth and packet delay. A simulation study has demonstrated that the proposed schemes can keep stations always being best connected.

Index Terms- Available bandwidth, packet delay, vertical handoff, WiMAX, WLAN

I. INTRODUCTION

Roaming across heterogeneous wireless networks such as wireless wide area network (WWAN) and wireless local area network (WLAN) poses considerable challenges, as it is usually difficult to maintain the existing connections and guarantee the necessary quality of service (QoS). The trend in fourth-generation wireless networks (4G) is the coexistence of heterogeneous technologies. During the past few years, wireless local area networks (WLANs) have been widely deployed due to its low cost and high capacity. On the other hand, mobile worldwide interoperability for microwave access (Mobile WiMAX) networks become a fast growing technology for its promised high bandwidth over long-range transmission with quality of service (QoS) supports. The integration of WiMAX and WLAN has been seen as a promising approach toward 4G.

In the design of heterogeneous overlay systems, one of the most important issue is vertical (intersystem) handoff (VHO) support. Generally, traditional horizontal (intrasystem) handoffs are initiated only by mobility to maintain the connectivity of the station. However, more metrics may be considered in VHOs especially when more than one network is available. These metrics can be classified into two categories. One category is QoS. If the service provided by the connected network cannot

satisfy the requirements, the station may switch to another network for better performance.

The other category is user preference which reflects the user's special requirements on price, power consumption or speed, etc. Therefore, VHO plays a significant role in achieving the main goal of 4G networks— allowing users to profit always best connected (ABC) service.

For VHO schemes, “seamless” and “proactive” are two desirable features. A proactive handoff means that the handoff process (i.e., initiation, decision, and execution) is controlled by the stations. Hence, if QoS metrics such as time, such as bandwidth and packet delay are considered in a VHO scheme, the stations should be able to detect network conditions for a handoff decision. Consequently, the network condition detection algorithms need to be tightly integrated into QoS oriented VHO schemes. On the other hand, a seamless handoff denotes that the handoff execution is transparent to upper layer applications. Indeed, this depends on the interworking architecture of heterogeneous networks. In the existing cellular/WLAN overlay systems, there are two types of interworking architectures: tightly coupled where WLAN works as a radio access network of cellular system, and loosely coupled where different networks are independently deployed but integrated at network layer. Comparably, a more seamless VHO can be expected in the tightly coupled networks, where the handoff execution follows the protocols of cellular network conditions.

We investigate the integration and VHO issues in WiMAX/WLAN overlay networks. The major contributions of our work are threefold: 1) a QoS oriented VHO scheme is proposed for the tightly coupled WiMAX/ WLAN networks to provide the ABC services (i.e connectivity over multiple mobile and fixed users; 2) in order to achieve proactive handoffs, network condition detection algorithms are derived for stations to estimate the available bandwidth and the packet delay of WiMAX and WLAN networks, respectively; and 3) since to our knowledge, there is still no tightly coupled architecture dedicatedly designed in literatures for WiMAX/WLAN systems, we address an architecture to support our VHO scheme

II. EXISTING SYSTEM

In existing QoS oriented VHO approaches, for overlay networks, QoS metrics are considered in handoff decisions. However, the handoff procedures are normally initiated when

the stations move across the border of WLANs. As a result, both the fixed stations and the mobile stations within overlapped areas cannot benefit from VHOs. This is the biggest disadvantage of the existing system
The main objective of the proposed algorithm is, to provide QoS service to both fixed and mobile networks.

III. PROPOSED SYSTEM

VHO could be initiated by two factors: mobility when a station moves out of the coverage of its connected network, and QoS when the connected network cannot satisfy the requirements. The Handoff does not take place immediately when the user enters into the child network. Only when the local connected network is proved to be working in a bad condition handoff decision process can be started. QoS parameters such as bandwidth and packet delay will be analyzed for the other network which is not serving (new child network), When the adequate values are met with handoff takes place.

Therefore, the QoS-triggered handoffs should be designed with an objective to provide ABC services for both mobile and fixed stations .To achieve a proactive handoff, we design a VHO manager (VHOM) to control the whole handoff process, which works on the medium access control (MAC) layers of WiMAX and WLAN interfaces at the station comes the most crucial step for your research publication. Ensure the drafted journal is critically reviewed by your peers or any subject matter experts. Always try to get maximum review comments even if you are well confident about your paper.

A. Service Evaluation and Handoff Initiation

Once an application is established at the station, VHOM will detect each packet of this application. Based on the delay sensitivity characteristics, the applications are classified into real-time applications and nonreal-time applications, respectively. Since a real-time application is sensitive to latency, both the throughput and packet delay of the traffic are measured. For a nonreal-time application, the amount of transmission data is more important, and then only the traffic throughput is measured. Here, the transmission direction of the application should be taken into account. For an uplink (UL) application, VHOM can record the moment that the packet arrives at the MAC layer buffer of the station and the moment that the packet is successfully transmitted by the connected network. Therefore, the calculated UL traffic throughput and packet delay can well reflect the performance of the local connected network (WiMAX or WLAN). If an UL application continually violates the QoS requirements for a given period, the handoff decision process will be started.

For the downlink (DL) traffic, however, the station cannot obtain the time information that the packet arrives at base station (BS) or access point (AP), and then an end-to-end delay will be calculated in this case rather than the delay purely introduced by the local connected network. Meanwhile, if it is the DL traffic throughput or packet delay violates the QoS requirements, the poor performance may be introduced by the

local connected network or by other networks on the path between two end nodes of this application. To avoid performing an unnecessary VHO within the local network, VHOM needs to evaluate the conditions of the local connected network first in this case. Only when the local connected network is proved to be working in a bad condition, the following handoff decision process can be started

B. Network Condition Detection and Handoff Decision

In this phase, a decision of whether to perform a VHO will be made by VHOM. The main work is to decide whether the conditions of the other network that is not serving the station can satisfy the QoS requirements. The flowchart is shown in Fig. 1 with the used parameters listed in Table 1. The available bandwidth of the network is evaluated first.If the calculated result is larger than the threshold and a real-time application is running on the station, the average

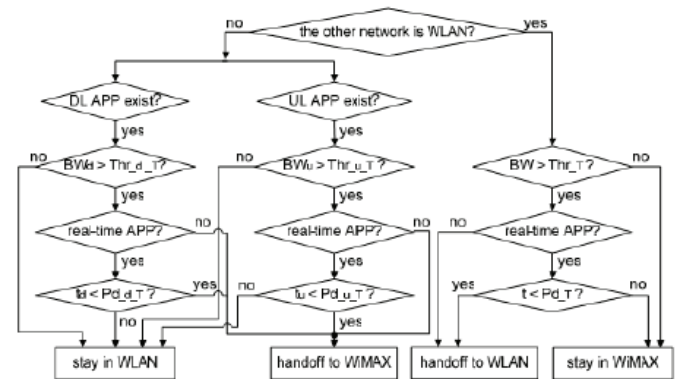


Fig. 1. The QoS-triggered VHO decision algorithm.

TABLE 1
Parameters Used in VHO Decision Algorithm

APP	current application
BW _d /BW _u /BW	estimated available bandwidth of DL WiMAX/UL WiMAX/WLAN
Thr _{d,T} / Thr _{u,T} / Thr _T	threshold for the available bandwidth of DL WiMAX/UL WiMAX/WLAN
t _d /t _u /t	estimated average packet delay of DL WiMAX/UL WiMAX/WLAN
Pd _{d,T} / Pd _{u,T} / Pd _T	threshold for the average packet delay of DL WiMAX/UL WiMAX/WLAN

packet delay of the network will be further estimated. If the other network is WLAN, the network conditions are estimated based on the total radio resource since the medium of WLAN is contended by all stations including AP. But in WiMAX networks, the radio resource has been allocated into a DL portion and an UL portion, which allows the network conditions be evaluated for DL and UL, separately. Therefore, only when both the DL and UL network conditions satisfy the requirements, a decision of handoff to WiMAX can be made.

To make an effective handoff, it is required that the conditions of the target network must be good enough. This is

guaranteed by accurately estimating the network conditions and setting suitable thresholds. We have designed novel algorithms for both WiMAX and WLAN networks to detect the network conditions in terms of the available bandwidth and the packet delay. By the proposed scheme, it is required that the thresholds for evaluating the available bandwidth (i.e., Thr_d_T;Thr_u_T and Thr_T) should not be less than the total throughput of the corresponding applications. Meanwhile, the thresholds for the packet delay (i.e., Pd_d_T;Pd_u_T and Pd_T) should not be larger than the required lowest packet delay for the corresponding applications.

C. Handoff Execution

Once a decision of handoff to the other network is made, VHOM needs to transfer current connections at the station to the target network. Under the tightly coupled architecture, AP connects to the central gateway called ASNGW in the access service network (ASN) of WiMAX, just as its overlay BS. Therefore, AP belongs to the same sub network at IP layer with its overlay BS. As a result, the IP address of the station needs not to be changed after a VHO, which makes a MAC layer handoff possible. Based on this consideration, we deploy an address resolution protocol (ARP) method to execute VHOs.

When a handoff decision is made, VHOM issues a gratuitous ARP message which will be transmitted by the target interface at the station. The message conveys the IP address of the station and the MAC address of the target interface. The AP or BS in the target network relays the message to ASN GW, which then updates its ARP cache by binding the IP address with the MAC address contained in the message. Then, ASN GW issues an ARP reply message to the station. Hereafter, the data packets destined to the station will be transferred by ASN GW via the newly selected network.

IV. PROPOSED ESTIMATION ALGORITHMS

The available bandwidth of a link equals to the difference between total capacity and the traffic load over the link. Usually, when the modulation and coding methods are known, the total capacity can be calculated. Therefore, the key idea of estimation is to find the utilization information of the link.

A. Estimation in WiMAX

Mobile WiMAX is specified by IEEE 802.16e standard which uses orthogonal frequency division multiple access (OFDMA) technique. Both the time division duplexing (TDD) and frequency division duplexing (FDD) are supported by IEEE 802.16e. In the standard, an adaptive split between DL and UL subframes are allowed. But it is usually fixed or remained unchanged for a long period impractical applications. Hence, we take the fixed split case as an example for analysis

1) Available Bandwidth Estimation

By the OFDMA technique, the bandwidth is allocated in the form of data bursts where an integer number of slots are included. The BS determines the number of DL and UL slots that a station obtains in one frame, and then broadcasts the resource allocation results through DL-MAP and UL-MAP messages at the beginning of each DL subframe.

Therefore, the station can easily obtain the utilization of WiMAX link by aggregating the number of allocated slots stated in DLMAP/UL-MAP messages. Let AAS_d and AAS_u denote the number of allocated DL/UL slots in one frame, which are averaged from n frames. T_f, T_{df}, and T_{uf} denote the duration of a frame, a DL subframe, and an UL subframe, respectively. Then, the available bandwidth in DL and UL can be calculated by

$$\begin{cases} B_d = \left(1 - \frac{AAS_d}{s_d}\right) \frac{\delta_d s_d}{T_f} \\ B_u = \left(1 - \frac{AAS_u}{s_u}\right) \frac{\delta_u s_u}{T_f} \end{cases}$$

Where $s_d(s_u)$ denotes the total slots in a DL(UL) subframe.

2) Packet Delay Estimation

We define the packet delay as the latency from the time that the packet arrives at the MAC layer buffer to the time that the packet is successfully transmitted. We divide the total delay into four components for analysis

$$t = t_s + t_q + t_m + t_t$$

The scheduling delay **ts** is taken from the moment the packet arrives at the MAC layer buffer, to the moment this arrival information is obtained by BS. The queuing delay **tq** is the time to be waited for the beginning of the frame allocated for transmitting the packet. The mapping delay **tm** is taken from the beginning of the allocated frame to the first time slot appointed to the station. The transmission delay **tt** is the time required to transmit the packet.

B. Evaluation of proposed VHO scheme

On the proposed VHO scheme, we have conducted simulations in an interworking system which consists of one WiMAX network and two overlapped WLANs, as shown in Fig 2.

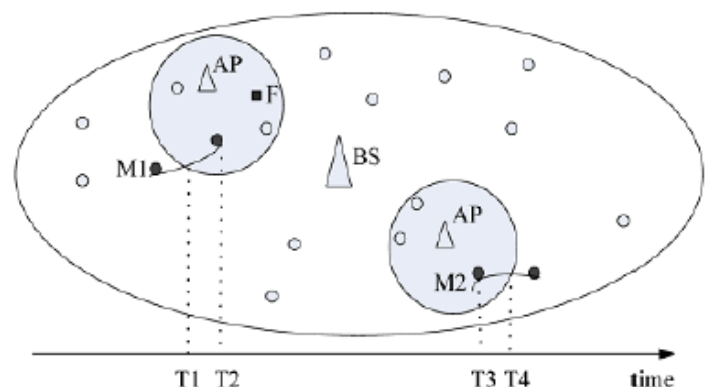


Fig.2. Simulation topology for WiMAX/WLAN interworking system

We have compared our proposed VHOM scheme with one reference scheme that is based on mobility factor. When the mobile node detects the presence of other network handoff takes place.

1) For Mobile Stations

We have performed simulation study for mobile station. In that scenario, a mobile station M1 moved toward an overlapped region as shown in Fig. 2. There was an UL connection running at M1 which was a nonreal-time variable bit rate (VBR) application with an expected throughput of 800 kbps. Initially, the VHO found that the average throughput of the application fell below the accepted 600 kbps.

But there was no other network available at that time. At the moment of T1, a WLAN network was found, and then a handoff was executed by the reference scheme immediately. But By our scheme, VHOM initiated the available bandwidth estimation process first. To guarantee the conditions of WLAN sufficiently good, Thr T was set to be 900 kbps. The estimated available bandwidth could not satisfy this requirement until T2, and then a handoff was performed at T2 as shown in Fig. 3a.

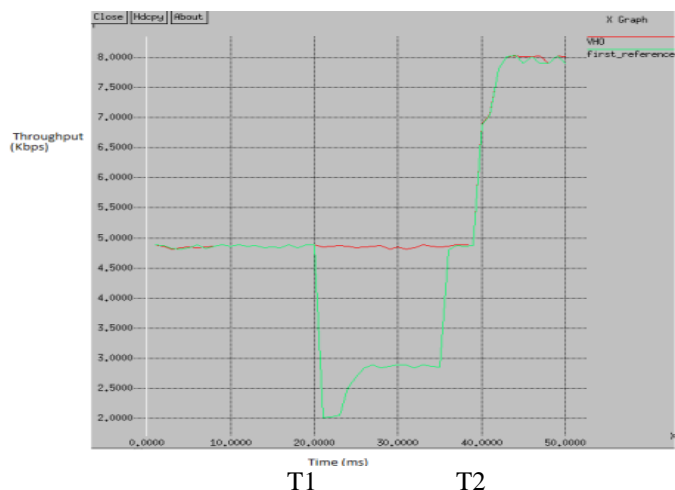


Fig 3.a Throughput comparison in the movement scenario.

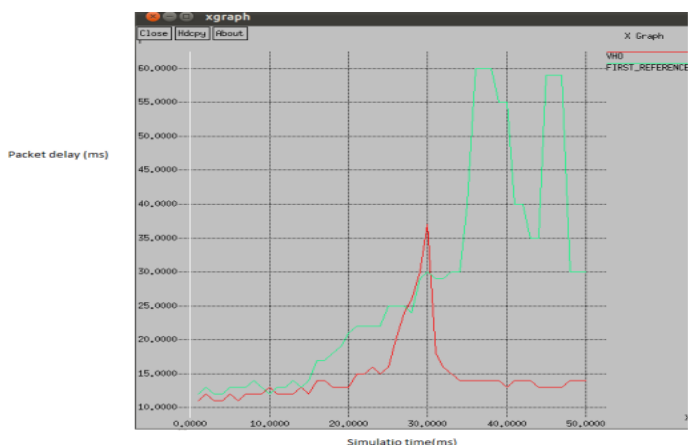


Fig 3.b Packet delay comparison in the fixed scenario

4.2.2 For Fixed Stations

In the simulation, a station F located in an overlapped region without movements, which worked with a real-time constant bit rate (CBR) application. The expected throughput was 500 kbps with a threshold of 450 kbps. The accepted end-to-end packet delay is 20 ms. Initially, the station was served by the WLAN. At around 27 ms, the average end-to-end delay detected by VHOM could not fulfill the requirement for three times although the throughput was fairly well. By the VHOM scheme, the condition of the WLAN was evaluated first.

The result showed that the latency introduced by the WLAN operations exceeded the 8 ms, which is the threshold. Then, the VHOM began to estimate the status of the WiMAX network. At about 30 ms, a decision of handoff was made based on the fact that conditions of the WiMAX network could satisfy the requirements. The end-to-end packet delay obtained by the schemes have been compared and shown in Fig. 3. The reference scheme could not initiate handoffs for the fixed stations. The results show that a much lower packet delay and more stable throughput can be obtained by the proposed VHOM scheme.

V. CONCLUSION

In this paper, we investigate several important issues for the interworking of WiMAX and WLAN networks. We address a tightly coupled interworking architecture as the platform of our scheme. Based on the tightly coupled architecture, we propose a novel seamless and proactive VHOM scheme for stations to control the vertical handoff operations in the interworking networks, which aims to provide ABC service for both mobile users and fixed users. In order to make stations be able to proactively evaluate network conditions for making handoff decisions, we develop algorithms to estimate the available bandwidth and packet delay in WiMAX and WLAN, respectively. By the simulation experiments, we have proven the feasibility and effectiveness of our proposed schemes.

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The preferred spelling of the word “acknowledgment” in American English is without an “e” after the “g.” Use the singular heading even if you have many acknowledgments.

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Five-Number Summary Method for Fault tolerance in Wireless Sensor Network

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Abstract- Wireless sensor network is a collection of sensor, which senses the data and perform the action, according to data. Where as wireless sensor and actor networks (WSANs) contain a group of sensors and actors connected via wireless medium. The sensor node senses the data and then transfers it to the actor. The actor performs the action according to the data. Sensor nodes in wireless sensor and actor network, have some hardware and software restrictions. Due to which, fault may occur in sensor as well as in network. However, some research emphasises on the link fault without considering the fault in sensing the data. Because of this, the node may sense incorrect data and perform the incorrect action. To solve this issue, Five Number Summary method for fault tolerance (FNSMFT) may be used.

Index Terms- Communication throughput, fault, sensor, five number summary method, fault tolerance, wireless sensor network and actor network.

I. INTRODUCTION

Wireless sensor network contains large number of sensors and a small number of resources. Sensors are low cost, and low power devices whose range, computation, and wireless communication will be limited. Nodes must be capable to give better processing capabilities, longer transmission radius, and larger battery energy. Wireless sensor and actor networks (WSANs) contain a group of sensors and actors connected via wireless medium. In this, sensors collect the information and actor performs the appropriate actions depending on the sensed data. WSAN can be divided into two parts: semi-automated and automated architectures, it depends on the functionality of actor nodes. When sensors send the sensing data to sink, sink sends the action commands to actor nodes to perform the action as shown in Fig. 1. So, due to semi-automated architecture there is no need to develop new algorithms and protocols for communication and coordination. However, actor nodes may delay in performing the action because of waiting the instructions from sink [2]. To solve this problem, the automated architecture is proposed.

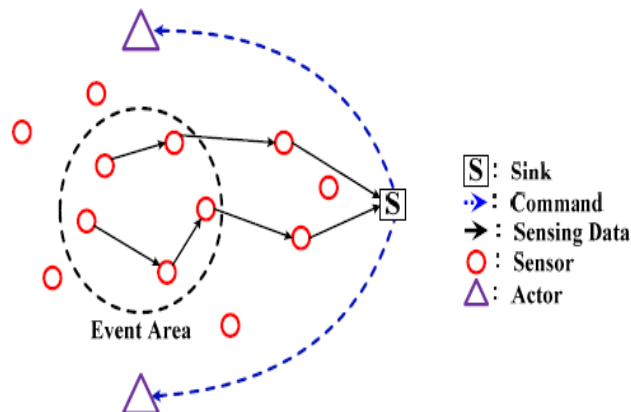


Fig.1. Semi-Automated Architecture of WSN

Sensors gather the sensing data and perform the suitable action in automated architecture. Node takes decisions to perform the action from sensing data directly as shown in Fig. 2. So sensors could save energy without forwarding the data to sink. The latency of performing actions could be minimized and prolonging the network lifetime is main concern of the automated architecture of WSAN [2]. In the this paper, the automated architecture in WSAN is taken into account.

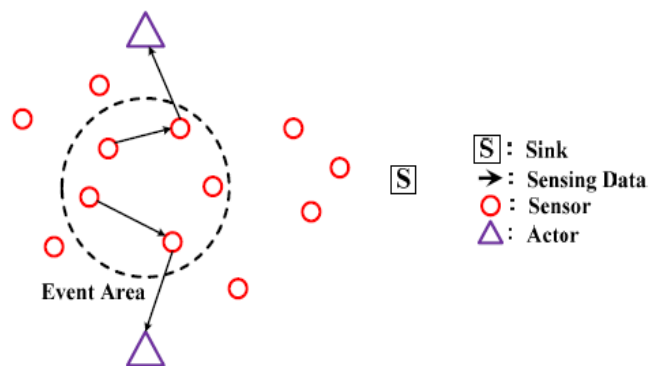


Fig.2. Automated Architecture

Fault tolerance mechanism is a main research issue in WSAN because sensor and communication link are easy to fail in the unreceptive or ruthless communication surroundings. There are many mechanisms to solve these issues in WSAN and are planned and taken into action. Some research focuses on the link fault without considering the fault in sensing the data. In this case, actor node may perform error actions because of receiving error sensing data from the sensors, due to which the sensing ability is failure but the communication ability is working. To solve this issue, Five Number Summary method for fault

tolerance (FNSMFT) is analysed in this paper. In FNSMFT, it uses the attribute of different data to sift the correct data by five number summary method. Therefore, in FNSMFT, node could perform the correct actions after receiving the correct sensing data.

II. RELATED WORK

Fault-tolerant permit a system to continue its operation, maybe at a reduced level, instead than failing entirely, when some of the parts are failed in system. Fault tolerance is the important part of the WSN due to limited energy and communication link failure. There are many mechanisms to solve these issues in WSN and are planned and taken into action. Some depth studies emphasis on the link fault without considering the fault in sensing the data. Because of this, sensors may send the error data to actor node and node may perform the incorrect computation. In this way, the sensing function may fail, but the communication function may work properly.

Average fault tolerant mechanism is proposed (AFTM) [6] to solve this problem. In AFTM, it defines r as a threshold value of failure, D_{avg} as an average data value and D_i is the sensed data value of sensor i . AFTM denotes sensing data as Byzantine Fault [18], whereas the absolute difference between real data and the sensing data will be greater than r . This type of sensor is also taken as the fail sensor in AFTM.

In AFTM, firstly the actor node calculates the average data value D_{avg} using the all sensed data of sensor node. Then the comparison will be performed by actor node between the average data value D_{avg} and sensed data value D_i of sensor i . If the difference between them will be greater than r then i will be considered as a fail sensor and sensed data value D_i will be fail. At last, the appropriate actions will be performed by filtering the correct sensing data.

For Example, $10.5\text{ }^{\circ}\text{C}$, $15.1\text{ }^{\circ}\text{C}$, $15.0\text{ }^{\circ}\text{C}$, $15.3\text{ }^{\circ}\text{C}$, $14.7\text{ }^{\circ}\text{C}$ are sensed by sensor nodes 1, 2, 3, 4, and 5 in an event area. Let the value of r is $2\text{ }^{\circ}\text{C}$ and the real ambient temperature is $15\text{ }^{\circ}\text{C}$. In this case actor node calculates the D_{avg} as $14.12\text{ }^{\circ}\text{C}$ and compares it with other sensing data. After the computation done from actor node, $|D_{avg} - D1| - r$, $|D_{avg} - D2| - r$, $|D_{avg} - D3| - r$, $|D_{avg} - D4| - r$, and $|D_{avg} - D5| - r$ are $3.62\text{ }^{\circ}\text{C}$, $0.98\text{ }^{\circ}\text{C}$, $0.88\text{ }^{\circ}\text{C}$, $1.18\text{ }^{\circ}\text{C}$, $0.58\text{ }^{\circ}\text{C}$ respectively. Now we can see that, $3.62\text{ }^{\circ}\text{C}$ is large than r . In this case, sensor 3 will be considered as fail sensor and its sensing data will be discarded. Now, the actor node could compute the average temperature value as $15.025\text{ }^{\circ}\text{C}$ from sensor 2, 3, 4, and 5, and make the proper actions.

Conversely, if the data sensed by sensor 3 is $0\text{ }^{\circ}\text{C}$ instead of $10.5\text{ }^{\circ}\text{C}$. The actor node computes the D_{avg} as $12.02\text{ }^{\circ}\text{C}$ and compares it with other sensing data. After the computation by actor node, $|D_{avg} - D1| - r$, $|D_{avg} - D2| - r$, $|D_{avg} - D3| - r$, $|D_{avg} - D4| - r$, and $|D_{avg} - D5| - r$ are $12.02\text{ }^{\circ}\text{C}$, $3.08\text{ }^{\circ}\text{C}$, $2.98\text{ }^{\circ}\text{C}$, $3.38\text{ }^{\circ}\text{C}$ and $2.68\text{ }^{\circ}\text{C}$ respectively. Here, mostly values are greater than r . Therefore, mostly sensors will be considered as the fail sensor and their sensing data will be discarded. But we know that, only sensor 3 is fail. To solve this problem, Five Number Summary method for fault tolerance (FNSMFT) can be used.

III. FIVE NUMBER SUMMARY METHOD FOR FAULT TOLERANCE

There is an important issue while designing a fault tolerance which is efficient, in wireless sensor network and wireless sensor and actor network, where sensors and communication link are prone to failure in hostile and harsh environment. However, some research emphasis on the link fault without considering the fault in sensing the data. To solve this problem, average fault tolerant mechanism was proposed (AFTM). However, average fault tolerant mechanism is not able to select the right sensing data.

To solve the above problem, Five Number Summary method for fault tolerance (FNSMFT) may be used. In FNSMFT, it will select the right sensing data and the sensors that perform correctly. Because of this, the actor node will perform the suitable actions.

3.1 Five Number summary Method

In five number summary method, firstly data will be sorted in an ascending order. For example, if the total number of data is n , then the $n/4$ will be the first part of data, $n/2$ will be the second part of data, and $3*n/4$ will be the third part of data. Let us suppose the first part; second part and the third part will be represented by Q_1 , M and Q_3 . Maximum and Minimum data will be denoted by Max and Min . The relation of Q_1 , M , Q_3 , Max and Min are defined as the five-number summary as show in Fig. 3.

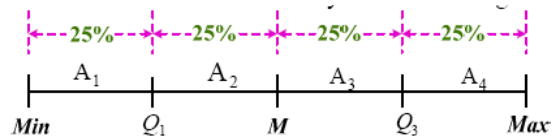


Fig.3. Q_1 , M , Q_3 , Max and Min in Five-Number Summary method

3.2 Process of Five Number Summary Method

Firstly, we will collect the sensing data and sort it in ascending order. Then we calculate Q_1 , M , Q_3 , Max and Min . If $Max - Min < r$, then we store the value of min and max in C_{min} and C_{max} respectively, which are temporary variables. If $Max - Min !< r$, then we check the difference between the parts which is less than $r/2$ until unless we get C_{min} and C_{max} . For getting this we sift the partition. And then correction will be made by actor node for sensing and computing the correct data and sensor node respectively.

IV. CONCLUSION

Fault tolerance mechanism is a main research issue in WSN because sensor and communication link are easy to fail in the unreceptive or ruthless communication surroundings. There are many mechanisms to solve these issues in WSN and are planned and taken into action. Some research focuses on the link fault without considering the fault in sensing the data. In this case, actor node may perform error actions because of receiving error sensing data from the sensors, due to which the sensing ability is failure but the communication ability is working.

To solve this problem, Five Number Summary method for fault tolerance (FNSMFT) can be used. We divide the sensing

data into four parts in FNSMFT. Then, we modify the region for selecting the right data from the discrete data. Therefore, the actor nodes can carry out the suitable actions in FNSMFT. FNSMFT has the better detection rate of correct data.

In the future, we propose an intrusion tolerance method combined with FNSMFT to give the proper security. INtrusion-tolerant routing protocol for wireless SEnsor Networks (INSENS) construct the tree structured routing, securely and efficiently for wireless sensor and actor networks (WSANs). INSENS is able to tolerate the damage caused by an intruder.

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Haematological Response of Freshwater Fish *Puntius Sophe* (HAM.) to Copper Exposure

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Abstract- Sublethal concentrations of copper ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) administered to freshwater fish, *Puntius sophe* for a period of 30 days brought about significant haematological alterations. RBC/TEC count, Haemoglobin, Haematocrit and MCHC content progressively decreased while WBC/TLC count, MCV and MCH increased. LC_{50} of CuSO_4 for *P.sophe* was estimated as 1.6 mg/l. Alterations in haematological parameters were dose and duration dependent. The highest concentration of copper (0.8 mg/l) proved lethal and resulted in mass mortality of the fish on 15th day of the experiment.

Index Terms- *Puntius sophe*, haematological response

V. INTRODUCTION

Aquatic pollution undoubtedly has direct effects on fish health and survival. Heavy metals are regarded as serious pollutants of the aquatic environment because of their persistence and tendency to be concentrated in aquatic organisms (Veena et al, 1997). Most heavy metals released into the environment find their way into the aquatic phase as a direct input by various anthropogenic processes, atmospheric deposition and erosion due to rainwater (Kalay and Canli, 2000). Copper is an essential heavy metal. It plays an important role in various biological processes including oxidative phosphorylation, gene regulation and free radical homeostasis as essential cofactor. However, when its concentration exceeds metabolic requirements, it becomes harmful and play a major role among pollutants (Singer et al, 2005). Copper sulphate (CuSO_4) has been widely used to control algae and pathogens in fish culture ponds, increasing copper concentrations in water. Copper sulphate though important as essential nutrient but becomes highly toxic to fish if its concentration required to control algae or pathogen agents is not below the threshold of fish. In light of this, present study was conducted to investigate the haematological changes in the fish *P.sophe* on exposure to copper treatment.

I. MATERIALS AND METHODS

The test fish *Puntius sophe* (length 7-9 cm and weight 9-10 gms) were collected with the help of cast net from Ghomanasa stream located 20 km north-west of Jammu. Fish were acclimatized to laboratory conditions for a fortnight. Copper was given in the form of copper sulphate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$). Experiments employing different doses of sublethal concentration of copper were carried out in 30 litre capacity tubs. Three sublethal concentrations of copper; viz, 0.16 mg/l (10% of LC_{50} value), 0.4 mg/l (25% of LC_{50} value) and 0.8 mg/l (50% of

LC_{50} value) were employed for experimental purpose. From the acclimatized group, 150 fish were selected and distributed into four groups; viz, Control group (normal water), Group II (0.4 mg/l Cu) and Group III (0.8 mg/l Cu). Haematological parameters were analyzed after an interval of every 5 day for 30 day experimental duration. Blood was collected with the help of insulin syringe rinsed with an anticoagulant (Heparin). Total erythrocyte count (TEC) and Total leucocyte count (TLC) was made by using an improved Neubauer haemocytometer (Shah & Altindag 2004). Haemoglobin value was estimated by Sahli's haematin method. Haematocrit was estimated by Wintrobe tube method. MCV (fl), MCH (pg) and MCHC (g/l) were calculated as:

$$\text{MCV} = \frac{\text{PCV} \times 10}{\text{RBC}}$$
$$\text{RBC Count}$$
$$\text{MCH} = \frac{\text{Hb in g/l of blood}}{\text{RBC in million/mm}^3}$$
$$\text{MCHC} = \frac{\text{Haemoglobin in g/100ml} \times 100}{\text{Vol. of packed RBC's in 100 ml}}$$

The data obtained from the experiment were subjected to statistical analysis.

II. RESULTS AND DISCUSSION

Erythrocytes : Compared to control group, significant decline has been observed in TEC, Hb and PCV values in all the metal treated fishes. The maximum decline in these values has been found in Group III fishes (highest concentration employed) (tab. 1a, fig. 1). One way ANOVA results reveal that the changes in TEC were significant ($p < 1$, about 0.99) at all intervals but highly significant ($p = 1$) only after ten days of metal exposure in all the treated groups. The reconnaissance of the data on percental decline in TEC further enlightens that the maximum decline was observed during first five days 0-5 days (about 24%, 30% and 35% in Group I, II and III resp.). This may apparently be due to the fact that upon exposure to copper the fish comes under stress and immediate response is a drastic decline in TEC. Reduction in TEC s observed in *P.sophe* according to present investigator can be very safely attributed to 1) erythrocyte cell lysis besides 2) inhibition of denovo formation of erythrocytes in haemopoietic tissues. Distorted shape of RBC's (fig. 2) as observed in smear preparation very clearly discern the qualitative effect on formed elements of blood. Similar results were also

reported by Katalay and Parlak (2004) while studying effect of pollution on *Gobius niger*.

On day 15/16 of the experiment, mass mortality occurred in Group III fishes. It simply indicates that 0.8 mg/l of copper concentration is highly fatal and appears to have caused an irreparable damage by tune of as much as 53.8% decline in TEC compared to other groups where decline is to the tune of 47.8% in Gp.I and 50.4% in Gp.II. it may be very safely inferred that such high percentage of decline in population of RBC simply cannot meet the O₂ requirement of fish creating hypoxic conditions and hence result in death of fish.

In the surviving Gp. I and II fishes, during 15 and 25 day interval (tab. 1a and fig.1) declining trend though was maintained, the magnitude of decline gets lowered which according to present author may simply be an adaptation (compensatory mechanism) on part of fish to meet its O₂ demand under stressful conditions of the metal toxicity. Similar viewpoint was also given by McDonald and Wood (1993), Handy et al, (1999) and Das et al, (2006). From 25th day onwards very interestingly, fishes of both the groups observe rise in TEC percental decline. This second bout of decline is indicative that the fish like other organisms also have tolerance limit to cope up the stress of metal toxicity.

The study of the data on TEC and Hb however reveal that the fall in TEC and Hb was not totally parallel. While TEC dropped by 48% in Gp. I, 50% in Gp. II and 54% in Gp. III, Hb values fall by 31%, 35% and 27% only in Gp. I, Gp. II and Gp. III respectively at the end of the experiment. This means that during the experimental duration greater number of erythroblasts may possibly have been released in circulation. The greater amount of Hb, therefore, appears to have been incorporated either in the erythrocytes or erythroblasts. This is evident from the increase in MCH values of the metal exposed fish when compared to control (tab.3a, fig. 3). The rise observed in MCH makes it clear that to compensate the increasing O₂ demand, there occurred an increased incorporation of Hb content per cell.

MCHC values after observing a slight initial rise in all the treated groups (tab. 4a, fig. 4) exhibit an overall decline. This decline in MCHC is the reflection of concomitant fall of Hb observed throughout the experiment. Such decline clearly is the indication of anaemia in the metal exposed fish. Also that the increase in MCHC value is more prominent in Gp.III fishes at the end of 10 days which may be an outcome of the increased lysis of RBC's and gradual fall in Hb. The Hb released from lytic RBC's may have contributed to the rise in MCHC observed in the present study. Immature erythrocytes (though not functional RBC) which start forming later when haemopoetic machinery get stimulated, atleast contribute to Hb and hence rise in MCHC is understandable here. No further data on MCHC of this group could be further obtained because these fish, which have received highest concentration of copper observed mass mortality.

Overall decline observed in PCV values was highest in Gp. III and lowest in Gp. I fishes. Thus, the decline observed in PCV follows the same trend as is shown by TEC in terms of dose dependency. Taking RBC as the essential basic component from which Hb and PCV (observed values) and calculated values (MCV, MCH and MCHC) are determined, the alterations in these values is simply the multiple reflection of RBC destruction

as a result of metal toxicity to *P.sophore*. As a consequence of this, not only normal physiology of the fish gets disturbed but they also exhibit hypochromic microcytic anaemia. The anaemic fish being very less energetic may fall easy prey to secondary infections.

III. LEUCOCYTES

WBC's or leucocytes are the cells of immune system defending the body against both infectious diseases and foreign materials. Tab. 5a and fig.5 clearly shows an increase in TLC values in all the metal treated groups as compared to control group. The maximum percental rise was observed in Gp. III fishes (49.8%). One way Anova results reveal that the changes in TLC was significant ($p < 1$, about 0.99) at all intervals but highly significant only after 10 days ($p = 1$) of metal exposure. Similar increase in TLC has also been reported earlier by Garg et al (1989), Singh (1995), Das & Mukherjee (2000) and Tyagi & Srivastava (2005) following treatment with various xenobiotics. The indepth study of the data (tab.5a, fig. 5) clearly reveals that the increment was highest in 0-5 days which present author feels may be a protective response on the part of the fish to combat stress caused by metal toxicity. The pathway of TLC increase appears to be lymphopoiesis (Gupta, 2008) because the lymphocytes which range from 50-60% in control group undergoes an appreciable increase in the metal treated groups (75-80%). In this context, the observations of Meenakala (1978) who stated that the stimulated lymphopoiesis and/or enhanced release of lymphocytes from lymphomyeloid tissues support the presently held viewpoint of lymphocytes to be the chief contributor for the increase in TLC. Mahajan & Juneja (1979) and Agrawal & Srivastava (1980) also advocated the increase in TLC to be the increased lymphocytes only.

From the day 5-10, although a rise in TLC was maintained in all the treated groups,5 but the magnitude of rise begins to fall to the tune of 20% in gp. I, 28% in gp. II and 29% in gp. III compared to 25%, 30% and 40% in gp. I, II and III respectively during first five days. The rise in TLC subsequently becomes lower and lower with the increasing time duration. Present author feels that during this time period, the internal defense mechanism of the fish may have become operational to fight the infection/foreign invasion by the addition of more lymphocytes in the circulation. Thus, increase in TLC observed presently seems to increase the immunity of the fish against stress caused by metal toxicity.

IV. CONCLUSION

From the overview of results, it can be concluded that exposure of fish *P.sophore* to metal toxicity (copper presently) even at low concentrations cause marked changes in haematological parameters. Such changes generally go unnoticed in the natural environment and their impacts on human beings are often overlooked. It is therefore recommended, that effluents containing heavy metals should only be disposed after their proper treatment. Further, there should be strict and regular monitoring of these toxicants in the water bodies to check possible environmental hazards.

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Table 1: Alterations in TEC ($\times 10^6$ cells/mm³) of *Puntius sophore* exposed to different sublethal concentrations (10%, 25% and 50% of LC₅₀ value i. e. 0.16, 0.4 and 0.8 mg/l) of Copper at 5 day interval.

Status and Exposure Period	Sublethal Copper concentrations employed		
	10%	25%	50%
Control	2.34±0.06	2.34±0.06	2.34±0.06
1 day	2.05±0.09	1.91±0.15	1.84±0.04
5 days	1.78±0.08	1.64±0.02	1.53±0.03
10 days	1.62±0.05	1.48±0.07	1.2±0.07
15 days	1.49±0.31	1.39±0.11	1.08±0.13
20 days	1.42±0.18	1.38±0.08	-
25 days	1.35±0.04	1.37±0.12	-
30 days	1.22±0.06	1.16±0.04	-

Table 2: Alterations in Haemoglobin of *P. sophore* exposed to different sublethal concentrations (10%, 25% and 50% of LC₅₀ value i.e. 0.16, 0.4 and 0.8 mg/l) of Copper at 5 day interval.

Status and Exposure Period	Sublethal Copper concentrations employed		
	10%	25%	50%
Control	5.2±0.05	5.2±0.05	5.2±0.05
1 day	5.1±0.03	5.0±0.06	5.0±0.06
5 days	4.8±0.09	4.7±0.07	4.6±0.02
10 days	4.5±0.04	4.6±0.02	4.3±0.04
15 days	4.3±0.06	4.2±0.07	3.8±0.05
20 days	4.0±0.12	3.8±0.08	-
25 days	3.8±0.18	3.7±0.03	-
30 days	3.6±0.03	3.4±0.05	-

Table 3: Alterations in PCV (Packed Cell Volume) of *P. sophore* exposed to different sublethal concentrations (10%, 25%

and 50% of LC₅₀ value i. e. 0.16, 0.4 and 0.8 mg/l) of Copper at 5 day interval.

Status and Exposure Period	Sublethal Copper concentrations employed		
	10%	25%	50%
Control	24.6±2.42	24.6±2.42	24.6±2.42
10 days	21.2±2.11	20.4±1.26	17.5±2.06
30 days	18.4±1.87	17.8±2.56	-

Table 4: Alterations in MCH (Mean Corpuscular Haemoglobin) of *P. sophore* exposed to different sublethal concentrations (10%, 25% and 50% of LC₅₀ value i. e. 0.16, 0.4 and 0.8 mg/l) of Copper at 5 day interval.

Status and Exposure Period	Sublethal Copper concentrations employed		
	10%	25%	50%
Control	2.22	2.22	2.22
1 day	2.48	2.61	2.71
5 days	2.69	2.80	3.0
10 days	2.77	3.10	3.58
15 days	2.88	3.02	3.50
20 days	2.80	2.75	-
25 days	2.81	2.70	-
30 days	2.95	2.93	-

Table 5: Alterations in MCHC (Mean Corpuscular Haemoglobin Concentration) of *P. sophore* exposed to different sublethal concentrations (10%, 25% and 50% of LC₅₀ value i. e. 0.16, 0.4 and 0.8 mg/l) of Copper at 5 day interval.

Status and Exposure Period	Sublethal Copper concentrations employed		
	10%	25%	50%
Control	21.13	21.13	21.13
10 days	21.22	22.54	24.57
30 days	19.56	19.10	-

Table 6: Alterations in MCV (Mean Corpuscular Volume) of *P. sophore* exposed to different sublethal concentrations (10%, 25% and 50% of LC₅₀ value i. e. 0.16, 0.4 and 0.8 mg/l) of Copper at 5 day interval.

Status and Exposure Period	Sublethal Copper concentrations employed		
	10%	25%	50%
Control	44.9	44.9	44.9
10 days	80.78	93.13	121.52
30 days	123.6	132.2	-

Table 7: Alterations in TLC ($\times 10^3$ cells/mm³) of *P. sophore* exposed to different sublethal concentrations (10%, 25% and 50% of LC₅₀ value i. e. 0.16, 0.4 and 0.8 mg/l) of Copper at 5 day interval.

Status and Exposure Period	Sublethal Copper concentrations employed		
	10%	25%	50%
Control	15.63±0.32	15.63±0.32	15.63±0.32
1 day	18.71±1.20	19.85±0.82	19.46±0.76
5 days	19.5±0.61	20.25±2.47	21.75±1.80
10 days	23.45±0.84	25.98±1.52	28.0±2.34
15 days	25.33±0.38	27.15±0.61	31.15±0.90
20 days	26.49±0.31	28.2±1.65	-
25 days	27.63±0.91	29.78±2.32	-
30 days	28.50±0.51	30.9±1.82	-

Trends in ambient loads of DDT and HCH residues in animal's and mother's milk of PaliakalanKheeri, Uttar Pradesh-India

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Abstract- Monitoring of DDT and HCH residues in the environment of Paliakalan during 2009 to 2011 revealed low to moderate levels of these insecticides in cow, buffalo, goat & breast milk samples. The levels of the DDT and HCH residues in animal & human milk collected from rural areas having intensive sugarcane, wheat & paddy cultivation in Paliakalan were analysed all samples contained detectable quantities of DDT, HCH and its metabolites. Total HCH residues were high than those of DDT in all the samples. The total concentration of DDT & HCH was found lower than the previous studies carried out in India. These results indicate that the overall organochlorine-residue levels in Paliakalan are slightly degrading. The residues were quantitatively analyzed on Gas Chromatograph with ECD & confirmed by Gas Chromatograph-Mass Spectrometer-Quadrupole on electron ionization (EI) mode. The data from this study is added to the scientific data and knowledge on OCPs levels in milk which was not available for PaliakalanKheeri Region, India.

Index Terms- DDT, HCH, Milk, Gas chromatography, Mass spectrometry

I. INTRODUCTION

India, having agriculture-based economy, is one of largest insecticide consumers in the world. Moreover two-thirds of the pesticides consumed are Class I and II pesticides (WHO) which are highly toxic. No wonder a number of studies from India have reported widespread contamination of various milk, food and water sources to be contaminated with these pesticides. In India, largest pesticide consumption has been in the state of Uttar Pradesh, according to the data of 1995-1996 and 1999-2000, produced by Central Insecticide Board and Registration Committee, India (Srivastava, S et al. 2008). Introduced in the 1940s, organochlorine pesticides (OCPs) were widely used in agriculture and pest control until research and public concern regarding the hazards of their use led to government restrictions and bans. Despite restrictions and bans on the use of many organochlorine pesticides in the 1970s and 1980s, they continue to persist in the environment today. OCPs, such as DDT and HCH, have stable chemical properties and less biodegradability. HCH and DDT exhibit broad-spectrum toxicity and residual activities. DDT and HCH are banned in India for agriculture but are still used for controls of vectors in public health. HCH was

banned for use in agriculture in 1998 and Lindane was recommended in its place (Mukherjee and Gopal, 2003). These toxicants enter the human body through the food chain and cause serious health problems (John et al., 2001). The presence of OCPs residues in food commodities (Mukherjee and Gopal, 1996), water (Agnihotri et al., 1993), Mother's milk (Nair et al., 1996; Okonkwa et al., 1999; Anoop et al., 2006), dairy milk (John et al., 2001; Mukherjee and Gopal, 1995; Nicholas., 2011), Human blood (Waliszewski et al., 2000) and in skin (Due et al., 1998) have been reported in earlier studies. Epidemiological studies provide evidence that exposures to organochlorine pesticide can produce adverse health effects (Kalpana, 1999; Jiawei et al., 2008).

Milk is a important source of nutrition for the infant, young and elderly. Milk is also rated very highly amongst vegetarians (over 50% of the 800 million population) and is often taken during illness and convalescence. Milk can be used as an evaluation index of environment contamination by these insecticides. This alarmingly high daily intake value is a cause for concern, since children are highly susceptible to effects from such environmental contaminants. The observed contamination of mother's milk and the possible transfer of the contaminant from mother to child is an obvious risk associated with breast-feeding (Gebremichael S et al., 2013). The main objective of this analysis is to monitor the levels of OCPs in animals and human milk. It is important to establish the level of OCPs in milk especially in rural area where animal & human are more exposed to these insecticides as they eat agricultural product from same area. The presence of organochlorine pesticide residues in agricultural fields in rural parts of India indicates regular use of these compounds (Mohapatra et al., 1995). OCPs residues are highly persistent and are reported to be sold to unsuspecting consumers, they are still needed to be monitored. There is no report on organochlorine pesticide residues in animal and human milk from PaliakalanKheeri region, we undertaken, a systematic study of monitoring the OCPs residue level in animal & human milk sample collected randomly from rural parts of PaliakalanKheeri, region.

II. MATERIAL AND METHODS

A. Site

PaliaKalan (28° 27' 0" North, 80° 35' 0" East) is a small peaceful city of [Lakhimpur Kheeri district](#) in the [Indianstate](#) of [Uttar Pradesh-India](#). Dudhwa National Park, home to Rhinos, Tigers, with countless animal species, birds, insects, reptiles is adjacent to the town. The main occupation is farming (cane, wheat, paddy etc.) and also houses the Bajaj Industries Private Limited Sugar production plant, distillery and 1 ecofriendly plywood production unit. The sugar production plant is second largest sugar production unit in Asia and the plywood production plant is only 2nd plant in the world which produces plywood with beggasse.

B. Sampling

The healthy women samples were collected from donors between age groups of 25 – 35 years and all had normal child deliveries. Normal healthy Cow, Buffalo & Goat were chosen for collection of samples. 50 mL of women milk & 200 mL animal milk were collected in glass bottles by manual suction pump. Milk samples were refrigerated at 4 °C until analyzed.

C. Extraction of the sample

The milk samples were extracted following procedure of Environmental Protection Agency Protocol (EPA1985) and (Ejobi et al., 1996) after some modification. The procedure involved denaturation, solvent extraction, centrifugation, extraction of organic layer and concentration. Briefly, 5 mL milk samples were mixed with anhydrous sodium sulphate to make a free flowing powder and then transferred into a glass extraction column (150x 20 mm). The dry column was eluted with 100 mL of n-hexane with the first 50 mL allowed to stay in contact with the powder for 10-15 min. The elute was collected in pre-weighed round bottom flask. n-Hexane was evaporated off under a rotary vacuum evaporator. The round bottom flask was then weighed again. The difference in weight is the weight of raw fat extracted. The extracted raw fat was cleaned up in a glass column packed with florosil using eluting solvent of n-hexane & dichloromethane in the ratio of 3:1. The flow rate of elution did not exceed more than 3 mL/min. Then the eluting solvent was passed through anhydrous sodium sulfate and concentrated under rotary vacuum evaporator. Final volume was made up to 1 mL n-hexane and injected 1 µL in gas liquid chromatograph equipped with an electron capture detector (Ni⁶³).

III. INSTRUMENT

A. GC instrument

The residues were quantitatively analyzed on Gas Chromatograph-Shimadzu 2010 (Shimadzu, Kyoto, Japan) equipped with split/splitless auto-injector model AOC-20i. The non-polar stationary phase used was a fused silica capillary column DB-5 (5 % phenyl polysiloxane) of 30 m, 0.25 mm i.d and 0.25 µm film thickness (J&W Agilent Palo Alto, CA, USA). GC Solution software was used for instrument control and data analysis.

B. GC/MS instrument

The residues were further confirmed on Gas Chromatograph-Mass Spectrometer-Quadrupole on electron ionization (EI) mode (Shimadzu 2010, Kyoto, Japan) equipped with with split/splitless auto-injector model AOC-20i. The non-polar stationary phase used was a fused silica capillary column DB-1 (1 % phenyl polysiloxane) of 30 m, 0.25 mm i.d., and 0.25 µm film thickness purchased from J&W Agilent Palo Alto, CA, USA. GCMS Solution software was used for instrument control and data analysis.

IV. ANALYTE RECOVERY AND QUALITY CONTROL

Milk samples (5 mL) were spiked with the Organochlorine insecticides α -HCH, β -HCH, γ -HCH, δ -HCH, *op'* DDT, *pp'* DDD and *pp'* DDE at 0.02, 0.05, 0.1 µg L⁻¹ levels. The recovery experiment was performed at the three concentrations and each concentration was analyzed in triplicate. The recovery percentage and standard deviation of organochlorine pesticide are summarized table 3, ranging from 86.2 ± 1.30 to 96.0 ± 1.25 across the three concentrations. The use of milk for recovery studied has earlier has reported by Kanja et al (1983); Ip and Phillips (1986); and Schinas et al. (2000); and Anoop et al. 2006. The limits of detection (LOD) and limit of quantification (LOQ) for OCPs was 0.001 µg/mL and 0.01 µg/mL, respectively. All the solvents & chemical used in the extraction and clean up procedure were special analytical grade for pesticide residues (E.Merk India Ltd.). Pesticide standards were obtained Sigma-Aldrich/ Riedel-de-Haen (Zwijndrecht, The Netherlands).

V. RESULTS AND DISCUSSION

Total Concentrations of DDTs and HCHs in human breast milk were high than animal milk. This indicates that the residents living in this area have been exposed to relatively high levels of DDTs and HCHs through animal milk, meat, water and agricultural products. *o,p'*-DDT, *p,p'* DDD and *p,p'* DDD were analyzed and detected 90% of human's milk, 80% of buffalo's & cow's milk and 70 % of goat's milk. α -HCH, β -HCH, γ -HCH and δ -HCH were also analyzed and found 90% of human milk, 80% of buffalo, cow and goat milk. The concentration of DDT and HCH are presented in Table 1 and 2. Dominant pesticide in all samples examined was HCH in mother's, buffalo's, cow's, and goat's milk in the concentrations of 159, 121, 149 and 108 ng/ml, respectively. Total DDT levels were found to be 158 ng/ml in mother's milk, 116 ng/ml in cow's & 92 ng/ml buffalo's & 88 ng/ml in goat's milk. These residues show that DDT & HCH used for pest control & agricultural purpose accumulates in human and animal body through the food chain and environment and is excreted through milk. Organochlorine pesticides (OCPs) with their high persistence in the environment accumulate in fatty foods and human adipose tissues. Contamination of human milk by organochlorine and other related compounds has been reported throughout the world (GEMS, 1998). During the recent decade, investigations on persistent pollutant (POPs) pollution in the Asian regions and found that relatively high residue levels of DDTs and HCHs exist in food stuffs (Kannan et al., 1997),

mussels (Monirith et al., 2003) and avian species (Kunisue et al., 2003) from some developing countries and these contaminants are possibly in use for public health purposes even now. Among Asian developing countries, concentrations of DDTs in human breast milk from Vietnam, mainland China, Cambodia, and Malaysia were relatively higher than those from other countries (Kunisue et al., 2004). Human milk, at the top of the food chain represents the major route of elimination of OCPs by lactating women (Rogan et al., 1986; Sim and Neil, 1992; IARC, 1991) concluded that there is insufficient evidence in humans but sufficient evidence in experimental animals to classify DDT as a possible carcinogenic to humans. However, body loads of DDT also raise concerns about potential effects on developing infants and children because DDT transfers across the placenta from

mother to fetus and exposure continues through breastfeeding after birth (Shen et al., 2007). It is well known that they are very dangerous if ingested as an overdose but there is also biological evidence that chronic low-grade exposure to these chemicals, which are very easily absorbed into the body through the skin and lungs, may have adverse effects on mental health (Zhang et al., 2009). The results obtained from other monitoring studies of organochlorine pesticide in human milk in India and abroad are compared with the results obtained from the present monitoring study in Table 4. Total HCH and total DDT levels in the present study are less than those reported in India. This indicates gradual phasing out of these compounds in India and has resulted in the reduction of their residues in mother's milk.

Table 1
Residues of DDT contaminants obtained in animal & mother's milk

Milk's type	No of samples	Residues in ppm			
		op'DDT	pp' DDE	PP'DDD	Total
Woman	10	R: (0.051-0.061)	R: (0.043-0.056)	R: (0.048-0.054)	$\Sigma=0.158(\pm 0.001)^*$
		M \pm 0.056 (± 0.007)*	M \pm 0.050 (± 0.009)*	M \pm 0.052 (± 0.008)*	
Cow	10	R: (0.034-0.042)	R: (0.036-0.048)	R: (0.029-0.043)	$\Sigma=0.116(\pm 0.002)^*$
		M \pm 0.038 (± 0.006)*	M \pm 0.042 (± 0.008)*	M \pm 0.035 (± 0.010)*	
Buffalo	10	R: (0.025-0.038)	R: (0.023-0.035)	R: (0.026-0.037)	$\Sigma=0.092(\pm 0.001)^*$
		M \pm 0.032 (± 0.009)*	M \pm 0.035 (± 0.009)*	M \pm 0.032 (± 0.008)*	
Goat	10	R: (0.023-0.031)	R: (0.025-0.035)	R: (0.02-0.031)	$\Sigma=0.083(\pm 0.030)^*$
		M \pm 0.027 (± 0.006)*	M \pm 0.029 (± 0.007)*	M \pm 0.026 (± 0.008)*	

R: range; M= mean; * figures in parentheses gives SD values.

Table 2
Residues HCH contaminants obtained in animal & mother's milk

Milk's type	No of samples	Residues in ppm				Total
		α -HCH	β -HCH	γ -HCH	δ -HCH	
Woman	10	R: (0.021-0.039)	R: (0.025-0.051)	R: (0.029-0.045)	R: (0.019-0.029)	$\Sigma=0.159(\pm 0.007)^*$
		M \pm 0.030 (± 0.013)*	M \pm 0.038 (± 0.018)*	M \pm 0.037 (± 0.011)*	M \pm 0.024 (± 0.007)*	
Cow	10	R: (0.037-0.058)	R: (0.039-0.063)	R: (0.032-0.068)	R: (0.015-0.025)	$\Sigma=0.121(\pm 0.004)^*$
		M \pm 0.048 (± 0.015)*	M \pm 0.051 (± 0.017)*	M \pm 0.05 (± 0.025)*	M \pm 0.02 (± 0.007)*	
Buffalo	10	R: (0.035-0.045)	R: (0.029-0.038)	R: (0.036-0.058)	R: (0.012-0.022)	$\Sigma=0.149(\pm 0.008)^*$
		M \pm 0.040 (± 0.007)*	M \pm 0.034 (± 0.006)*	M \pm 0.047 (± 0.016)*	M \pm 0.017 (± 0.007)*	
Goat	10	R: (0.032-0.057)	R: (0.023-0.045)	R: (0.021-0.037)	R: (0.012-0.021)	$\Sigma=0.108(\pm 0.012)^*$
		M \pm 0.045 (± 0.018)*	M \pm 0.034 (± 0.016)*	M \pm 0.029 (± 0.011)*	M \pm 0.017 (± 0.006)*	

R: range; M= mean; * figures in parentheses gives SD values.

Table 3
The effect of pesticide concentration (ppm) on recovery from spiked buffalo milk

Pesticide	Spiking Level (mg/Kg)	Recovery (%)			Mean recovery % (± SD)	Average Recovery % (± SD)
		R ₁	R ₂	R ₃		
α-HCH	0.05	87.2	84.0	83.5	84.88 ± 2.00	86.2 ± 1.30
	0.02	90.9	83.8	82.8	85.75 ± 4.44	
	0.10	85.4	88.5	88.5	87.45 ± 1.78	
β-HCH	0.05	89.0	85.6	89.6	88.04 ± 2.15	87.6 ± 1.49
	0.02	85.7	87.9	83.0	85.50 ± 2.45	
	0.10	89.8	93.2	85.5	89.44 ± 3.85	
δ-HCH	0.05	85.8	87.4	86.9	86.69 ± 0.81	88.7 ± 1.49
	0.02	95.5	92.4	96.0	94.61 ± 1.95	
	0.10	82.9	86.6	85.8	85.08 ± 1.94	
γ-HCH	0.05	98.9	92.5	97.9	96.395 ± 3.44	93.6 ± 5.10
	0.02	92.8	95.3	93.7	93.92 ± 1.26	
	0.10	90.0	91.1	90.5	90.53 ± 0.55	
o,p'-DDT	0.05	95.3	89.7	91.9	92.27 ± 2.82	96.4 ± 3.87
	0.02	94.7	99.0	98.3	97.31 ± 2.30	
	0.10	100.9	98.9	99.9	99.89 ± 1.0	
p,p'-DDT	0.05	98.8	99.1	95.2	97.68 ± 2.17	92.0 ± 4.93
	0.02	89.9	87.6	89.7	89.06 ± 1.27	
	0.10	88.7	85.2	93.9	89.19 ± 4.37	
p,p'- DDE	0.05	98.0	96.6	97.3	97.29 ± 0.0	96.0 ± 1.25
	0.02	96.4	92.5	95.5	94.78 ± 2.04	
	0.10	96.9	96.0	94.9	95.92 ± 1.00	

R₁, R₂ & R₃ are the replicates

Table 4

Concentration (ng/g) of organochlorine pesticide residues in human milk in various parts of world

Contries	α-HCH	β-HCH	γ-HCH	δ-HCH	DDE	DDD	DDT	DDT	References
Spain	34.2	235	10.5	279.7	604.1	-	12.5	659.8	Hernandez et al., 1993
Poland	17.5	92.5	15	125	610	12.5	47.5	670	Czaja et al., 1997
Turkey	60	380	17	457	2013	-	100	2357	Coke et al., 1997
France	52	287	37	376	2183	-	79	2262	Bordet et al., 1993
Delhi	1125	495	2100	175	1680	5250	4000	26050	Nair et al., 1996
Mumbai	14.82	259.5	17.5	289.75	232	35	288.5	510.5	Sharma et al., 2001
Agra*									
Bakhoti	32	40	51	123	56	65	58	179	
Chiraigaon	34	43	51	128	56	60	54	170	Anoop et al., 2006
Ghodhakhas	37	40	54	131	56	63	55	174	
Minahas	36	39	52	127	56	66	57	179	
PaliaKalan	30	38	37	24	56	50	54	169	Present

*Agra: Bakhoti, Chiraigaon, Ghodhakhas & Minahas

VI. CONCLUSION

We have reviewed the available data/information of organochlorine pesticides contamination in animal & breast milk of PaliaKalanKheeri, U.P-India. The result demonstrates that considerable amount of DDT & HCH residues are transferred from the animal & mother to infant. Milk can be considered as a

suitable indicator for monitoring the burden of persistent lipophilic chlorinated insecticides in the environment & human body. In view of our observations suggest that further investigation on animal and human exposure in organochlorine pesticides are needed to elucidate future pollution trends and to assess specially infant health risk.

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Livelihood Improvement through Sustainable Large Cardamom Cultivation in North Sikkim

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Abstract- Large cardamom (*Amomum subulatum* Roxb.) belongs to family Zingiberaceae and order Scitaminae is the most suitable cash crop for the hilly terrain of the state of Sikkim. Likewise a large section of farmers in North Sikkim and most parts of Sikkim are engaged in large cardamom cultivation. For years cardamom has been the single most crucial cash crop to these stakeholders. However recent times have shown a steep decline in the land holdings, as well as productivity under large cardamom. Although not evident apparently, it has drastically affected the livelihood of a large section of the rural population. In Dzongu, North Sikkim where Indian cardamom Research institute in collaboration with ICAR has launched the National Agricultural Innovation Project (NAIP) component -III, from 2007. The project has been able to experience and identify certain aspects which need closer attention and evaluation, if large cardamom as a cash crop or simply as a horticultural crop is to be cultivated in the State of Sikkim towards sustainable source of livelihood. The NAIP initiated, with the objective of development of improved farming systems in large cardamom plantation in Dzongu, North Sikkim.

Index Terms- *Amomum subulatum* Roxb., Large Cardamom, Livelihood, NAIP, Sustainable.

I. INTRODUCTION

The NAIP (SRLS) Components-III project “livelihood improvement and empowerment of rural through sustainable farming system in North East India” been implemented in Dzongu in the North District of Sikkim. Ethnic tribes known as Lepchas are the main inhabitants of the areas. The main source of livelihood is agriculture and animal husbandry. Farming is considered as primary profession, where maize, millets, wheat are staple crops. As is a known fact that large cardamom is the important cash crop for the hilly terrain of the state of Sikkim. North Sikkim consisting of Dzongu region is known for cultivation and production of *Dzongu golsey* and *Ramsey* cultivars of large cardamom. *Dzongu golsey* is very much location/region specific in nature. In the recent past area, production and productivity of large cardamom in entire Sikkim particularly in Dzongu area is diminishing at an alarming rate. Major reason for decline in area production and productivity of large cardamom in Dzongu area are menace of *Colletotrichum* blight, *Chirkey*, *foorkey*, pest incidence, cultivation of large cardamom in open area, lack of phytosanitary measures and irrigation during dry periods. North Sikkim contribute major portion of large cardamom production from the state of Sikkim. Its local name is Alainchi in Nepali and Bada elaichi in Hindi,

Sthulaila, Bhadraila in Sanskrit, Bara Ilachi in Bengal, Peralam in Malayalam, Periya elam, Kattelam and Perelam in Tamil Nadu, Pedda Yelakaya in Telegu and didda yelakki in Kannada (V.K. Bisht, 2011). Roxburgh (1820a) was first to describe this plant in his ‘Plants of the Coast of Coromandel’ and in ‘Flora Indica’ (1820b). During base line survey it was observed that there has been decline in the large cardamom production due to various factors such as diseases incidence, methods of agricultural practices, lack of quality planting material, socio-economic conditions, lack of phytosanitation, and absence of proper shade management, lack of irrigation facilities and lack of scientific methods of cultivation.

After the base line survey report and interaction with the community main focus for NAIP, ICRI was the large cardamom, under which nurseries, replantation, gap filling, phytosanitation, plants protection measures, development of agro forestry system, i.e.; by *alnus* sapling plantation, irrigation facilities, ICRI modified *bhattis*, were the main focus that was indicated in the areas. Importance of Scientific methods of propagation through suckers, shade management, phytosanitation, plants protection methods and manureing was given by organizing farmers training programmes. And others cash crops like ginger, garlic, citrus seedling have also been benefited for the farmers for logistic and technical supports. To restore and rejuvenate the damaged plantations and to save large cardamom cultivation in Dzongu area, National Agricultural Innovation Project (NAIP) intervention started 2007 with the following objectives.

- Evaluation and validation of indigenous and improved farming system models for enhancing production in agro ecosystem of disadvantage areas of NEH regions for sustainability, profitability and competitiveness.
- Addressing the constraints of disadvantage to deliverables to facilities the community/people to harness optimum benefits from agriculture sector.
- Capacity building, Skill upgradation, information access and promotion of activity specific SHGs.
- Employment generation through agro-processing and value addition including storage, packaging, transportation and marketing of the produce.

II. METHODOLOGY

The methodology for the project includes the selection of the target area, implementation and stakeholder participation, forming of SHGs and farmers clubs.

Table 1. Name of the Villages within the Project Clusters:

Sl.No	Gram Panchayat Unit	Village
1.	Tingbong	1. Tingbong 2. Nung 3. Namprick 4. Kussong 5. Payal 6. Lingkoo
2.	Passingdang	1. Mentam 2. Passingdang 3. Panang 4. Laven 5. Rukloo 6. Kayam 7. Lingthem 8. Sangkalang

The baseline survey was done during 2008 at the project site. Data was collected from 111 households within two GPU viz., Passingdang and Tingvong (Table 1). Under Passingdang GPU 42 household with population of 293 individuals (137 male and 156 female) and Tingvong GPU with 70 household which has population of 514 individuals (268 male and 246 are female) was surveyed. Total house hold under NAIP Project Clusters within two GPU is 155 numbers with the total population of 807 where male population is 405 and female population is 402 with total area covered of 293.32 ha and the whole population is schedule tribe.

To manage the menace of large cardamom diseases at Dzongu area integrated approach of crop husbandry was adopted. The work plan consisting of establishment of large cardamom sucker nursery, replanting/gap filling in the plantation followed by strict phyto-sanitary measures, managed the problem of the intervention site. Through NAIP intervention and linkage with Spices Board Development division, zonal office Mangan, sucker nurseries were established. Establishment of nurseries was able to address one of the most critical issues that farmers were facing. The farmers generated enough quantity of quality planting material required for planting season. Thirty ICRI improved *bhattis* having capacity of curing 400 kg fresh capsule was constructed as per the design of ICRI, Spices Board, Tadong.

Silpaulin lined water storage tank were tank constructed for the irrigation of large cardamom during the dry seasons. To safe guard the farmer's livelihood security, additional crop component (Citrus, ginger, garlic, radish, pea and raisag) was taken as intervention near silpaulin lined water storage tank site. Productivity rate of 1:6 and 1:8 was observed in ginger and garlic respectively with generation of additional income.

III. RESULT AND DISCUSSION

From two GPU's 100 certified nurseries were established with approximate production of 2, 50,160 suckers. Linkage programme was established with Spices Board (Dev.) Zonal office Mangan North Sikkim. From this intervention assurance of supply of quality planting material was materialized with achievement in expansion of area under new planting and

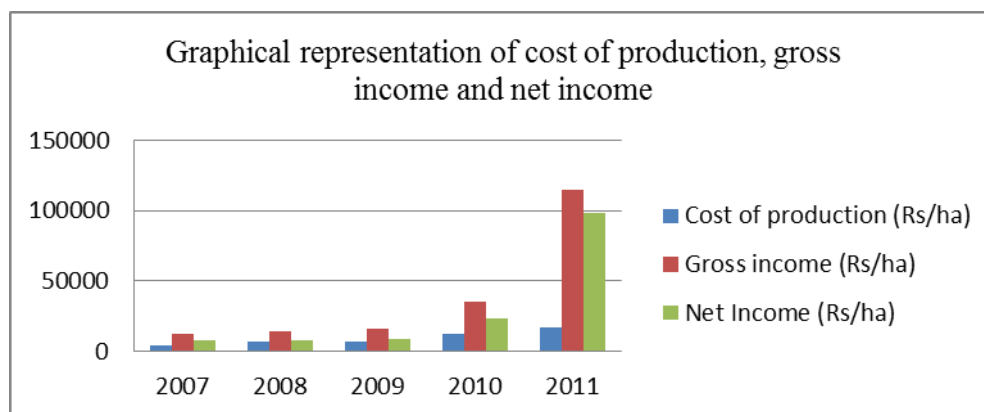
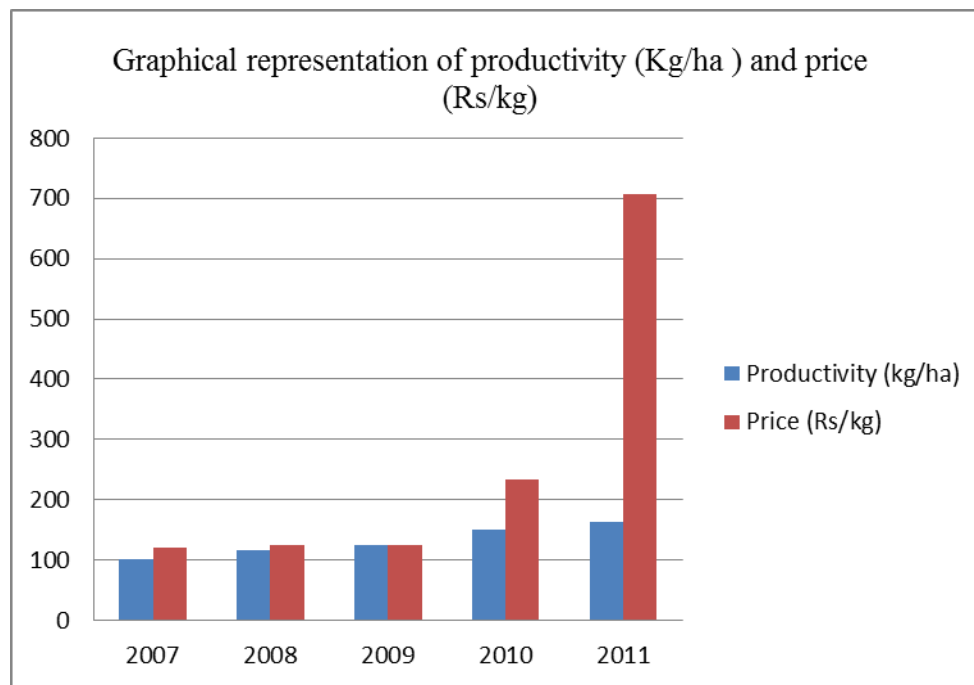
replantation to the tune of 65.22 ha. However an increase in trend of productivity of capsule (14.26 kg/ha) was recorded from the rejuvenation area. More over by selling excess suckers by the beneficiary farmers had earned additional income. Totally 160 ha of large cardamom plantation was brought under phytosanitation work with due application of bioagents viz., *Pseudomonas fluorescens* & *Bacillus subtilis* to 24.5 ha. 47% of crop loss was minimized due to adoption of this plant protection strategy. In traditional *bhatti* capsules were directly heated to remove excess moisture. Due to this direct heating natural aroma and colour is lost during the process of curing. On the other side in ICRI improved *bhattis* cardamom capsule can be cured through indirect heating. As a result natural colour, aroma and flavor is retained in the capsule. ICRI improved *bhattis* were also used to cure other agriculture products. Thirty ICRI improved *bhattis* having capacity of curing 400 kg fresh capsule was constructed as per the design of ICRI, Spices Board, Tadong. Since the end produce had retained its quality criteria capsules fetched 50-100 Rs/kg more price than capsules cured in traditional *bhatti*. Silpauline water harvesting tanks lined with silpauline sheet and one concert tank having storage capacity of 15000 liters was constructed at the intervention site. Apart from it water source modification by installing of PVC drum of 200 liter capacity. Moreover 11 drip irrigation systems were also installed for ensuring irrigation supply to cardamom sucker nursery (Table 2). Assistance through this type of physical supplementation of inputs certainly helps in improving farm productivity and farmers livelihood status. With adoption of scientific method of large cardamom cultivation in holistic approach even with increase in cost of production the farmers realized higher net income and BC ratio for their premium product. Productivity level was increased to the tone of 58% and with realization of Rs. 98196 as net income with BC ratio of 7.0 (Table. 3) (Deka et al, 2012).

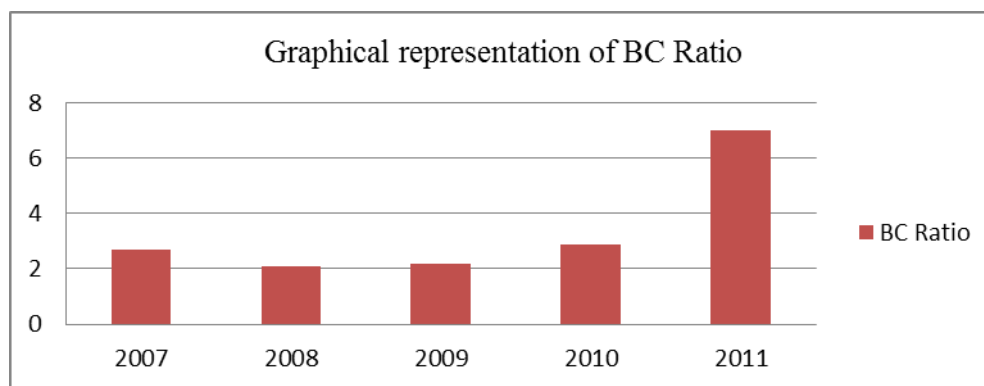
Table 2. Area covered under different intervention

Sl. No.	Interventions	Area covered
1	Large cardamom nursery	10 ha
2	Replantation and rejuvenation	65.22 ha
3	Phytosanitation	160 ha
4	Plant protection	10 ha
6	Irrigation	30 ha
7	ICRI improved bhatti	30 nos.

Table 3. Economics of large cardamom at NAIP intervention site

Sl. No.	Year	Productivity (kg/ha)	Price (Rs/kg)	Cost of production (Rs/ha)	Gross income (Rs/ha)	Net Income (Rs/ha)	BC Ratio
1	2007	102	120	4500	12240	7740	2.7
2	2008	116	125	7000	14500	7500	2.1
3	2009	124	125	7000	15500	8500	2.2
4	2010	150	234	12000	35100	23100	2.9
5	2011	162	708	16500	114696	98196	7.0





IV. CONCLUSION

The NAIP (SRLS) Components-III project “livelihood improvement and empowerment of rural through sustainable farming system in North East India” been implemented in Dzungu in the North District of Sikkim. Ethnic tribes known as Lepchas are the main inhabitants of the areas. Total house hold under NAIP Project Clusters within two GPU is 155 numbers with the total population of 807 where male population is 405 and female population is 402 with total area covered of 293.32 ha and the whole population is schedule tribe. After the base line survey report and interaction with the community main focus for NAIP, ICRI was the large cardamom, under which nurseries, replantation, gap filling, phytosanitation, plants protection measures, development of agro forestry system, i.e.; by *alnus* sapling plantation, irrigation facilities, ICRI modified *bhattis*, were the main focus that was indicated in the areas. Importance of Scientific methods of propagation through suckers, shade management, phytosanitation, plants protection methods and manureing was given by organizing farmers training programmes. And others cash crops like ginger, garlic, citrus seedling have also been benefited for the farmers for logistic and technical supports. From two GPU’s 100 certified nurseries were established with approximate production of 2, 50,160 suckers. Linkage programme was established with Spices Board (Dev.) Zonal office Mangan North Sikkim. 65.22 ha brought under replantation and gap filling, 160 ha under phytosanitation, 10 ha under plant protection and 30 ha area brought under irrigation through the construction of silpauline tank, and 10 drip irrigation system.

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Exploration of GSM and UMTS Security Architecture with Aka Protocol

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Abstract- With the expansion of mobile communication network, incredible changes are taking place in the field of mobile technologies, as requirements are increasing day by day for mobile data services along with them security concerns are also expanding. This paper focuses on the architecture of GSM and UMTS along with Authentication and Key Agreement protocol description, which shows the encryption process used in the authentication of the network and the client over the air interface. In addition, this paper also gives an introduction to some concepts of UMTS security architecture.

Index Terms- GSM, UMTS, Authentication and key agreement, 3GPP and Authentication Vector

I. INTRODUCTION

In the past decade, communications which are wireless in nature experienced an impulsive growth and also became a vital part of the society. Authentication, Encryption, Security and access control are some essential features that should be present in communication network. One of the main reason because of which security is so much important is rely of communication process on radio waves. As they are not protected by any physical boundaries or walls rather than they are created to cover as much area as they can. And due to this they are more exposed for any kind of interception. After considering so many issues in security area, Second Generation (2G) system was developed. In 2G Global System for Mobile Communications (GSM) was most successful one. It was the first one which introduces encryption and cryptographic mechanisms for confidentiality and authentication of telephone system. But GSM also suffers from some security problems similar to weak encryption and authentication algorithms, along with short length of secret key and no authentication process for the network.

The Universal Mobile Telecommunications System (UMTS) is a Third Generation (3G) mobile system which was based on the Global System for Mobile Communications and specified by Third Generation Partnership Project (3GPP) [1]. It was developed on the success of GSM [2, 3, 4, 5]. UMTS offers more bandwidth and spectral efficiency to the network operators by using Wideband Code Division Multiple Access (WCDMA) technology.

This paper is organized as follows: Section II discuss about the security system in GSM. Section III explains about the security architecture of UMTS and 3GPP. Finally, conclusion is present in section IV.

II. GSM SECURITY

Global System for Mobile Communications (GSM) is a standard set which was used to illustrate protocols for 2G cellular network. GSM has been one of the most successful part of the 2G (Second Generation) mobile systems. TDMA was also one of the leading 2G technologies in the United States. One of the main features of 2G was the launch of information transmission in digital form through the air interface. Some advantages of 2G over the earlier ones were improved speech quality, better network capacity, easy data communication process and also enhanced security. The main goal of GSM security is to provide exact billings of phone calls. For the subscriber's authentication a secret key is stored in SIM cards and to protect the authentication, different types of cryptographic algorithms are used. The one of the excellent feature in GSM is its invisibility to the user.

Some essential security features of GSM are:

- User's authentication
- Use of temporary identities for the protection of user privacy
- Encrypted form for communication

But along with these advantages there are some disadvantages also, which are as following:

- Authentication triplets which contain ciphering keys are sent over network without any kind of protection
- Possibility of active attacks over the network

Subscriber's authentication process in GSM needs a secret key K, which is stored in following locations:

- In the users SIM card i.e. Subscriber Identity Module
- In the AuC i.e. Authentication center

The complete process of authentication is based on one key which is stored in user's mobile device. The authentication process is a challenge responsive mechanism which is based on one-way function [6]. The network releases a challenge to the mobile, which contains a random value, but the main attribute is that the challenge should be non-repeatable and also unpredictable. After receiving the challenge mobile device passes it to the subscriber identity module, which further computes an output from the help of one-way function. This output is then sent to the network. There also exists a expected output which is computed by network itself. When both the output gathers at network then it compares them with each other. If both values are

same then it ensures the authentication of mobile. But still there is one flaw in this communication. Suppose there is an active attacker which access a node from the middle of the communication process and showed that this is the end part of the communication line. To handle this kind of problem a cryptographic key can be used to protect the communication.

III. GSM CIPHERING

During the process of authentication a session key (K_c) is generated which is of secret in nature. With the help of this key and encryption algorithm A5, all calls are changed into encrypted form. There are three different standard A5 algorithms present, which are A5/1, A5/2 and A5/3. From these three algorithms A5/1 and A5/2 are confidentially managed by the association of GSM which provides them under some specific license only to its vendors [7]. The A5/3 is a new approach and it is based on f8 ciphering algorithm of UMTS and is easily available on websites also.

There are two main goals of GSM ciphering which are as following:

- Protection of call from eavesdropping scenario between the base station and the mobile device
- Protection of call from those who are non-paying users

The process of ciphering is managed by the base station, it also chooses the type of algorithm which has to be used for the process. But using only ciphering algorithm cannot provide complete protection, since some of them are also weak in nature [8]. This type of flaw in the security architecture of GSM has been improved in the 3G by using different algorithm for confidentiality and integrity over the air interface and by using mutual authentication.

IV. UMTS SECURITY

Design of third generation (3G) was initiated by some organizations like UMTS Forum, European Telecommunications Institute (ETSI), Telecommunications Conference (CEPT) and European Posts. The main idea behind this was to achieve global roaming, so that it will become easy for users to access their mobile systems throughout the world. In starting UMTS was only done on theoretical concepts. Later in 1998, organizations of five standards decide to combine efforts and generate global interoperability. 3rd Generation Partnership Project (3GPP) was formed by combination of some organizations such as Telecommunications Technology Association (TTA), Committee on Telecommunications of American National Institute of Standards (ATSI), ETSI, ARIB and TTC. Introduction of 3G changed the technology to WCDMA from TDMA but still requirements for security remain same.

V. MUTUAL AUTHENTICATION

UMTS provides some security mechanisms and one of them is Authentication and Key Agreement (AKA) protocol, which is designed to help an outside or foreign network in the

authentication process of a roaming mobile device through the vectors which are generated by AuC in the home network. For the execution process of authentication and key agreement amount of time consumption is near about few hundred milliseconds only.

Mutual authentication means that both the network and the device engage in a response and challenge exchange. The main objective of authentication and key agreement is to verify that the network contains the secret key for the client and the client contains the secret key for the network, without any actual exchange of the key [9]. There are three entities which are involved in the process of authentication of UMTS system, these are [10]:

- Authentication Center (AuC) and Home Environment,
- Visitors Location Register (VLR),
- Terminal or USIM.

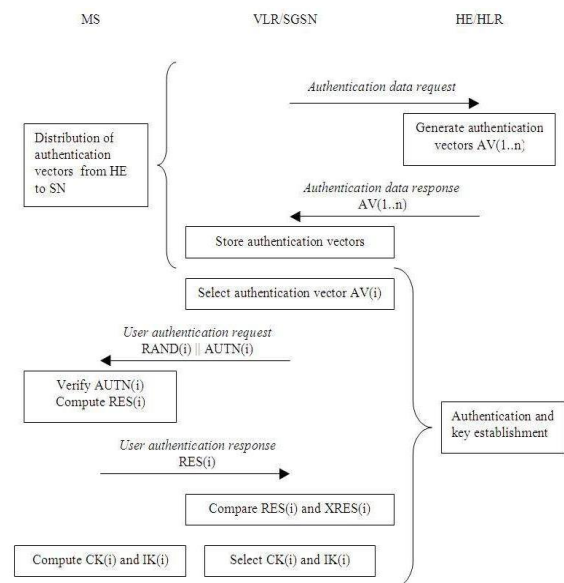


Fig 1: Working of AKA process in UMTS from [11]

When Home Environment receives an authentication request then it generates authentication vectors of five components Expected Result (XRES), Integrity Check (IK), Session Key (CK), Random Challenge (RAND) and Authentication Token (AUTN). Each of Authentication Vectors can be used only one time for the authentication of USIM [11]. Each of AV is generated using sequence number (SQN) and Key. After receiving these authentication vectors are stored in visitor location register. In the next step only one of the AV is selected and a user authentication request which contains RAND and AUTN is sent to the MS or Mobile Station. The MS then examines the network authentication token (AUTN) by verifying the SQN is not in sync then it discards the authentication process but also allows for retry. If SQN and AUTN are correctly verified by the Mobile Station, then it shows that the network has been successfully authenticated by the client.

After this MS generates its own RES or authentication response by using both RAND and Key then send it to the network. Network then also compares the RES and XRES similarly like GSM. If both the values are equal then it shows the successful authentication to the network and the client.

VI. AUTHENTICATION VECTORS OF AKA

The main core of the authentication mechanism in AKA is combination of authentication vectors. Each AV is used for one session of authentication and key agreement between the AuC or the HE and the Mobile Station.

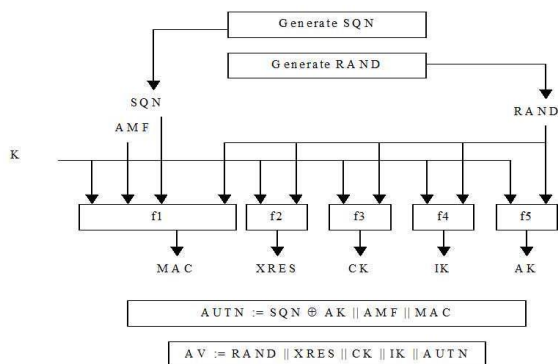


Fig 2 : Authentication vectors generation process from [11]

The authentication vector AUTN is of size 16 bytes, IK is of size 16 bytes, CK is of size 16 bytes, XRES is of size range between 4-16 bytes and RAND is of size 16 bytes. There are seven algorithms which are used for cryptography process of AKA in UMTS [12, 13, 14, 15]:

- f1 : Calculation of Message Authentication Code (MAC)
- f1* : Calculation of MAC-S
- f2 : Calculation of RES and XRES
- f3 : For the computation of CK
- f4 : For the computation of IK
- f5 : For the computation of AK
- f5* : For the computation of AK but in the re-synchronization process

There are some flaws in 3GPP – AKA protocol, which are as follows:

- Transmission process of Authentication vectors is unsecure
- Difficulty in operating sequence number
- Incomplete bidirectional authentication process
- Only same key is shared between mobile equipment and home environment

VII. CONCLUSION

Since the cellular communication systems are the base line for the future communication services, the security part is essential. In this paper we explore some features and beneficial points of GSM and UMTS. In this we also elaborate the use and

implementation of AKA mechanism along with its mutual authentication which helps to eliminate the chances of man-in-the-middle attacks which were quiet possible with GSM. But still there are some flaws in AKA protocol which have an area for future work.

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Analysis of Performance of Core Based Tree and Centralized Mode of Multicasting Routing Protocol

Ijtaba Saleem Khan, Abhinandan Tripathi and Anwar Ahamed Shaikh

Abstract- In recent years online gaming where multiple players from different location participate through internet in same session. Multicasting is very suitable in such environment. Multicasting is a key concept for modern communication. A message is sent from a source host to a group of destination hosts. Communication link is used as a path to receivers. Multicasting uses several multicast routing protocols for forwarding messages from source host to destination hosts. In recent years packet radio has gained much popularity for host to host communication. Power constraints and scarce bandwidth are the major challenges for routing protocols. We performed the comparative study and analysis of the Reactive and Proactive routing strategies for wired ad hoc networks. In this paper we are showing the comparison between the Core Based Tree and Centralized routing strategies.

Index Terms- Multicast routing, ad hoc network, RP, CBT, CM

I. INTRODUCTION

Multicasting is a highly demanded service now a days. Most of the major ISP provides the multicast [12] features. Applications such as online multiplayer gaming, news, audio/video conferencing and so on are used in our day to day life. Earlier in unicasting multiple copies were forwarded one by one to a group of multiple users. In unicasting the bandwidth and delay were the major concern because there was limited bandwidth and delay was there between first and last receiver of message. Steve Deering [4] introduced the concept of multicasting in the late 80s. Later in 1992 IETF (Internet Engineering Task Force) did audiocast which is a widescale test. Multicast added to internet without any change to basic model of network. It uses a new type of address known as host group address. One common situation where multicast is used is distributed conference. In distributed conferencing a set of hosts joins the real time distribution of audio and video. Figure 1 is showing the example of multiple unicast and multicast.

Problem with Unicast

Anything which is neither multicast nor broadcast is unicast. When one sends a packet and there is only one sender and one recipient process, this is unicast. TCP is a unicast oriented protocol. Unicast is supported by UDP also. Unicast was enough for data transmission on internet for many years.

In 1993 when BSD 4.4 releases, multicast first implemented.

In today's technology if a web page is shared to different peoples on internet, can be done through unicast. However if we want to send audio/video which uses a huge amount of

bandwidth relative to web applications, we are having two options either every recipient is connected through unicasting or to use broadcast. Unicasting is not affordable because sending audio/video requires a huge amount of bandwidth for a single connection, so for hundred or more it will be much more and network and sending computer would collapse. Broadcast is a solution if we are interested to send all hosts on a LAN but if we want to send a group of host on one LAN and a group of host on other LAN, the best

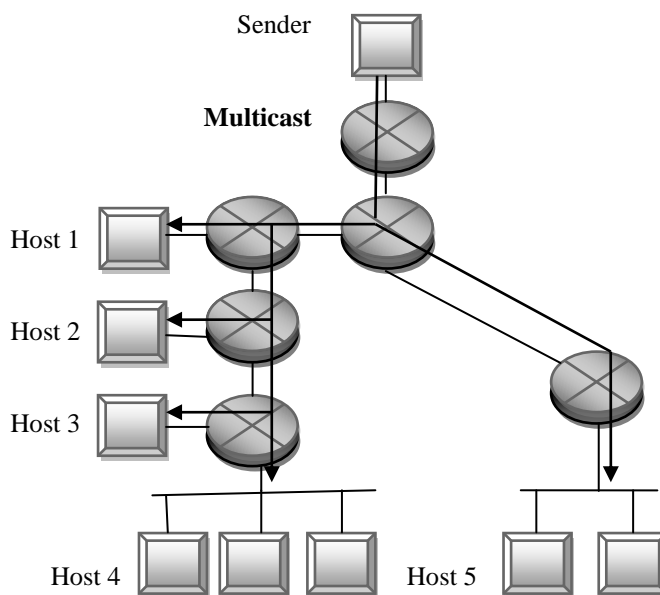
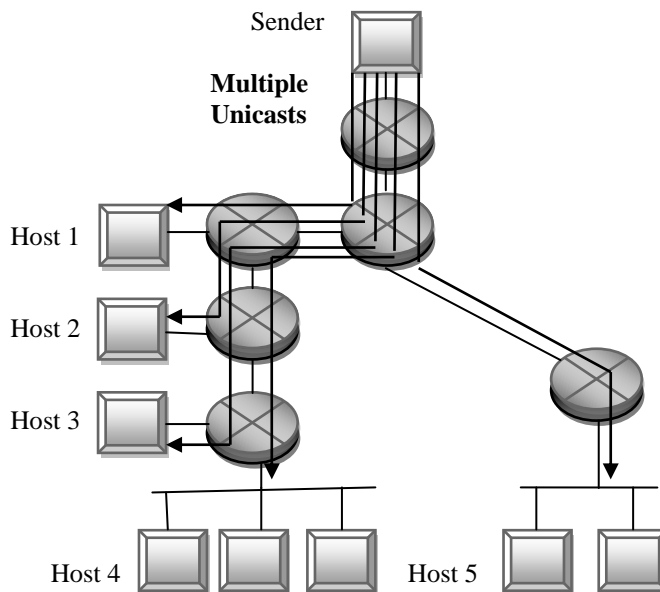


Figure: 1 Multiple Unicasts vs Multicast comparison solution will be one in which we want to send packets to a certain specified address. All interested hosts to join the conference must notice that destination address of packet, read that address while traversing the network and send them for demultiplexing to IP layer. These packets are IP packets, are routed at kernel level. The routing algorithm tells the kernel where to route or not to route them.

II. ROUTING PROTOCOLS – AN OVERVIEW

Ad-hoc [1] On Demand Distance Vector Routing (AODV) [2,3] can be used for scalability study of various communication methods such as unicast, multicast, and broadcast. Routes for unicasting and broadcasting are discovered by route discovery mechanism of broadcast. AODV provides broadcast data delivery using source IP address and IP header's Identification field to uniquely identify the packet. Every node maintains two routing tables in AODV first one as Route Table and another as Multicast Route Table. Route discovery in AODV is done as route request/reply cycle. When a route for a particular destination is needed by certain node Route Request is broadcasted. Any node having this route as current route to that particular destination, unicast Route Reply back to the source node. Every node maintains a table as Route Table for these route information. Route Table keeps the information obtained through these Route request and Route reply messages with other routing information. Primary objective of AODV is not only the unicasting, broadcasting, and multicasting, but also minimizing the broadcast of control packet as well as link breakage information is dissemination to the neighboring nodes that uses that link. AODV provides an on-demand route discovery that is when any node requires a route to any particular destination. Node asking for route discovery does not have a pre-recorded route. In the network, each node maintains two separate counters: broadcast ID and sequence number. The freshness of routes is ensured by the sequence number to the node. Each Route Request is uniquely identified by the IP address of source node and broadcast ID together. A node first updates its route table after receiving Route Request message. Updation for sequence number and next hop is done for the source node. This is known as reverse route entry and is used to relay a Route Reply back to the source. A node that responds the Route Request can have the fresh route to destination or destination itself. Nodes fulfilling the above requirements send a Route Reply message back to source. Route Reply receiving nodes increment the Hop Count by one. Route Table updates this entry for destination node and establishes the forward path to the destination. Route Reply is then unicasted towards recorded next hope to the source node. This forward path is established till the Route Reply reaches the source node. Once the Route Reply reaches the source node a route is established from source node to destination node to send data packets. For ad-hoc networks, multicast routing protocol is an extension of AODV. This protocol is known as MAODV[11]. A tree is created with the nodes joining the group. Tree connects group members as well as non routers which are non group members. These routers exist to connect the group members in the tree. Dynamic group membership is there in multicast routing protocol. Routers along with group members are members of the

tree. There is a unique address to identify every multicast group and the freshness of group condition is traced by group sequence number. As we have discussed in AODV any interested node to join any particular group broadcasts a Route Request message. Node having fresh enough routes to that multicast group can give a response by Route Reply message. To become member of such a group which does not exist, node sending message to such groups becomes the leader of group and responsible to maintain that group. Periodically group hello messages are broadcasted to check the tree structure's connectivity. QoS multicast routing protocol are reviewed long in current scenario. Power consumption and energy efficiency are the major concerns in quality of service for multicast routing protocols. QoS extensions to MAODV use the bandwidth, delay and packet loss as characteristic of MAODV. A QoS Route Request is send by the source node. Intermediate nodes forward this Request until it reaches the destination. Destination node forwards the Route Reply by adding a delay time known as predefined node traversal time (NTT). These NTTs are added by all intermediate nodes to the delay values and there routing table is updated. For data transmission minimum delay route is selected. For bandwidth requirements similar techniques are used. One more protocol for managing the group is IGMP. This protocol tells the host's membership information of group to multicast routers. The multicast tree is build using vertices and edges depending on minimum cost or smallest path. The tree can be defined mathematically as $G(V,E)$ where V denote the vertices and E represent the edges of the tree.

III. TAXONOMY OF MULTICAST ROUTING PROTOCOLS

Multicast routing protocols can be classified on various issues into different categories. For instance one can classify them as sparse and dense mode protocol. PIM is one of the protocols which can operate as PIM-SM and PIM-DM. Another way to classify the multicast routing protocol is how the connectivity is initiated and maintained. Two methods in this category are source initiated and receiver initiated connectivity. In source initiated approach source initiates the multicast group formation and a tree is constructed per sender. In source initiated protocol periodically join request is polled, Packet receivers of this join message if they are willing to join responds with reply packets. In receiver initiated approach a join message is flooded by the receiver and a path towards the multicast group is searched. One common technique used in receiver initiated approach is that every group has a node known as rendezvous point to accept join requests. This rendezvous point is also known as the core. The shortest path connection from core to every member of the group is maintained. Multicast routing protocols can also be divided as reactive and proactive protocols. Reactive protocols are on demand protocols, this on demand approach is the best suited mesh or tree network is created whereas due to dynamic variation in topology table driven protocol is used for Manets. Multicast routing protocols further classified as mesh and tree based topology [5]. In tree based protocol only one route from source to destination is available whereas in mesh based protocols there exist more than one path for source destination pair. Tree based topology can be further classified as shared tree [13] and source based shortest path tree.

In shortest path tree a minimum cost spanning tree is maintained using Dijkstra's algorithm or any other minimum spanning tree algorithm whereas in shared tree a core is selected and data from source is first send to core later it forwards destination by appropriate route. When the group members are densely distributed, shortest path tree is used to minimize the delay. In shared trees resource utilization is much better than shortest path trees. Figure 2 is showing the classification of routing protocols for wired network.

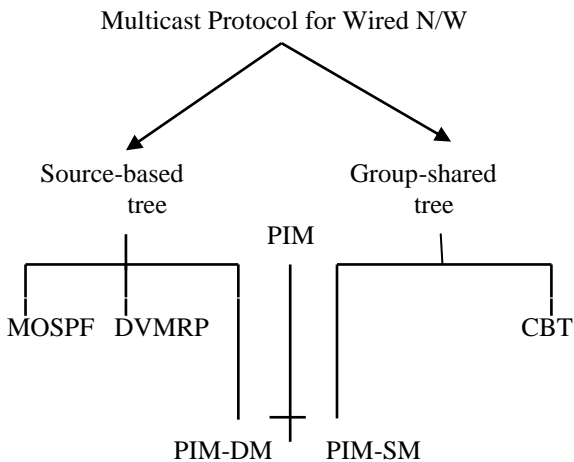


Figure: 2 Classifications of Wired Multicast Protocols

IV. MULTICASTING PROTOCOL FOR WIRED NETWORK

Distance Vector Multicast Routing Protocol (DVMRP)

Distance vector Multicast Routing protocol [6] is originally driven from Routing Information Protocol. The difference between RIP and DVMRP is that RIP takes the information of next hop and forwards the unicast packets towards the destination whereas DVMRP takes the information of previous hop and makes delivery tree back to the source. Now DVMRP constructs its delivery based on Reverse Path Multicasting. The first packet send from source to destination is flooded across internetwork. Branches which are not coming from any group member are truncated by the use of "prune" message. If a new host joins that pruned branch then a new type of message called "graft" message quickly backs that branch. Prune messages are forwarded hop by hop whereas the graft message are sent one hop back until they reach a node which is available on that multicast delivery tree. DVMRP floods the packets periodically. If there are more than one router present in a subnetwork the one close to the source is elected as incharge to forward multicast messages. Multicast messages are simply discarded by other routers. If the two routers have the same distance from the source then the router having lowest IP address is elected.

Multicast Extensions to OSPF (MOSPF)

MOSPF[7], an extension of OSPF uses group membership obtained from IGMP and also obtains the unicast routing information from OSPF. For each (source, group) pair MOSPF builds a multicast forwarding tree. MOSPF supports hierarchical routing in which all host are partitioned into autonomous systems. To distribute unicast routing information within an AS,

Interior Gateway Protocol is used. AS is further divided into OSPF area, based on the address range. With the help of these areas border routers can identify every router in that area. Area in OSPF is similar to IP network subnetting. Routing in OSPF can be intra-area routing or inter-area routing as it is limited to single OSPF or multiple OSPF. Intra-area routing runs within a single OSPF area, supporting multicast in which sender and receiver are in the same OSPF area of an autonomous systems. Inter-domain routing is used when the sender and the receiver are in different Autonomous Systems. MOSPF uses area border router (ABR) to support inter-domain routing. These ABR works as inter-area multicast forwarders.

Protocol-Independent Multicast (PIM)

Protocol Independent Multicast (PIM)[5] is independent of any particular unicast routing protocol providing scalable multicast routing across the internet. It is developed by Inter Domain Multicast Routing working group of the IETF. Basically PIM have two variations as PIM Dense-Mode (PIM-DM) [9] and PIM Sparse-Mode (PIM-SM) [10]. PIM-DM is a source based multicast routing protocol whereas PIM-SM is core based multicast routing protocol. PIM-DM is suitable for that area where group members are frequently available, densely populated and plentiful bandwidth is available. PIM-SM is suitable when the group members are widely distributed across the globe and bandwidth is limited. It must be noticed that sparse mode does not mean that group members are distributed sparsely but the groups are sparsely present across the internet. In the next two sections these two protocols are reviewed.

Protocol Independent Multicast- Dense Mode (PIM-DM)

PIM-DM is very much similar to Distance Vector Multicast Routing protocol. PIM-DM also uses RPM algorithms to construct delivery tree. It builds source based multicast tree. Although unicast routing protocols are used to find the path back to the source node, PIM-DM is independent of the mechanism used by unicast routing protocols. DVMRP and MOSPF are different as RIP-like exchange message is used by DVMRP and OSPF link state database is used by MOSPF. Another difference between DVMRP and PIM-DM is that in DVMRP child nodes in delivery tree obtain the forwarded multicast messages while in PIM-DM all downstream interfaces obtain the forwarded multicast messages until it receives prune messages. So PIM-DM also needs mechanism to deal with duplicate messages. PIM-DM is chosen because it eliminates routing protocol dependencies and also the overhead at each router due to calculation of child interface. A previously pruned branch can be active by sending graft messages as in DVMRP.

Protocol Independent Multicast-Sparse Mode (PIM-SM)

PIM-SM can use both the approaches core based tree and source rooted tree for multicasting. In PIM-SM to receive multicast messages of multicast groups routers explicitly announce their will while in dense-mode all routers receive the multicast messages unless the prune message is sent. The other difference is that a "rendevous point" (RP) or the "core" that is employed in PIM-SM. Any receiver interested in multicast packets has to join a multicast tree explicitly. Some rendezvous points are selected for each group. One of the RP is selected as primary RP.

All packets destined for any multicast group are forwarded by this RP. A designated router (DR) is selected for every multicast domain. Multicast group membership messages are handled by this DR.

V. ROUTING STRATEGIES

Core Based Tree (CBT) Multicast Routing Protocol

Core based Tree[8,10] is sparse mode, protocol independent shared tree protocol. CBT is rooted at Core routers. One more router in every domain is present known as Designated Router. Multicast Group Membership messages are handled by these DRs.

Finding Core Router

In the CBT domain a set of routers are configured as candidate core routers. Candidate core messages are exchanged using these routers. One of the router among these is elected as Boot Strap Router. This Boot Strap router selection is priority based. If equal priority is there then router having highest IP is selected. Now candidate core messages by the other core routers is unicast to the Boot Strap Router as a keepalive in every 60 seconds. A candidate core set is assembled using these candidate core messages. Now using boot strap messages this candidate core set is advertised to all CBT routers in that domain. To join a group using IGMP router runs a hash algorithm against candidate core set. This gives the correct core router for that group.

Finding The Designated Router

Designated Routers are elected using the HELLO messages on a multi access network. CBT DR concept is same as MOSPF DRs and DVMRP Designated Forwarders. RPF is not used by CBT for checking the forwarding of packets. When there are multiple paths towards the core then DRs are especially important for preventing loops. CBT interfaces are configured using preference values between 0 and 255. A HALLO message carries these values. Routers having preference values between 1 and 254 are eligible to become DR. The lower number gets higher preference that is a preference value with 5 is more eligible with preference value 10. CBT router having preference value 0 is selected as DR as shown in figure 3.

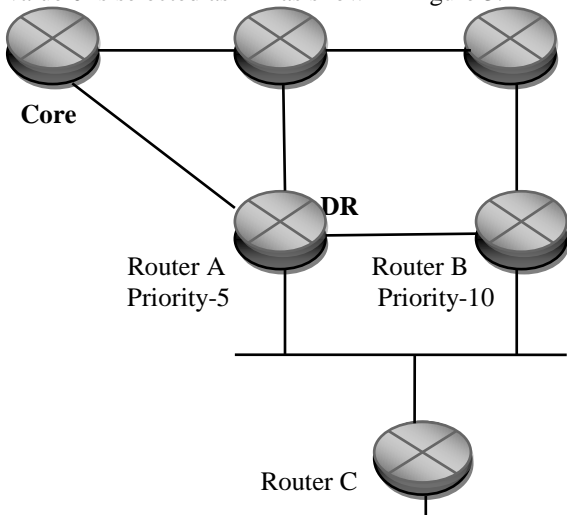


Figure: 3 CBT electing designated router (DR)

Working of CBT

The location of Core can be anywhere in the network, one Core can be used as root for many group trees. Links leading to interested receivers are included in CBT. Any host is interested to join any particular group may join using IGMP membership report message. Using explicit join, CBT router forwards packet for a particular group. This router graft itself from the multicast tree of that group. Now router first checks the core for that particular group in its routing table and a JOIN_REQUEST message towards the core is forwarded. These JOIN_REQUEST messages are examined by the next hop routers for the group and core addresses. If router is an on tree router or a core router a JOIN_ACK message to the originator of JOIN_REQUEST is sent. It indicates that Originator now successfully joined. If the router is neither in group tree nor the core, must join the tree also. Router consulting its own routing table for core identification and a JOIN_REQUEST message is forwarded upstream. If the JOIN_ACK is not received within 7.5 seconds this transient join state is deleted and unsuccessful join is considered. Two interfaces are present, upstream towards the core is called as parent interface and downstream towards the group member is child interface. When tree is created using JOIN_ACK, an ECHO_REQUEST is sent every 60 seconds by the child router to its parent router. Only the originating child routers address is present in this ECHO_REQUEST message. An ECHO_REPLY message is responded by the parent listing those groups for which messages are forwarded. A timeout period of 70 seconds is there for ECHO_REPLY after that parent router is declared as unreachable. Likewise if a group is not listed in the past 90 seconds this is also declared as invalid. Two messages are now sent as QUIT_NOTIFICATION upstream towards parent router and FLUSH_TREE downstream for listing all invalid group addresses. This FLUSH_TREE is further sends towards the downstream and so on till all branches of tree having routers

Routers are deleted. QUIT_NOTIFICATION message is also used for pruning. For checking of a particular group that there are no attached members, a router uses IGMP leave group messages. By checking it, router forwards QUIT_NOTIFICATION message to its parent router. This message contains that group address to be pruned. If there are no group members attached to this parent router and no child interfaces are present then this parent router also forwards the QUIT_NOTIFICATION message upstream. This continues until a core or an active on tree router is obtained.

Centralized Multicast (CM)

All major multicast routing schemes assumes that the routers participate in data movement and control algorithm both. For example if we see the DVMRP approach we will find that multicast routers forwards packets and also participate in DVMRP protocol. Similar requirements are with the CBT and PIM. By involving in both data forwarding and control algorithm, complexity of router is substantially increased. For multicast forwarding router needs to support complex routing and if flow and reservation protocol are also be there it will make the task much more difficult. We will take the approach that not only decouples data movement and control but special control elements that centralize the control. A two level hierarchy as

shown in figure 4 is used to arrange the control elements. This two level controls the multicast routing within autonomous system and between autonomous systems. Autonomous systems (ASs) are also called as domains. Control element in each domain is called a gateway and the other one linking these gateways is called as root controllers. Figure 4 is showing the gateways and root controllers. Our approach is to centralize the control, because of this it is called as Centralized Multicast or CM [14].

In CM, Each domain is having a well known gateway. Host interested to join a particular multicast group determine the IP address of the gateway. Host may discover the group IP address in variety of ways. Host can get the address using session discovery or a centralized server.

Working of CM

When a new sender comes in the contact of gateway, it grafts the sender if a multicast tree exist otherwise creates a new tree with only node as sender. Grafting is done as a shortest path tree from sender to the existing tree by sending ADD messages. These messages are forwarded using appropriate routers. If creates the tree with only one node then no computation of shortest path is done. This working is if groups are present within domain.

If the group span across different domains the new sender first contacts the gateway present in that domain. Now This particular gateway contacts with the nearest root controller. Now two cases arise whether the root controller knows that particular gateway or it does not know the presence of that gateway. If the root controller knows the group it forwards the JOIN message to that gateway of domain. Group is created by this gateway for admission control. Gateway replies with an OK message to root controller. On receiving the OK message from gateway, root controller grafts the sender. If the root controller does not know the existing group, either group is not present or it is present and not known by root controller. In both cases root controller waits for a certain period. This period is state exchange period to know about the group. A new group is created by the root controller if the group does not exist. And information is forwarded to other root controllers. If the group is existing then root controller grafts that sender in the tree present. In CM the tree within the domain can be source specific shortest path tree or bidirectional shared tree whereas in inter domain multicasting a shared tree is used.

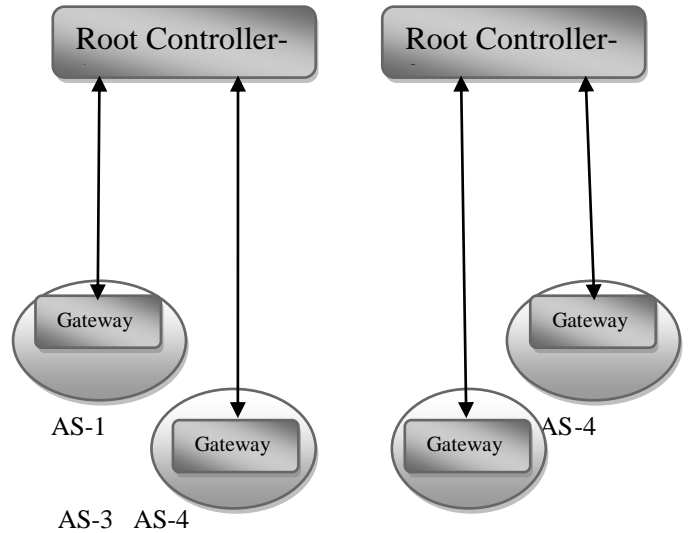


Figure: 4 Gateways and root Controllers

In CBT a JOIN message is forwarded from a router to the core. This message goes through different intermediate routers in the shared tree to that particular node. In CM the JOIN message is first forwarded to the gateway which sends the ADD message to the appropriate routers. The path associated with these ADD messages is same as the path associated with the shared tree constructed in CBT. So the CM will take additional messages between the sender and the gateway. So there is an increased overhead in Centralized Multicast with respect to CBT.

VI. EXPERIMENTAL RESULT

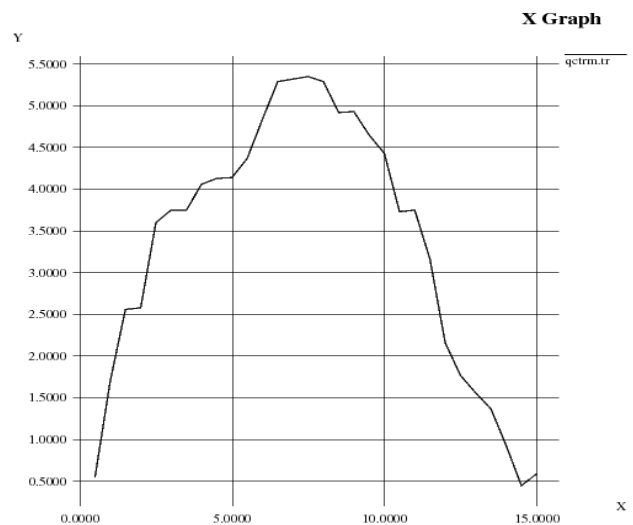


Figure: 5 Graph for QoS of Centralized mode showing time interval on x-axis and quality of service on y-axis.

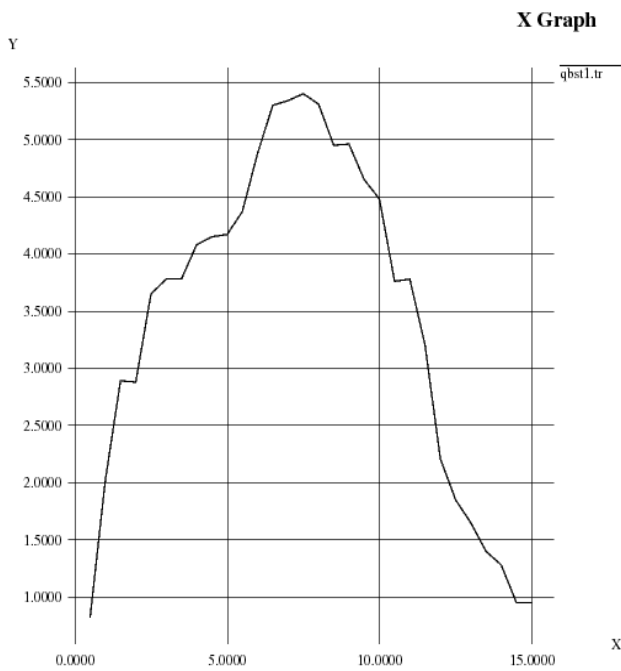


Figure: 6 Graph for QoS of CBT mode showing time interval on x-axis and quality of service on y-axis.

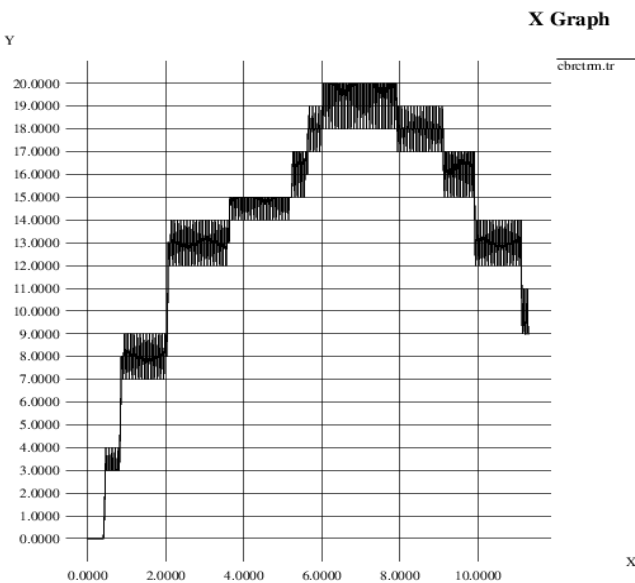


Figure: 7 Performance of Centralized mode showing time interval on x-axis and number of packets on y-axis

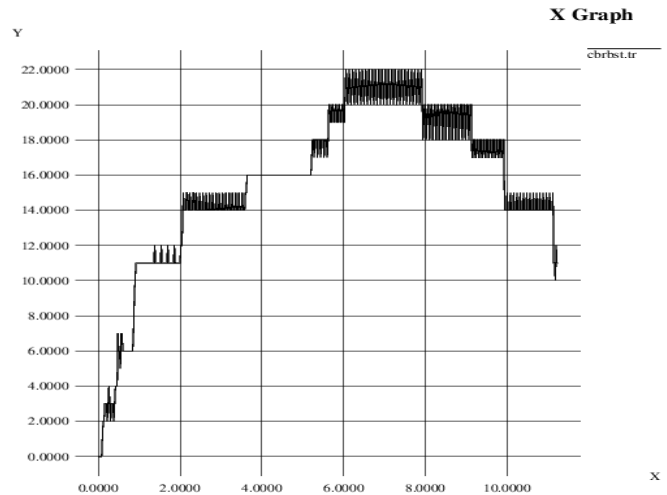


Figure: 7 Performance of CBT mode showing time interval on x-axis and number of packets on y-axis

VII. CONCLUSION

In this paper I have implemented the Centralized mode and CBT mode of routing protocol. NS-2 simulator is used to integrate the module using tool command language. Packet delivery ratio metrics is used to measure the performances. I have made the performance comparison of Centralized mode and CBT mode. The result indicates that the performance of CBT mode protocol is better than the centralized mode protocol.

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Background Subtraction Algorithm Based Human Motion Detection

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Abstract- Recent research in computer vision has increasingly focused on building systems for observing humans and understanding their look, activities, and behavior providing advanced interfaces for interacting with humans, and creating sensible models of humans for various purposes. In order for any of these systems to function, they require methods for detecting people from a given input image or a video. Visual analysis of human motion is currently one of the most active research topics in computer vision. In which the moving human body detection is the most important part of the human body motion analysis, the purpose is to detect the moving human body from the background image in video sequences, and for the follow-up treatment such as the target classification, the human body tracking and behavior understanding, its effective detection plays a very important role. Human motion analysis concerns the detection, tracking and recognition of people behaviors, from image sequences involving humans. According to the result of moving object detection research on video sequences. This paper presents a new algorithm for detecting moving objects from a static background scene to detect moving object based on background subtraction. We set up a reliable background updating model based on statistical. After that, morphological filtering is initiated to remove the noise and solve the background interruption difficulty. At last, contour projection analysis is combined with the shape analysis to remove the effect of shadow; the moving human bodies are accurately and reliably detected. The experiment results show that the proposed method runs rapidly, exactly and fits for the concurrent detection.

Index Terms- Background model, Background subtraction, Background updating, moving object detection

I. INTRODUCTION

An important stream of research within computer vision which has gained a lot of importance in the last few years is the understanding of human activity from a video. The growing interest in human motion analysis is strongly motivated by recent improvements in computer vision, the availability of low-cost hardware such as video cameras and a variety of new promising applications such as personal identification and visual surveillance. It aims to automatically guess the motion of a person or a body part from monocular or multi-view video images. Human body motion analysis has been an interesting research for its various applications, such as physical performance, evaluation, medical diagnostics, virtual reality, and human-machine interface. In general, three aspects of research

directions are considered in the analysis of human body motion: tracking and estimating motion parameters, analyzing of the human body structure, and recognizing of motion activities.

At present methods used in moving object detection are mainly the frame subtraction method, the background subtraction method and the optical flow method. The presence of moving objects determined by calculating the difference between two consecutive images, in the frame subtraction method. Its calculation is simple and easy to implement. For a variety of dynamic environments, it has a strong adaptability, but it is generally difficult to obtain complete outline of moving object, responsible to appear the empty phenomenon, as a result the detection of moving object is not accurate. Optical flow method is to calculate the image optical flow field, and do clustering processing according to the optical flow distribution characteristics of image. This method can get the complete movement information and detect the moving object from the background better, however, a large quantity of calculation, sensitivity to noise, poor anti-noise performance, make it not suitable for real-time demanding occasions. The background subtraction method is to use the difference method of the current image and background image to detect moving objects, with simple algorithm, but very sensitive to the changes in the external environment and has poor anti-interference ability. However, it can provide the most complete object information in the case of the background is known. In this paper, in a single static camera condition, we combine dynamic background modeling with threshold selection method based on the background subtraction, and update background on the basis of exact detection of object, this method is effective to improve the effect of moving object detection. Any motion detection system based on background subtraction needs to handle a number of critical situations such as:

1. Noise image, due to a poor quality image source;
2. Gradual variations of the lighting conditions in the scene;
3. Small movements of non-static objects such as tree branches and bushes blowing in the wind;
4. Undeviating variations of the objects in the scene, such as cars that park (or depart after a long period);
5. Sudden changes in the light conditions, (e.g. sudden raining), or the presence of a light switch (the change from daylight to non-natural lights in the evening);

6. Movements of objects in the background that leave parts of it different from the background model;
7. Shadow regions that are projected by foreground objects and are detected as moving objects.
8. Multiple objects moving in the scene both for long and short periods;

The main objective of this paper is to develop an algorithm that can detect human motion at certain distance for object tracking applications. We carry out various tasks such as motion detection, background modeling and subtraction, shadow detection and removal.

II. LITERATURE SURVEY

The importance and popularity of human motion analysis has led to several previous surveys.

Neeti A. Ogale[1] discussed a agent sample of techniques for finding people using visual input. These techniques are classified with respect to the need for pre-processing ,features used to describe human appearance,use of explicit body models.

Prithviraj Banerjee and Somnath Sengupta[2] proposed Automated Video Surveillance System .The system employs a novel combination of an Adaptive Background Modeling Algorithm ,based on the Gaussian Mixture Model and a Human Detection for Surveillance (HDS) System. The HDS system incorporates a Histogram of Oriented Gradients based human detector which is well known for its performance in detecting humans in still images.

Xiaofei Ji, Honghai Liu[3] provides a total survey of human motion detection with the variation on view-invariant expression, and detection of special facial expressions and proceedings. In order to help readers understand the incorporated development of visual analysis of human motion detection, this paper presents recent growth in human detection, view-invariant pose demonstration and estimation, and human performance understanding.Public available standard datasets are recommended. The last replace assesses the development so far, and outlines some observed issues and future guidelines, and solution to what is necessary to get the goals of total human motion examination.

Murat Ekinci, Eyup Gedikli[4] presented a real-time background modeling and maintenance based human motion detection and analysis in an indoor and an outdoor environments for visual surveillance system is described. The system operates on monocular gray scale video imagery from a static CCD camera. In order to detect foreground objects, background scene model is statistically learned using the redundancy of the pixel intensities in a preparation stage, even the background is not completely stationary. This redundancy information of the each pixel is separately stored in an history map shows how the pixel intensity values changes till now.

Then the highest ratio of the redundancy on the pixel intensity values in the narration map in the training sequence is determined to have initial background model of the scene. A background maintenance model is also proposed for preventing some kind of falsies, such as, illumination changes, or physical changes. At the background modeling and maintenance, the consistency and computational costs of the algorithm presented

are comparatively discussed with several algorithms. Based on the background modeling, candidate foreground regions are detected using thresholding, noise cleaning and their boundaries extracted using morphological filters.

Hanzi Wang and David Suter[5] presented an effective and adaptive background modeling method for detecting foreground objects in both static and dynamic scenes. The proposed method computes sample consensus (SACON) of the background samples and estimates a statistical model per pixel.

Sumer Jabri, Zoran Duric, Harry Wechsler, Azriel Rosenfeld [6] proposed a new method of finding people in video images is presented. Detection is based on a novel background modeling and subtraction approach which uses both color and edge information. We introduce confidence maps, gray-scale images whose intensity is a function of our confidence that a pixel has changed to fuse intermediate results and to represent the results of background subtraction. The latter is used to define a person's body by guiding contour collection to segment the person from the background. The method is understanding to scene clutter, slow illumination changes, and camera noise, and runs in near real time on a standard platform.

Jing Li and Zhaofa Zeng, Jiguang Sun, and Fengshan Liu [7] presented Ultra wideband (UWB) radar technology which has emerged as one of the chosen choices for through-wall detection due to its high range resolution and good dispersion. The motion is a result of high bandwidth of Ultra wideband radar and helpful for better separation of multiple targets in complex environment. One important attribute of human is the periodic motion, such as lungful of air and limb movement. In this paper, the human life is detected and identified by the methods based on fast Fourier transform and S transform; they apply the UWB radar system in through-wall human detection. In particular, they can extract the center frequencies of life signals and locate the position of human targets from experimental data with high accuracy. Compared with other examine studies in through-wall detection, this ultra wideband radar technology is well-built in the particular deliberation and identifying of the continued existence signal under strong insecurity.

III. BACKGROUND SUBTRACTION METHOD

Detection of moving human in videos from static camera is widely performed by background subtraction method. The origin in the approach is that of detecting the moving objects from the difference between the existing frame and a reference frame, frequently called the "background copy", or "background replica"[1]. As a baric, the background image must be a representation of the scene with no moving objects and must be kept regularly updated so as to adapt to the varying luminance conditions and geometry settings. More difficult models have extended the concept of "background subtraction" beyond its literal meaning. The background subtraction method is the common method of motion detection. It is a technology that uses the difference of the current image and the background image to detect the motion region, and it is generally able to provide data included object information. The key of this method lies in the initialization and update of the background image[2]. The effectiveness of both will affect the accuracy of test results.

Therefore, this paper uses an effective method to initialize the background, and update the background in real time.

The process algorithm is described as follow:

1. Sequences of Video Frames
2. Frame Separation
3. Image Sequence
4. Separation of Image Sequence in Current Frame Image and Background Frame Image
5. Perform Background subtraction
6. Detection Of Moving Object
7. Perform Background updating
8. Noise Removal
9. Shape Analysis

A. Background Image Initialization

There are many civilizations to obtain the initial background image. For instance, with the first frame as the background directly or, the average pixel brightness of the first few frames as the background or using a background image sequences without the hope of moving objects to approximate the background model parameters and so on. From these methods average method is commonly used for background Image initialization [3], but there are many shadow problems will occur which can be removed by median method, So the median method is selected in this paper to initialize the background.

Expression is as follows:

$$B_{init}(L,M) = \text{median } F_k(l,m) \quad k=1,2 \dots n$$

Where B_{init} is the initial background, n is the total number of frames selected.

B. Moving Object Mining

Background subtraction is a popular technique to fragment out the interested objects in a frame. This technique involves subtracting an image that contains the object, with the previous background image that has no foreground objects of interest. The area of the image plane where there is a significant difference within these images indicates the pixel location of the moving objects[5]. These objects, which are represented by groups of pixel, are then separated from the background image by using threshold technique.

After the background image $B(l,m)$ is obtained, subtract the background image $B(l,m)$ from the current frame $F_k(l,m)$. If the pixel difference is greater than the set threshold T , then determines that the pixels appear in the moving object, otherwise, as the background pixels. The moving object can be detected after threshold operation.

Expression is as follows:

$$D_k(l,m) = \begin{cases} 1 & \text{if } |F_k(l,m) - B_k(l,m)| \geq T \\ 0 & \text{Otherwise} \end{cases}$$

The flow chart of moving human body mining is shown in (Fig.1): Human body detection is to identify the corresponding part of human from the moving region. But the extracted moving region may correspond to different moving objects, such as vehicles and other such birds, floating clouds, swaying tree and other moving objects [8]. Hence we use the shape features of motion regions to further determine whether the moving object is a human being or not. Judging criteria are as follows:

1. The object area is larger than the set threshold
2. The aspect ratio of the object region should conform to the set ratio.

If these two conditions are met, the moving object is the moving human body or not a human body is conform.

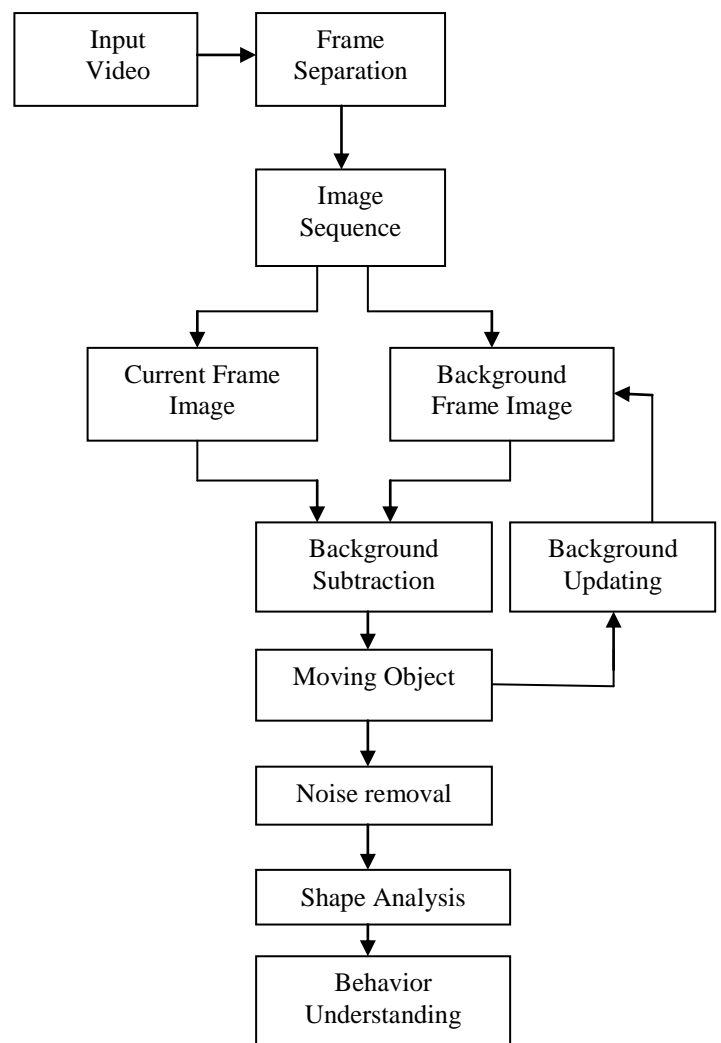


Figure 1. Flow chart of moving human body mining

C. Noise Removal

Since the difficulty of the background, the discrepancy image obtained contains the motion region as well as large number of noise. These noises might be included in the image due to environmental factors, illumination changes, during transmission

of video from the camera to the further processing. Therefore, noise needs to be removed. In this paper we adopt median filter with the 3 X 3 window for filtering noise.

As we know, motion region just not includes human being, but also it may include moving cars, flying birds, flowing clouds and swaying trees and other non body parts. Morphological methods are used for further processing. Corrosion operation is taken to effectively filter out non-human activity areas and by using the development operation they can filter out most of the non-body motion regions while preserving the shape of human motion without injury. After expansion and corrosion operations, some inaccessible spots of the image and some intrusion of small pieces are eliminated, and we get more accurate human motion region.

D. Extraction of Moving Human Body

Some accurate edge regions will be got after median filtering, corrosion and expansion operations, but the region belongs to the moving human body could not be determined. Through inspection, we can find out that when moving object appears, shadow will appear in some regions of the scene. Accurate mining of the moving object affected by the presence of shadow. By analyzing the characteristics of motion detection, we combine the projection operator with the previous methods.

Based on the results of the methods above, height of the motion region will get detected by adopting the method of combining horizontal with vertical projection. This can eliminate the impact of the shadow to a certain level. Then we analyze the vertical projection value and set the threshold value to remove the pseudo-local maximum value and the pseudo-local minimum value of the vertical projection to determine the number and width of the body in the motion region, we will get the moving human body with precise edge. This paper assumes that people in the scene are all in upright-walking state.

E. Behavior Understanding

After successfully detecting the moving humans from one frame to another in an image sequence, the problem of understanding human behaviors from image sequences follows naturally. Behavior understanding involves action identification and description. Human behavior understanding can guide the development of many human motion analysis systems.

Behavior understanding is to analyze and recognize human motion patterns, and to produce high-level description of actions and interactions. The behavior understanding will be the most important area of future research in human motion analysis.

IV. CONCLUSION

Our proposed method of moving object detection will help to find the moving object perfectly in the approved manner. To minimize or avoid the problems approaching in moving object detection, we use threshold method to detect moving object, background initialization and update the background in real time. At last, shadow effect removed by combining projection analysis with shape analysis. This method has also a very good effect on the elimination of noise and shadow, and be able to extract the

complete and accurate picture of moving human body.

V. FUTURE IMPROVEMENT

In this paper, we have considered static background; in future it can be improved for changing/non-static background.

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Diversity of *Dendrobium* Sw. Its Distributional Patterns and Present Status in the Northeast India

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Abstract- The family Orchidaceae is one of the largest groups among the angiosperms and distributed throughout the world. The genus *Dendrobium* is the second largest group among the orchid plant in India and exhibit diverse shapes, colour and morphological characters. They are widely distributed throughout the Northeastern states and recorded with 82 species from the region. The highest number of occurrence with 49 species has been recorded in Arunachal Pradesh and the least number with 5 species in Tripura state from the region. The present analysis reveals 71.95 per cent of the species require attention for conservation, 36.58 per cent of the total species are widely distributed throughout the region, while 26.89 per cent of the species are endemic confining to a particular state.

Index Terms- Orchidaceae, *Dendrobium*, Diversity, Status.

I. INTRODUCTION

Biodiversity is used as a synonym of species diversity or species richness. In Orchid the extreme degree of morphological variability is attributed to genetic drift (Brieger, 1975). Species diversity is an important aspect of biodiversity as genetic diversity often evolves as a result of the interactions between different individuals of the same species and sometimes other subsystem species. Thus, species are the central object to the concept of biodiversity and the knowledge of species taxonomy is the current currency of biodiversity (Heywood, 1996). A biodiversity study comprises the systematic examination of the full array of different kinds of organisms together with the technology by which the diversity can be maintained and used for the benefit of humanity (Paul and Edward, 1991). Hence, conservation of biodiversity and its taxonomic studies for sustainable development is the focused for proper management in the present context.

The Orchidaceae is one of the largest families of flowering plant distributed throughout the world and the greatest diversity occurs in the tropical and sub-tropical climate. The estimated number of species varies from 12000 to 35000 (Fiveash, 1974; Sanford, 1974; Alphonso, 1975; Hunt, 1984; Heywood, 1985; Dressler, 1993), contributing up to 10% of all flowering plants species in the world (Dressler, 1981). A large variety of orchids are found in India, and the numerical strength in terms of species varies from 800 to 1500, which makes India one of the richest orchid floras in tropical Asia (Kumar and Manilal 1990; Dressler, 1981; Joseph, 1982; Santapau and Henry, 1973; Bose and Bhattacharjies 1980. There are also some works on orchid flora of the region by Pradhan (1979) for Sikkim; Katakai (1984) for Meghalaya; Hegde (1984) for Arunachal Pradesh; Chankija *et al.*, (1992) for

Nagaland; Singh *et al.*, (1990) for Mizoram; Chowdhury (1998); Singh (1999); Khyanjeet Gogoi *et al.*, (2012); Chaya Deori *et al.*, (2009); Khyanjeet Gogoi (2011); Bhattacharjee & Dutta (2010); Borgohain *et al.*, (2010); Lucksom (2007); Rao (2010); Rao (2007) and Khyanjeet Gogoi *et al.*,(2012).

In the recent past, from the statistical analysis of the angiospermic flora it has revealed that the family Orchidaceae with 184 genera and 1,229 species forms the second largest family of flowering plants in India (Karthikeyan, 2000). The fascination of an orchid flower is the mimicking of the animals morphology and anatomy parts, like wasps, bees, moths, lizards, butterflies, swans, doves and even human form. Besides of its morphological variability and uniqueness in beauty adorned with sweet fragrances they constitute prized ornamentals in floriculture all over the world. The orchids are popular among the horticulturist for its immense potential market for trade in floriculture industry because of its exquisite beauty.

The Northeast region lies between 22.30°N latitude and 80.97°E longitude and is bordered by China in the north, Bhutan in the west, Bangladesh in the south and Myanmar in the east. The Northeast India falls under the Eastern Himalayas and comprised of eight states viz., Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura, occupies a total geographical area of 2,62,251 km², possesses a great diversity in physiographic and climatic conditions. The region is also known for its diverse cultures, ethnic groups and one of the mega-biodiversity zones in the world. The northeast India accounts for about 750-876 species of orchids under 151 genera (King & Pantling, 1898; Pradhan, 1976, 1979; Katakai, *et al.*, 1984; Hegde, 1987a; Jain 1985; Sharma, 1993; Chowdhery, 1998; Mao & Hynniewta, 1999; Hynniewta, 2000) which are distributed in different parts of the region.

The genus *Dendrobium* is the second largest group in Orchidaceae with 900 species (Dressler, 1993) and widely distributed in the countries like India, China, South East Asia, Japan, Malaya, Philippines, New Guinea, Australia, Pacific Islands and New Zealand, with highest concentration of more than 150 species in Papua New Guinea. The numerical strength of the genus in terms of species has been variously estimated between 900 and 1600 (Holttum, 1957; Hooker, 1890; Santapau and Henry, 1973; Willis, 1973; Hawkes, 1970). As, the genus is very large, biologically diverse and taxonomically complex, it has been variously segregated into sections and sub-sections at different time by different workers (Lindley, 1840; Bentham, 1881; Hooker, 1896; King and Pantling, 1898; Kranzlin, 1910; Schlechter, 1926; Seidenfaden, 1985; Dressler, 1993). In India, it is the second largest genus among the orchid and represented by 103 species distributing in the Eastern Himalayas, Western Himalayas, Western Peninsular, Andaman and Nicobar Island

(Singh *et al.*, 2001). Although the general account and occurrence of Indian *Dendrobium* have been documented right from the old literature on Indian orchid there is no such comprehensive accounts on *Dendrobium* in India and in particular to northeast India where maximum number of species are distributed. Therefore, a survey on biodiversity of North-East *Dendrobium* its distribution and present status has taken up for the present study.

Methodology

The diversity study is based on field survey, collection of specimens from various parts of the region and literature survey.

For collection and pressing and preparation of herbarium specimens, the methods suggested by Jain and Rao (1977) were followed with suitable modifications. The specimens are identified with the help of published literature such as regional floras, standard books and with the consultation of herbarium specimens of Botanical Survey of India (BSI) herbarium (ASSAM) Shillong. The specimens are deposited in the herbaria of Botany department (NEHU), Shillong. The accepted names and its synonyms were given according to the World Checklist of Monocotyledons (Govaerts 2003).

Table 1. Distributional Patterns of *Dendrobium* Species in Northeast India:

** = Synonym; +=Present; - = Absent

** ArP=Arunachal Pradesh; Assm=Assam; Manip=Manipur; Megh=Meghalaya; Mizo=Mizoram; Naga=Nagaland; Sikkim=Sikkim; Trip=Tripura.

Sl. No.	Name of the Species	**Name of the States in North Eastern Region India								Status/Category
		ArP	Assm	Manip	Megh	Mizo	Naga	Sikkim	Trip	
1	<i>Dendrobium acinaciforme</i> Roxb.	+	+	+	+	+	+	-	-	
2	<i>Dendrobium aduncum</i> Wall. ex Lindl.	+	+	+	-	-	-	+	-	Rare , Threatened, Endangered
3	<i>Dendrobium angulatum</i> Lindl. ** <i>D. podagraria</i> Hook.f.	+	-	-	-	-	-	-	+	Rare
4	<i>Dendrobium amoenum</i> Wall. ex Lindl.	+	-	-	-	-	-	+	-	
5	<i>Dendrobium anceps</i> Sw.	+	+	+	+	+	+	+	-	
6	<i>Dendrobium aphyllum</i> (Roxb.) Fischer ** <i>D. pierardii</i> Roxb. ex Lindl.	+	+	+	+	+	+	+	-	
7	<i>Dendrobium aphyllum</i> (Roxb.) Fischer var. <i>katakianum</i> Iswar Barua	-	+	+	-	-	+	-	-	Rare
8	<i>Dendrobium dickasonii</i> L.O. Williams ** <i>D. arachnites</i>	-	-	+	-	+	-	+	-	Rare

	Rchb.f.									
9	<i>Dendrobium arunachalense</i> C. Deori et al.	+	-	-	-	-	-	-	-	Rare, Threatened
Sl. No.	Name of the Species	**Name of the North Eastern Region								Status/Category
		ArP	Assm	Manip	Megh	Mizo	Naga	Sikm	Trip	
10	<i>Dendrobium assamicum</i> S. Chowdhury	-	+	-	-	-	-	-	-	Very Rare
11	<i>Dendrobium bellatulum</i> Rolfe.	-	-	+	-	-	-	-	-	Rare, Threatened
12	<i>Dendrobium bensonae</i> Rchb.f.	-	-	+	-	+	+	-	-	Rare
13	<i>Dendrobium bicameratum</i> Lindl.	+	-	-	+	+	+	+	-	Rare, Threatened, Endangered
14	<i>Dendrobium brymerianum</i> Rchb.f.	-	-	+	-	-	-	-	-	Rare
15	<i>Dendrobium moniliforme</i> (L) Sw. ** <i>D. candidum</i> Wall. ex Lindl.	+	+	+	+	-	+	+	-	Rare, Threatened, Endangered
16	<i>Dendrobium capillipes</i> Rchb.f.	-	-	+	-	+	-	-	-	Rare
17	<i>Dendrobium cariniferum</i> Rchb.f.	-	-	+	-	+	-	-	-	Rare, Threatened
18	<i>Dendrobium salaccense</i> (Blume) Lindl. ** <i>D. catchartii</i> Hk.f.	+	+	-	+	+	-	+	-	Rare, Threatened
19	<i>Dendrobium chrysanthum</i> Lindl.	+	+	+	+	+	+	+	-	
20	<i>Dendrobium chryseum</i> Rolf. ** <i>D. aurantiacum</i> Rchb.f.	-	-	+	+	-	-	+	-	Rare, Endangered, Threatened
21	<i>Dendrobium chrysotoxum</i> Lindl.	+	+	+	-	+	+	-	+	Rare, Endangered, Threatened
22	<i>Dendrobium denneanum</i> Kerr, J. ** <i>D. clavatum</i> Roxb.	-	-	+	-	-	-	-	-	
23	<i>Dendrobium crepidatum</i> Lindl. & Paxt.	-	-	+	+	+	+	+	-	Rare, Threatened, Endangered
24	<i>Dendrobium cretaceum</i> Lindl.	+	+	-	+	+	-	-	-	

25	<i>Dendrobium cumulatum</i> Lindl.	+	+	-	+	-	-	+	-	Rare, Threatened, Endangered
26	<i>Dendrobium darjeelingensis</i> Pradhan	-	+	-	-	-	-	-	-	Very Rare
27	<i>Dendrobium densiflorum</i> Lindl.	+	-	+	+	+	+	+	-	
28	<i>Dendrobium denudans</i> D. Don.	+	-	-	-	+	+	+	+	
29	<i>Dendrobium devonianum</i> Paxt.	+	-	+	+	+	+	+	-	Threatened
Sl. No.	Name of the Species	**Name of the North Eastern Region								Status/Category
		ArP	Assm	Manip	Megh	Mizo	Naga	Sikm	Trip	
30	<i>Dendrobium draconis</i> Rchb.f.	-	-	+	-	-	-	-	-	Rare
31	<i>Dendrobium eriiflorum</i> Griff.	+	+	+	+	-	+	+	-	Rare, Threatened
32	<i>Dendrobium falconeri</i> W.J. Hook.	+	+	+	+	+	+	+	-	Rare, Threatened, Endangered
33	<i>Dendrobium farmeri</i> Paxt.	+	+	+	+	-	-	+	-	Very Rare
34	<i>Dendrobium fimbriatum</i> Hook.	+	+	+	+	-	-	+	-	
35	<i>Dendrobium fimbriatum</i> Var. <i>occulatum</i> Hook	+	-	+	-	-	-	+	-	
36	<i>Dendrobium formosum</i> Roxb. ex Lindl.	+	+	+	+	+	-	+	-	Endangered, Threatened
37	<i>Dendrobium graffithianum</i> Lindl	-	+	-	-	-	-	-	-	Rare
38	<i>Dendrobium gibsonii</i> Lindl.	+	-	+	+	+	-	+	-	Rare, Threatened, Endangered
39	<i>Dendrobium gratiosissimum</i> Rchb.f.	-	-	+	-	-	-	-	-	Rare
40	<i>Dendrobium heterocarpum</i> Wall. ex Lindl. ** <i>D. aureum</i> Lindl.	+	-	+	+	+	+	+	-	
41	<i>Dendrobium hookerianum</i> Lindl.	+	+	-	+	+	+	+	-	
42	<i>Dendrobium infundibulum</i> Lindl.	-	-	+	-	+	-	+	-	
43	<i>Dendrobium jaintianum</i> Sabap.	-	-	-	+	-	-	-	-	Rare, Threatened

44	<i>Dendrobium jenkensis</i> Wall. ex Lindl.	+	+	+	+	+	-	+	-	Rare, Threatened, Endangered
45	<i>Dendrobium khasianum</i> Deori	-	-	-	+	-	-	-	-	Very Rare, Endangered
46	<i>Dendrobium keithii</i> Ridl.	-	+	-	-	-	-	-	-	
47	<i>Dendrobium kentrophyllum</i> Hook.f.	+	+	-	-	-	-	-	-	Rare
48	<i>Dendrobium lindleyi</i> Steud. ** <i>D. aggregatum</i> Roxb.	+	+	-	+	+	+	+	-	
49	<i>Dendrobium linguella</i> Rchb.f.	-	-	+	-	-	-	-	-	Rare
50	<i>Dendrobium lituiflorum</i> Lindl.	+	+	-	-	+	-	-	-	
51	<i>Dendrobium longicornu</i> Lindl.	+	-	-	+	+	+	+	-	Rare, Endangered, Threatened
Sl. No.	Name of the Species	**Name of the North Eastern Region								Status/Category
		ArP	Assm	Manip	Megh	Mizo	Naga	Sikm	Trip	
52	<i>Dendrobium meghalayense</i> Y. Kumar & S. Chowdhury	-	-	-	+	-	-	-	-	Rare, Threatened
53	<i>Dendrobium miserum</i> Rchb.f.	-	+	-	-	-	-	-	-	Rare
54	<i>Dendrobium monticola</i> P.E.Hunt & Summerh. ** <i>D. alpestre</i> Royle.	+	-	-	-	-	-	-	-	Rare
55	<i>Dendrobium moschatum</i> (Buch. Ham.) Sw. ** <i>D. calceolaria</i> Carey ex Hook.	+	+	+	+	+	+	+	-	Rare, Threatened, Endangered
56	<i>Dendrobium mannii</i> Ridl.	+	+	-	-	-	-	-	-	Rare
57	<i>Dendrobium nareshbahadurii</i> Naithani	+	-	-	-	-	-	-	-	Rare
58	<i>Dendrobium nobile</i> Lindl.	+	-	+	+	+	+	+	-	Threatened
59	<i>Dendrobium numaldeori</i> C. Deori	+	+	-	-	-	-	-	-	Rare

	et al.									
60	<i>Dendrobium ochreatum</i> Lindl.	-	-	+	+	+	+	-	-	
61	<i>Dendrobium pachyphyllum</i> (Kuntze) Bakh.f.	-	+	-	-	-	-	-	-	Rare
62	<i>Dendrobium palpebrae</i> Lindl.	+	-	-	+	-	-	+	-	Rare
63	<i>Dendrobium parciflorum</i> Rchb. f. ex Lindl.	+	-	+	-	-	-	-	-	
64	<i>Dendrobium parishii</i> H. Low	+	-	+	-	+	-	-	-	Rare
65	<i>Dendrobium peguanum</i> Lindl.	-	-	-	-	+	-	+	-	Very Rare, Endangered
66	<i>Dendrobium pendulum</i> Roxb.	+	-	+	-	+	-	-	+	Rare, Threatened, Endangered
67	<i>Dendrobium porphyrochilum</i> Lindl.	+	+	-	+	+	+	+	-	Rare, Threatened, Endangered
68	<i>Dendrobium praecinctum</i> Rchb. f.	-	-	-	-	-	-	+	-	Very Rare, Threatened, Endangered
69	<i>Dendrobium primulinum</i> Lindl.	+	-	+	+	+	-	+	-	
70	<i>Dendrobium pulchellum</i> Roxb. ex Lindl.	-	-	+	-	+	+	-	-	
Sl. No.	Name of the Species	**Name of the North Eastern Region								Status/Category
		ArP	Assm	Manip	Megh	Mizo	Naga	Sikm	Trip	
71	<i>Dendrobium pycnostachyum</i> Lindl.	-	-	-	-	+	-	-	-	
72	<i>Dendrobium ruckerii</i> Lindl.	-	-	-	-	+	-	+	-	Rare, Threatened, Endangered
73	<i>Dendrobium spatella</i> Rchb.f.	+	-	-	-	-	-	-	-	Rare, Threatened
74	<i>Dendrobium stuposum</i> Lindl.	+	-	+	+	-	+	+	-	Rare, Threatened, Endangered
75	<i>Dendrobium sulcatum</i> Lindl.	+	+	+	+	+	-	+	-	Rare, Threatened, Endangered
76	<i>Dendrobium terminale</i> Par. & Reichb.f.	+	+	-	+	+	-	+	-	Rare, Threatened, Endangered
77	<i>Dendrobium</i>	-	-	+	-	-	+	+	+	Rare, Threatened

	thyrsiflorum B.S. Williams									
78	Dendrobium transparens Lindl.	+	+	+	+	+	+	+	-	Threatened
79	Dendrobium vexabile Rchb.f.	+	-	-	-	-	-	-	-	Rare
80	Dendrobium wardianum Warner	+	-	+	+	-	+	-	-	Rare
81	Dendrobium williamsonii Day & Rchb.f.	-	+	+	+	-	+	-	-	
82	Dendrobium wattii (Hook. f.) Rchb. f.	-	-	+	-	-	+	-	-	Rare, Endangered

Sectional Distribution of Indian *Dendrobium* from Northeast India:

Section **Bolbidium** Lindl.
Dendrobium pachyphyllum

Section **Callista** (Lour.) Schltr.

Dendrobium lendleyi, *Dendrobium jenkinsii*, *Dendrobium sulcatum*, *Dendrobium chrysotoxum*, *Dendrobium griffithianum*, *Dendrobium densiflorum*, *Dendrobium thyrsiflorum*, *Dendrobium fameri*, *Dendrobium palpebrae*, *Dendrobium meghalayense*

Section **Dendrobium**

Dendrobium brymerianum, *Dendrobium fimbriatum*, *Dendrobium moschatum*, *Dendrobium chryseum*, *Dendrobium gibsonii*, *Dendrobium capillipes*, *Dendrobium heterocarpum*, *Dendrobium chrysanthum*, *Dendrobium ochreatum*, *Dendrobium falconeri*, *Dendrobium wardianum*, *Dendrobium gratiiosissimum*, *Dendrobium pendulum*, *Dendrobium parishii*, *Dendrobium devonianum*, *Dendrobium pulchellum*, *Dendrobium primulinum*, *Dendrobium aphyllum*, *Dendrobium cretaceum*, *Dendrobium bensonae*, *Dendrobium fimbriatum* var. *occulatum*, *Dendrobium crepidatum*, *Dendrobium lituiflorum*, *Dendrobium nobile*, *Dendrobium amoenum*, *Dendrobium arachnites*, *Dendrobium assamicum*, *Dendrobium clavatum*, *Dendrobium khasianum*, *Dendrobium ruckeri*, *Dendrobium hookerianum*, *Dendrobium transparens*, *Dendrobium jaintianum*, *Dendrobium nareshbahadurii*, *Dendrobium pulchellum*.

Section **Breviflores** Hk.f.

Dendrobium aduncum, *Dendrobium linguella*, *Dendrobium stuposum*, *Dendrobium parciflorum*, *Dendrobium bicameratum*.

Section **Formosae** (Benth. & Hook.f.) Hook.f.

Dendrobium bellatulum, *Dendrobium draconis*, *Dendrobium formosum*, *Dendrobium wattii*, *Dendrobium infundibulum*, *Dendrobium cariniferum*, *Dendrobium williamsonii*, *Dendrobium longicornu*.

Section **Stachybum** Lindl.

Dendrobium peguanum, *Dendrobium monticola*, *Dendrobium porphyrochilum*, *Dendrobium denudans*, *Dendrobium eriiflorum*, *Dendrobium pchnostachyum*, *Dendrobium darjeelingense*, *Dendrobium miserum*.

Section **Pedilonum** (Bl.) Lindl.

Dendrobium cumulatum

Section **Rhopalanthe** Schltr.

Dendrobium podagraria

Section **Aporum** (Bl.) Lindl.

Dendrobium acinaciforme, *Dendrobium terminale*, *Dendrobium manni*, *Dendrobium nathanielis*, *Dendrobium keithii*, *Dendrobium anceps*, *Dendrobium spatella*.

Section **Strogyle** Lindl.

Dendrobium kentrophyllum, *Dendrobium parciflorum*.

Section **Grastidium** (Bl.) J.J. Smith

Dendrobium salaccense (**D. catchartii*)

Section **Stuposa**

Dendrobium praecinctum.

II. DISCUSSION

In India, Orchidaceae is the second largest family among the angiospermic flora with 184 genera and 1229 species (Karthikeyan, 2000) and mainly distributed in the Eastern Himalayas along with the northeast region. The region is one of the major habitats of *Dendrobium* in the world and centre of species diversity. Out of 900 species (Dressler, 1993) reported in the world, 103 species are reported from India out of which 77 species are from northeast region (Singh et al., 2001). Under the present investigations 82 species are recorded from different

parts of the region. These species are grouped into 12 sections viz., *Bolbidium*, *Callista*, *Dendrobium*, *Breviflores*, *Formosae*, *Stachyobium*, *Pedilonum*, *Rhopalanthe*, *Aporum*, *Strongyle*, *Gratidium* and *Stuposa* following the grouping made by Seidenfaden (1985). The section *Dendrobium* has got maximum number of species (35) while the section *Bolbidium*, *Pedilonum*, *Stuposa*, *Rhopalanthe* and *Gratidium* comprises least number of species (only 1 in each). The section *Callista*, *Formosa*, *Stachyobium*, *Aporum* includes 10, 8, 8 and 7 species respectively and the section *Breviflores* and *Strongyle* comprises 5 and 2 species respectively. The *Dendrobium* species are distributed throughout the regions with a maximum diversity found in Arunachal Pradesh with 49 species and a minimum diversity of 5 species in Tripura. However, 48 species were recorded in Manipur, 46 Assam, 42 Meghalaya, 41 Sikkim, 40 Mizoram and 30 Nagaland respectively. About 30 species have shown common distributional patterns and present almost in all the states of the region. The species like *D. anceps*, *D. aphyllum*, *D. chrysanthum*, *D. chrysotoxum*, *D. crepidatum*, *D. densiflorum*, *D. devonianum*, *D. falconeri*, *D. fimbriatum*, *D. crepidatum*, *D. lindleyi*, *D. heterocarpum*, and *D. transparens* are found almost in all the states of the region. On the other hand, there are few species, which are endemic to a particular state within the region. For instance, *D. dickasonii* (**D. arachnites*), *D. bellatullum*, *D. brymerianum*, *D. clavatum*, *D. capillipes* and *D. gratiosissimum* are found only in Manipur; *D. monticola*, *D. vexabile*, *D. arunachalense*, *D. nareshbahadurii*, *D. spatella* in Arunachal Pradesh; *D. assamicum*, *D. keithii*, *D. graffithianum*, *D. darjeelingense*, *D. pachyphyllum* in Assam; *D. khasianum*, *D. jaitianum*, *D. meghalayense* in Meghalaya; *D. ruckerii* in Mizoram; *D. praecinatum* in Sikkim and *D. wattii* in Nagaland state. The details state wise distributional pattern of the *Dendrobium* species is depicted in the table 1. It is observed that majority of the species (46 spp.) are confined only in the Northeast region. There are 36 species from northeast region that are common with the rest of the country are, viz., *D. amoenum*, *D. anceps*, *D. aphyllum*, *D. bicameratum*, *D. candidum*, *D. cathcartii*, *D. chrysanthum*, *D. transparens*, *D. crepidatum*, *D. cumulatum*, *D. eriiflorum*, *D. fimbriatum*, *D. heterocarpum*, *D. barbatulum*, *D. monticola*, *D. moschatum*, *D. peguanum*, *D. sulcatum*, *D. formosum*, *D. lindleyi*, *D. aduncum*, *D. chrysotoxum*, *D. densiflorum*, *D. denudans*, *D. devonianum*, *D. falconeri*, *D. farmer*, *D. longicornu*, *D. nobile*, *D. ochreatum*, *D. porphyrochilum*, *D. praecinatum*, *D. stuposum*, *D. terminale*, *D. chryseum*, *D. primulinum* and *D. darjeelingense*.

III. CONCLUSION

In spite of its richness in species diversity, about 71 per cent of the total species found in the region are either in a state of rare, endangered or threatened category (Table 1), which is an alarming signal. Besides these, some of the species reported by earlier workers could not be traced or located probably, due to deforestation or excess collections from their natural habitats. Therefore, urgent steps for conservation have to be taken up at different levels in order to preserve the most popular and economically important genus in the field of floral trade in Asia and other parts of the world. In the present studies some species are identify as a potential in floriculture industry viz., *D.*

chrysotoxum, *D. densiflorum*, *D. falconerii*, *D. wardianum*, *D. chrysanthum*, *D. nobile*, *D. fimbriatum*, *D. infundibulum*, *D. devonianum*, *D. thyrsoflorum*, *D. hookerianum*, *D. lindleyi*, *D. ochreatum*, *D. gibsonii*, *D. lituiflorum*, *D. porphyrochilum*, *D. denudans*, *D. denneanum*, *D. aphyllum*, *D. primulinum*, *D. bensonae*, *D. farmeri*, *D. moschatum* and *D. formosum*. The *Dendrobium* species are biologically diverse and very complex group in general so more scientific research in different aspect is require for better understanding of their systematic and preservation of the Germplasm of this important group.

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Clustering Based Certificate Revocation Scheme for Malicious Nodes in MANET

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Abstract- Certificate revocation is an important security component in mobile ad hoc networks. Owing to their wireless and dynamic nature, MANETs are vulnerable to security attacks from malicious nodes. Certificate revocation mechanisms play an important role in securing a network. When the certificate of a malicious node is revoked, it is denied from all activities and isolated from the network. The main challenge for certificate revocation is to revoke the certificates of malicious nodes promptly and accurately. In this paper, proposed scheme is based upon a clustering-based certificate revocation scheme, which outperforms other techniques in terms of being able to quickly revoke attackers' certificates and recover falsely accused certificates.

Index Terms- mobile Ad Hoc networks, certificate revocation, recovery, clustering

I. INTRODUCTION

Due to advances in wireless communications technologies, Mobile Ad hoc Networks (MANET) has attracted much attention. MANET is a highly flexible network where nodes can freely move and join, with no fixed infrastructure, and thus it is vulnerable to attacks by malicious users. Therefore, ensuring network security is one of the most important issues in MANET. With the increased focus on wireless communications, mobile ad hoc networks (MANETs) are attracting much attention in recent years. MANET is an infrastructure less mobile network formed by a number of self-organized mobile nodes; it is different from traditional networks that require fixed infrastructure. Owing to the absence of infrastructure support, nodes in MANET must be equipped with all aspects of networking functionalities, such as routing and relaying packets, in addition to playing the role of end users.

In MANET, nodes are free to join and leave the network at any time in addition to being independently mobile. Consequently, a mobile ad hoc network is vulnerable to many kinds of malicious attacks, and it is thus difficult to ensure secure communications. Malicious nodes directly threaten the robustness of the network as well as the availability of nodes. Protecting legitimate nodes from malicious attacks must be considered in MANETs. This is achievable through the use of a key management scheme which conveying trust in a public key infrastructure. These certificates are signed by the Certificate Authority (CA) of the network, which is a trusted third party that is responsible for issuing and revoking certificates.

The mechanism performed by the CA [2] plays an important role in enhancing network security. It digitally signs a valid certificate for each node to ensure that nodes can communicate

with each other in the network. In such networks, a certificate revocation scheme which invalidates attackers certificates is essential in keeping the network secured. An attacker's certificate can be successfully revoked by the CA if there are enough accusations showing that it is an attacker. However, it is difficult for the CA to determine if an accusation is trustable because malicious nodes can potentially make false accusations. A malicious node will try to remove legitimate nodes from the network by falsely accusing them as attackers. Therefore, the issue of false accusation must be taken into account in designing certificate revocation mechanisms.

II. EXISTING TECHNIQUES

In URSA [1], two neighboring nodes receive their certificates from each other and also exchange certificate information about other nodes that they know. Nodes sharing the same certificate information are regarded as belonging to the same network. In these networks, the certificate of a suspected node can be revoked when the number of accusations against the node exceeds a certain threshold. While URSA does not require any special equipment such as Certificate Authorities (CA), the operational cost is still high.

URSA proposed by Luo *et al.* [5] uses certified tickets which are locally managed in the network to evict nodes. URSA does not use a third-party trust system such as a CA. The tickets of the newly joining nodes are issued by their neighbors. Since there is no centralized authority, the ticket of a malicious node is revoked by the vote of its neighbors. In URSA, each node performs one-hop monitoring, and exchanges monitoring information with its neighbors which allow for malicious nodes to be identified. When the number of votes exceeds a certain threshold, the ticket of the accused node will be successfully revoked. Since nodes cannot communicate with other nodes without valid tickets, revoking a node's ticket implies the isolation of that node.

In contrast to URSA, DICTATE [2] employs a number of CAs to efficiently perform the publication and revocation of certificates. CAs monitor node behavior in order to detect attacks and share the certificate information with each other. If a CA identifies a malicious node, the certificate of the node is revoked by the CA and its information is shared among other CAs, thus resulting in the complete exclusion of the node from the network. However, the deployment of a sufficient number of CAs is not an easy task in MANETs.

In [3], the certificate of a node which has been accused by just one node will be revoked by every node. As a result, this scheme exhibits good performance in terms of promptness and low operating overhead. However, this scheme poses a controversial point that an accuser will be removed from the

network along with the accused node. This approach is fundamentally flawed, and so this scheme cannot be commonly used.

The method proposed in [4] introduces a time session to refresh the certificate information of each node. The accusation count is reset at the end of each session. Therefore, while this scheme is able to mitigate the damage caused by false accusations, the performance can be largely degraded by the increase of malicious nodes.

In the voting based scheme [3], [6], if the number of nodes, which have accused a particular node, exceeds the predefined threshold, the accused node is removed from the network by having its certificate revoked. This scheme takes into account of the false accusations, i.e. each accusation has a different weight according to the accuser's reliability. However, this scheme has two problems, a large amount of operational traffic and a long revocation time, because the opinion of every node in the network is needed for each node to decide whether to revoke the certificate of the malicious node or not.

III. NODE CLUSTERING

By classifying nodes into clusters, the proposed scheme allows each Cluster Head (CH) to detect false accusation by a Cluster Member (CM) within the cluster. Node clustering provides a means to mitigate false accusations.

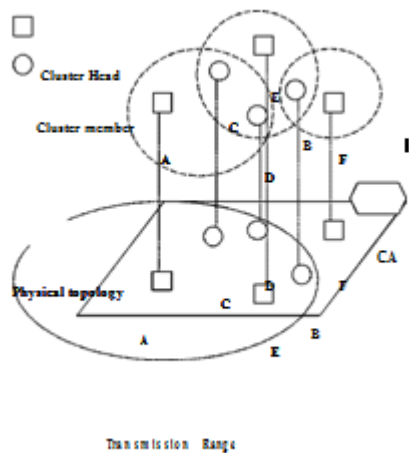


Fig.1. Node clustering

Fig. 1 shows an example of how clusters are constructed in the proposed scheme. While each cluster consists of one CH and CMs lying within the CH's transmission range, some nodes within the transmission area of the CH might not be the member of the cluster and can be the CM of another cluster. For example, in Fig. 1, node B does not belong to the cluster headed by node A while it is located within the transmission area of node A. Only normal nodes having high reliability are allowed to become a CH. Nodes except CHs join the two different clusters of which CHs exist in the transmission range of them. By constructing such clusters, each CH can be aware of false accusations against any CMs since each CH knows which CM executes attacks or not, because all of the attacks by a CM can be detected by any

node, of course including the CH, within the transmission range of the CM. The reason why each node except CH belongs to two different clusters is to decrease the risk of having no CH due to dynamic node movement. To maintain clusters, CH and CMs frequently confirm their existence by exchanging messages, i.e., the CH periodically broadcasts CH Hello packets to the CMs within its transmission range, and each CM replies to the CH with the CM Hello packet.

IV. CLUSTERING-BASED CERTIFICATE REVOCATION SCHEME

In this, clustering-based certificate revocation scheme which was originally proposed in [4]. Although a centralized CA manages certificates for all the nodes in the network, cluster construction is decentralized and performed autonomously. Nodes cooperate to form clusters and each cluster consists of a Cluster Head (CH) along with several Cluster Members (CMs) that are located within the communication range of their CH. Each CM belongs to two different clusters in order to provide robustness against changes in topology due to mobility. It should be noted that because the clusters overlap, a node within the communication range of a CH is not necessary part of its cluster.

The aim of using clusters is to enable CHs to detect false accusations. Requests for the CA to recover the certificates of falsely accused nodes can only be made from CHs. A CH will send a Certificate Recovery Packet (CRP) to the CA to recover an accused node, only in the case where it is a CM in its cluster. This is based on the fact that most types of attacks, such as flooding attack, black hole attack, wormhole attack and sybil attack, can be detected by any node within the communication range of the attacker. In other words, a CH will be able to detect any attack executed by one of its CMs, implying that a CH can identify whether a CM is malicious or not.

In order for clustering-based certificate revocation to work, CHs must be legitimate. Nodes can be classified into three different categories, normal nodes which are highly trusted, warned nodes with questionable trust, and attacker nodes which cannot be trusted. Only normal nodes are allowed to become CHs and accuse attackers by sending Detection Packets (ADPs) to the CA. Nodes in the Warning List (WL) cannot become CHs or accuse attackers, but they can still join the network as CMs and communicate without any restrictions. Nodes classified as attackers are considered malicious and completely cut off from the network. The reliability of each node is determined by the CA as follows.

The CA maintains both a Black List (BL) and a Warning List. When the CA receives an ADP from an accuser, the accused node is regarded as an attacker and is immediately registered in the BL. The BL includes nodes which are classified as attackers and have had their certificates revoked. The accuser of the attacker is then listed in the WL because the accuser might actually be making a false accusation. However, falsely accused nodes will be restored quickly by their CHs. We consider false accusation and false recovery as an act of misbehavior, and define nodes that do such act as misbehaving nodes.

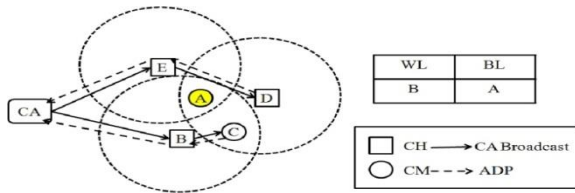


Fig.2. The procedure of certificate revocation

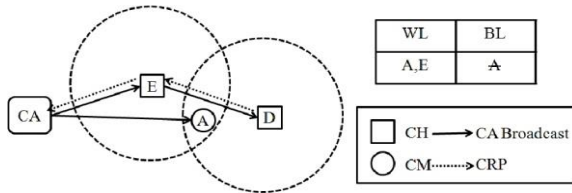


Fig.3. The procedure of certificate recovery

Fig.1 and Fig.2 shows examples of certificate revocation and recovery procedures. As shown in Fig.1, node A is a malicious node and launches attacks on its neighbors, i.e.

nodes B, C, D and E. Its neighbors detect the attacks and send ADPs to the CA to accuse node A. Upon receiving the first ADP from node B, the CA puts it into the WL as an accuser and node A into the BL as an attacker. It then broadcasts the information contained in the WL and BL to the entire network. Fig.2 shows the procedure of certificate recovery. When node E and D, which are the CHs of node A, are informed that node A is listed in the BL, if they have never detected any attacks coming from A, the accusation as a false one. They will then send a CRP to the CA to recover node A's certificate. Upon receiving the first arrival CRP from node E, the CA removes the falsely accused node A from the BL, and enlists it into the WL along with node E. After the broadcast of the updated WL and BL, the certificate of node A will be recovered successfully.

V. ADVANTAGES

The proposed certificate revocation scheme for ad hoc networks, that provide some measure of protection against malicious accusation succeeding in causing the revocation of certificates of trustworthy, well-behaving nodes.

VI. RESULTS

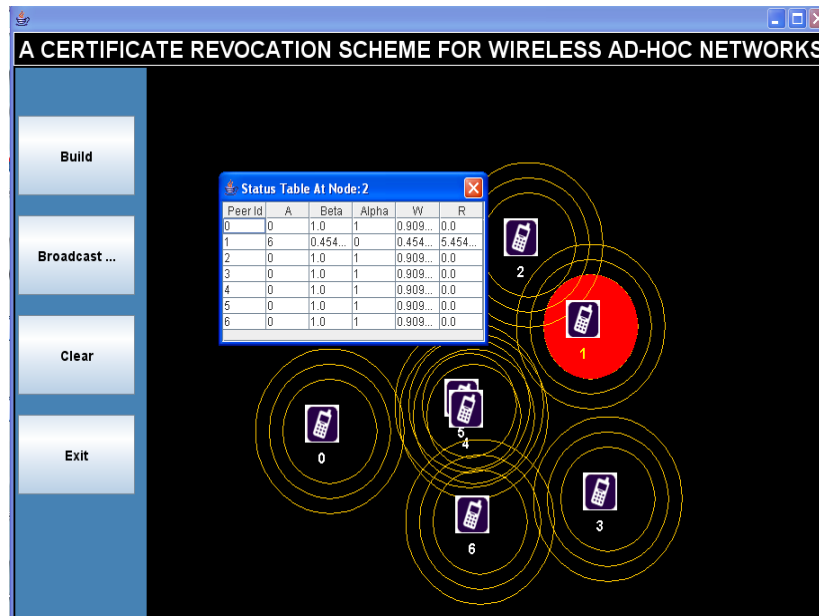


Fig.4.status table of node

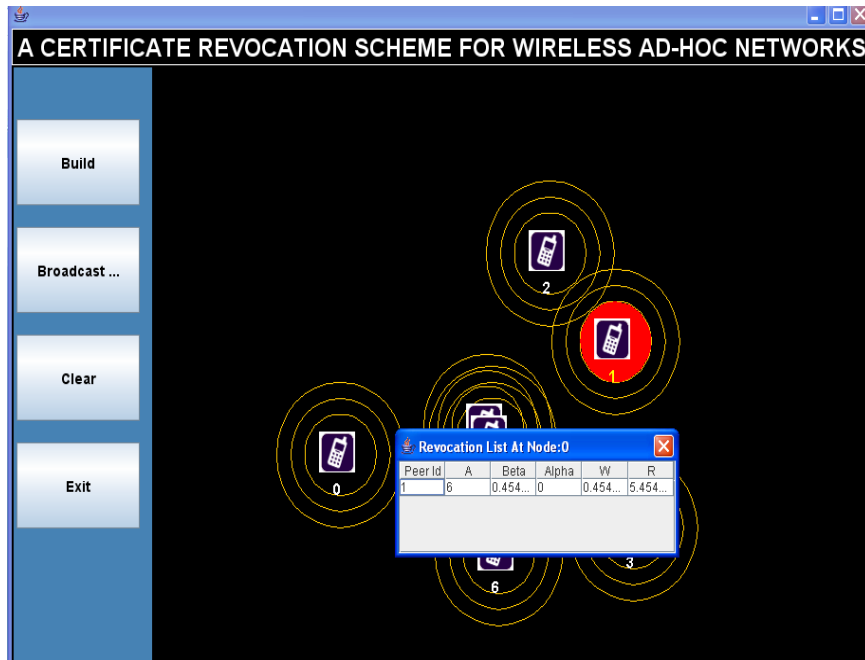


Fig.5.Revocation List

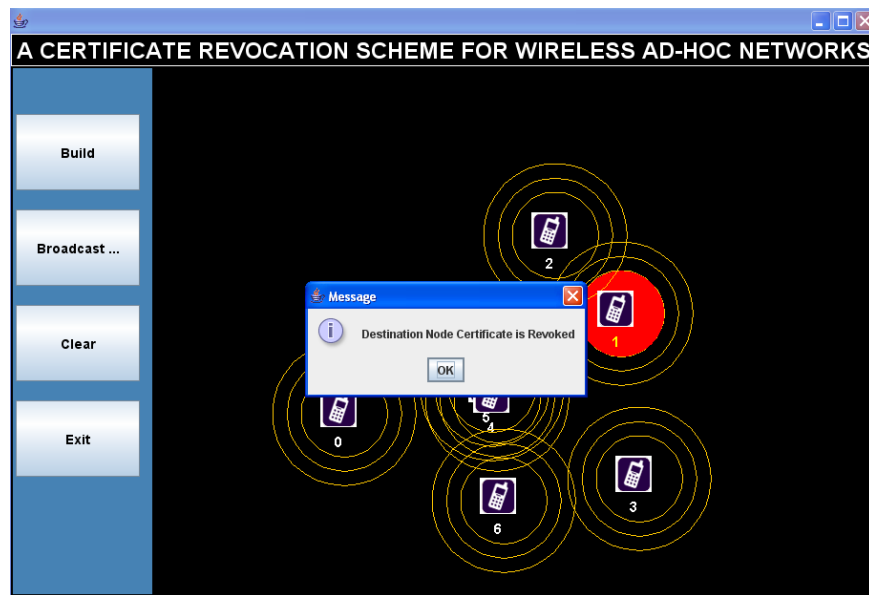


Fig.6.Error Message

The fig.4 shows the certificate of the specified node where the certificate contains the Serial no of certificate,issue time and expiration time etc.The fig.5 shows the dialog box asking for the data to be send for the destination node.Here each node be able to communicate with each other in a secure way.In the fig.6 or results specify the move option at the node which enables the movement one node dynamically to another node.Here the figure shows the node 6 initial position.

VII. CONCLUSION AND FUTURE WORK

In this paper, we have enhanced our previously proposed clustering-based certificate revocation scheme which allows for

fast certificate revocation. In order to address the issue of the number of normal nodes being gradually reduced, we have developed a threshold based mechanism to restore the accusation function of nodes in the WL. The effectiveness of our proposed certificate revocation scheme in mobile ad hoc networks has been demonstrated through extensive simulation results.

Our future work includes doing further explorations to evaluate our protocol through security analyses and simulations to access its robustness and its cost in terms of overhead and throughput. We intend to present the results of the further investigations in another publication.

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Loss in Earth Mass due to Extraterrestrial Space Exploration Missions

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Abstract- The big question is does Earth losing or gaining mass. This paper deals with the review of the research that Earth mass is decreasing due to the various reasons they are Hydrogen escape, Helium escape and loss due to nuclear radiation from Earth core. Mass loss due to space exploration missions cannot be neglected.

Similar to the pollution, pollution happen in many ways due to natural and human activities but pollution due to human activities is found to be more hazardous likely the earth loses mass due to natural phenomenon but loss due to human activity may be hazardous in future.

This paper gives the analysis of the space missions which lead to loss in Earth mass due to space missions.

Earth lost its mass of **about 3473 tons** in the infant space age of 53 years; it is found that Earth loses its mass with the **rate of 65.185 tons per year**.

Index Terms- Earth mass balance sheet, spacecraft, hydrogen escape, lunar module, and command module

I. INTRODUCTION

Usually when we talk about the Earth mass we say it is constant and has a value of 5.9736×10^{24} kg. When we look at the scenario we find that Earth must loose or gain mass due to effects like space dust falling in Earth or due to global warming etc. There are the various factors of Earth mass loss decrease or increase are Hydrogen Escape from the Earth atmosphere, Helium escape from Earth atmosphere, Space dust falling in, mass increase due to global warming, Energy loss due to nuclear reactions taking place inside Earth core and the loss of earth mass due to space missions.

Physicist and Cambridge University professor Dave Ansell to draw up a balance sheet of the mass that's coming in to the earth.

GAIN	IN TONS	LOSS	IN TONS
HYDROGEN ESCAPE	95000	SPACE DEBRIS FALLING	40000
HELIUM ESCAPE	1600	GLOBAL WARMING	160
RADIATION LOSSES	16		
NET LOSS OF EARTH MASS IS ABOUT 55000 TONS PER YEAR			

This balance sheet neglected the mass of earth loss due o the Space exploration missions. That should not be neglected. My work is the calculation of the space missions which lead to loss in Earth mass.

II. RESEARCH IDEA AND DATA COLLECTED

Physicist and Cambridge University professor Dave Ansell's balance sheet lead me to work on the mass loss study due to space missions. That research gave the point the space mission's usually fall back to Earth like Fobos Grunt.

This research work is studying only those space missions which lead to mass loss mean that are on other planet surface or at in the other planets gravitational field and are not returning back to Earth.

This mass loss contains the mass of spacecraft and the fuel taken with them, and the orbit insertion modules.

The research data is collected from different websites such as NSSDC catalogue, Gunturs space site, Russian space web etc and the masses are calculated and approximate rate of loss of earth mass due to these happenings is represented.

This research is the approximate analysis of the spacecraft masses.

STUDIES AND FINDINGS

This data collected came with findings that the total mass of the spacecrafts with their fuel had mass of about **263297 Kg**, mass of the lunar modules used in Apollo space missions fueled is in total **102872Kg**, total mass of the command modules of Apollo, Apollo-Soyuz and Skylab space missions in space with their fuel mass is in total **1798500Kg**, mass of lunar rover used in Apollo space missions with their payload is **14649Kg** in total, and mass of the Upper stages of rockets/orbit insertion modules like centaur, IUS, Blok D is about **1275556 Kg**. **The total of these masses is 3454874 Kg.**

On average it came to be 65.145 tons per year

This total mass is lost by the Earth in 53 years of the space age till 2012. Data is approximate calculation of spacecraft masses as the masses of various spacecraft shown by various websites.

TABLE NO. 2 EARTH MASS LOSS DUE TO SPACECRAFT LAUNCHES	
	TOTAL MASS IN KG
SMALL SPACECRAFT MASSES	263297
ORBIT INSERTION HARDWARE	1275556
LUNAR MODULE (APOLLO'S)	102872
COMMAND MODULES (APOLLO'S)	1798500
LUNAR ROVER WITH PAYLOAD	14649
	3454874

TABLE NO. 3 SMALL SPACECRAFT MASSES	MASS IN KG
LUNAR MISSIONS	101502
VENUS MISSIONS	55329
MARTIAN MISSIONS	64698
COMETS AND ASTEROIDS	9634
OUTER SOLAR SYSTEM PROBES	14492
SOLAR MISSIONS	7594
SPACE OBSERVATORIES AT L2	10048
TOTAL	263297

TABLE NO.4 LUNAR MODULES PRESENTLY ON LUNAR SURFACE		
MISSION	LUNAR MODULE	MASS IN KG
APOLLO 10	LM-4	14696
APOLLO 11	LM-5	14696
APOLLO 12	LM-6	14696
APOLLO 14	LM-8	14696
APOLLO 15	LM-10	14696
APOLLO 16	LM-11	14696
APOLLO 17	LM-12	14696
	TOTAL MASS OF LM	102872

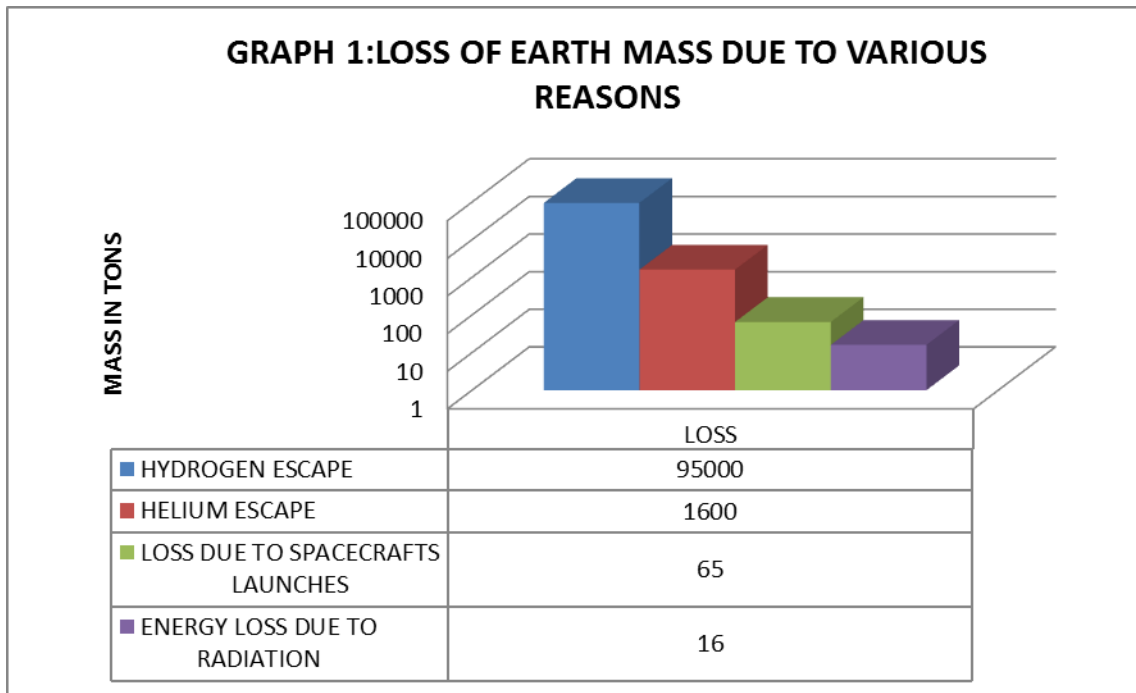
TABLE NO. 5 MASS OF COMMAND MODULES WHICH ARE NOT PRESENT ON EARTH			
MISSION	DESIGNATION	PRESENT LOCATION	MASS IN KG
APOLLO 7	S-IVB-205	SOLAR ORBIT	119900
SKYLAB 2	S-IVB-206	SOLAR ORBIT	119900
SKYLAB 3	S-IVB-207	SOLAR ORBIT	119900
SKYLAB 4	S-IVB-208	SOLAR ORBIT	119900
APOLLO SOYOUZ	S-IVB-210	SOLAR ORBIT	119900
APOLLO 8	S-1V-503	SOLAR ORBIT	119900
APOLLO 9	S-1V-504	SOLAR ORBIT	119900
APOLLO 10	S-1V-505	SOLAR ORBIT	119900
APOLLO 11	S-1V-506	SOLAR ORBIT	119900
APOLLO 12	S-1V-507	SOLAR ORBIT	119900
APOLLO 13	S-1V-508	LUNAR SURFACE	119900
APOLLO 14	S-1V-509	LUNAR SURFACE	119900
APOLLO 15	S-1V-510	LUNAR SURFACE	119900
APOLLO 16	S-1V-511	LUNAR SURFACE	119900
APOLLO 17	S-1V-512	LUNAR SURFACE	119900
		TOTAL	1798500

According to the plans of various space agencies for the future space missions it is found that if all is done success fully the numbers will be doubled in next fifty year or may be tripled.

III. CONCLUSION

From the upper data it is found that Earth mass is losing to 65.145 tons/year due to space missions it will be increasing time by time.

TABLE NO. 6 EARTH MASS BALANCE SHEET CONSIDERING SPACECRAFT MASS LOSS			
GAIN	IN TONS	LOSS	IN TONS
HYDROGEN ESCAPE	95000	SPACE DEBRIS FALLING	40000
HELIUM ESCAPE	1600	GLOBAL WARMING	160
SPACECRAFT LAUNCHES	65		
RADIATION LOSSES	16		
NET LOSS OF EARTH MASS IS ABOUT 56521 TONS PER YEAR			



APPENDIX

Appendixes, if needed, appear before the acknowledgment.

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We are thankful to the space websites giving such a precious data available, we are thankful to . www.nssdc.gsfc.nasa.gov, www.wikipedia.com, www.astronautix.com, www.russianspaceweb.com, www.space.skyrocket.de etc.

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A comparative study of GA, PSO and APSO: Feed point optimization of a patch antenna

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Abstract – In this age of wireless communication, micro strip antennas have drawn maximum attention of antenna community because of its compact size, light weight and low profile configuration. In this paper the problem of locating feed point of an inset fed microstrip patch antenna designed for wireless communication is dealt with. The optimization is done using three techniques: Genetic Optimization (GA), Particle Swarm Optimization (PSO) and Accelerated Particle Swarm Optimization (APSO). Results obtained using all these techniques are in good agreement and are compared using convergence graphs. Return loss and radiation pattern for the optimized antenna was verified using IE3D software.

Index Terms – Micro strip antenna, optimization, genetic algorithm, particle swarm optimization, accelerated particle swarm optimization

I. INTRODUCTION

The explosive growth in the field of wireless communication and information transfer has created the need for advancements in the field of antenna design as a fundamental part of any wireless system. The antennas used must have to be small, light-weighted and low profile configuration. Microstrip antennas fulfill these entire criterions and hence are currently the most active field of antenna research and development. [1]

In recent years several algorithms have been developed for optimization of various kinds of problems related to antenna design. The aim of any optimization technique is to find a solution that represents a global maximum or minimum in a suitably defined solution domain, that means to find the best solution among many possible solutions for a considered problem. [2]

In this paper a study of three optimization techniques namely Genetic algorithm, Particle swarm optimization and Accelerated particle swarm optimization is dealt with. All these techniques are used for the feed point optimization of microstrip patch antenna. In the following sections a brief overview of all the algorithms are given followed by the verification of the results using IE3D software.

II. GENETIC ALGORITHM

Genetic algorithm is a robust global stochastic search methods based on the Darwinian concepts of natural selection and

evolution. The parameters of each individual of the population are usually encoded as a string of bits (chromosomes). The first group of individuals (generation) is created randomly. The fitness of each individual is determined. Mating these individuals forms a new generation. The more fit individuals are selected and given greater chance of reproducing. The best individual may be passed unchanged to the next generation. This iterative process creates successive generations until a stop criterion is reached. It is expected that individuals of successive generations converge to the global maximum. [3], [4].

Once the problem is encoded in a chromosomal manner and after the fitness function is chosen we start to evolve solutions using the following steps:

1. Initialization: The initial population of candidate solutions is usually generated randomly across the search space.
2. Evaluation: The fitness functions of the candidate solutions are evaluated.
3. Selection: Solutions with higher fitness values get more copies.
4. Recombination: Parental solutions are combined to get new, possibly better solutions.
5. Mutation: Locally but randomly modifies a solution.
6. Replacement: Replaces the original parental population.
7. Repeat steps 2-6 until a terminating condition is met.

III. PARTICLE SWARM OPTIMIZATION

Inspired by natural phenomenon such as bird flock Particle swarm optimization (PSO) is an evolutionary computation technique developed by Kennedy and Eberhart in 1995. This optimizing technique has been based on mechanism similar to how a swarm of bees search for the location with highest density of flowers in a field. [5]. This method has been effectively used by antenna engineers in optimizing numerous multidimensional problems.

PSO is initialized with a group of random particles which searches for an optimum value by updating two best values in each iteration. First one is called the personal best or *pbest* which is the best value so far obtained by any particle in the population. All the particles explore the search space and the information collected by them is used to find the best particle in the swarm called as global best or *gbest*. After finding the two best values,

the particle updates its velocity and positions with following equations (1) and (2):

$$v[i] = v[i] + C1.rand() \cdot (pbest[i] - present[i]) + C2.rand() \cdot (gbest[i] - present[i]) \quad (1)$$

$$present[i] = present[i] + v[i] \quad (2)$$

$v[i]$ is the particle velocity, $present[i]$ is the current particle (solution). $pbest[i]$ and $gbest[i]$ are defined as stated before. $rand()$ is a random number between (0,1). It is introduced to randomly position all particles in the swarm to enable exhaustive exploration and exploitation of each particle on the entire solution space. $C1, C2$ are learning factors. Usually $C1 = C2 = 2$

III.ACCELERATED PARTICLE SWARM OPTIMIZATION

APSO is similar to that of PSO except the fact that it is an accelerated version of PSO. It harnesses the same concept of movement of swarm to locate the optimum value. Process begins with a randomly initialized population moving in randomly chosen directions. In PSO after locating the $pbest$ and $gbest$ in each iteration the particles would update their position and velocity for the next move. APSO updates acceleration in addition to position and velocity thus speeding up the process of search exploration. Finally, all particles will fly towards better and better positions over the searching process until the swarm moves closer to its optimum value.[6]

Thus in APSO there are three parameters to be considered for optimization which includes position, velocity and acceleration unlike in PSO there were just two parameters. This makes APSO faster than PSO though the difference can be noticeable when the dimension of the problem becomes more unlike when it's dealt with lower order dimension.

IV.ANTENNA DESIGN

In this paper we designed a microstrip antenna for Bluetooth communication purpose i.e at a centre frequency(fr) of 2.44 GHz with dielectric constant (ϵ_r) 4.36 and substrate thickness (h) 1.6mm. At this frequency using the below formulae [7] we calculated the length and width of the antenna which came to be 29.061 mm and 37.526mm respectively.

Calculation of the Width (W):

$$W = \frac{c0}{(2 \times fr)} \sqrt{\frac{2}{(\epsilon_r + 1)}} \quad (3)$$

Calculation of Effective dielectric constant (ϵ_{reff}):

$$\epsilon_{reff} = (\epsilon_r + 1)/2 + \frac{(\epsilon_r - 1)/2}{\sqrt{(1 + 12 \times \frac{h}{W})}} \quad (4)$$

Calculation of the length extension (ΔL):

$$\Delta L = 412 \frac{((\epsilon_{reff} + 2) \cdot ((W/h) + .264))}{((\epsilon_{reff} - .258) \cdot ((W/h) + .8))} \quad (5)$$

Calculation of effective length of patch (L):

$$L_{eff} = L + 2 \Delta L \quad (6)$$

$$L_{eff} = \frac{c}{(2 \cdot fr \cdot \sqrt{(\epsilon_{reff})})} \quad (7)$$

Where c_0 is the speed of light in free space.

Impedance matching is a very important for designing an antenna as it decides the coupling effect. Perfect impedance matching leads to maximum coupling and thus minimizing the return loss. To locate the point where the impedance is 50 ohm is difficult task and is usually done by hit and trial method. In this paper the optimization task is to locate the feed point of an inset fed microstrip antenna.

We thus use an optimization technique to locate the point where the impedance is 50 ohm. We know that the impedance of a microstrip antenna varies as shown in figure(i)

$$Rin(y = y_0) = Rin(y = 0) \times \cos^2((\pi/L) \cdot y_0) \quad (8)$$

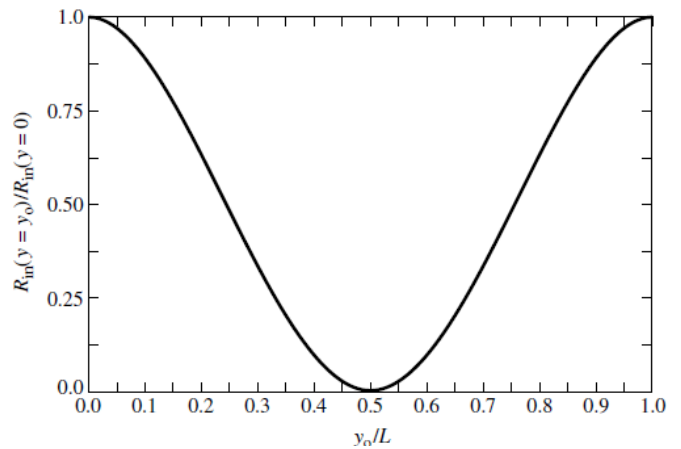


Figure (i) normalised impedance of the microstrip patch

Using GA, PSO and APSO we designed a one dimensional fitness function to locate the feed point y (cm) of the antenna which is as given below:

$$F = \text{abs}(Rin(y) - 50) \quad (9)$$

V.RESULTS

In this paper we compare the three optimization techniques namely GA, PSO and APSO. Matlab was used for implementing all these algorithms. The following parameters were chosen for optimization.

Technique	GA	PSO	APSO
Particles	-	25	25
Iterations	100	1000	100
Convergence(for an accuracy up to 0.01)	30	30	18

Convergence graph for all the techniques are obtained as shown in the figures below. All the algorithms converge to the same theoretical value but in different number of iterations.

IE3D software was used to verify the results. Return loss and the radiation pattern for the optimized design are shown in the following section.

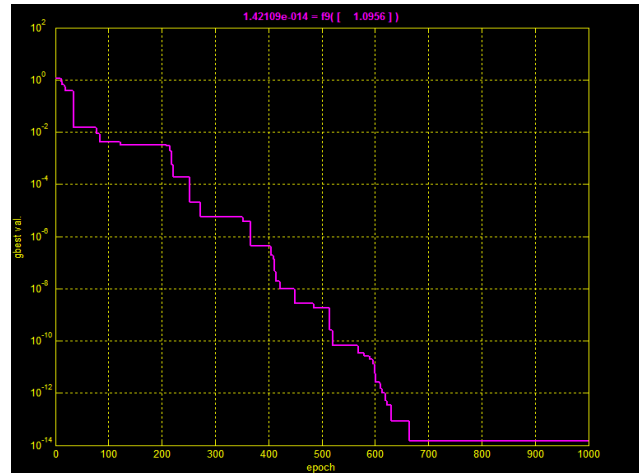


Figure (iii) Convergence graph of PSO

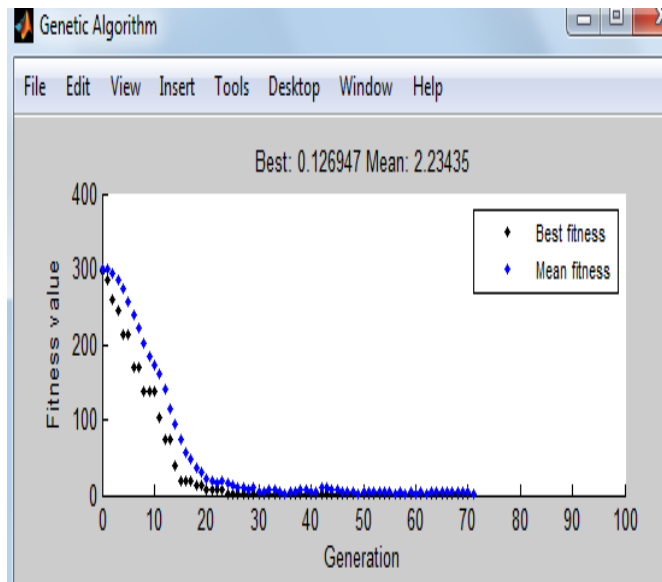


Figure (ii) Convergence graph of GA

In GA we took the help of matlab’s Global optimization tool box for this purpose whose convergence graph is as shown above in figure(ii). And for PSO Brian Birge[8] optimization tool box was used for the same as shown in figure(iii). APSO was obtained using matlab code.

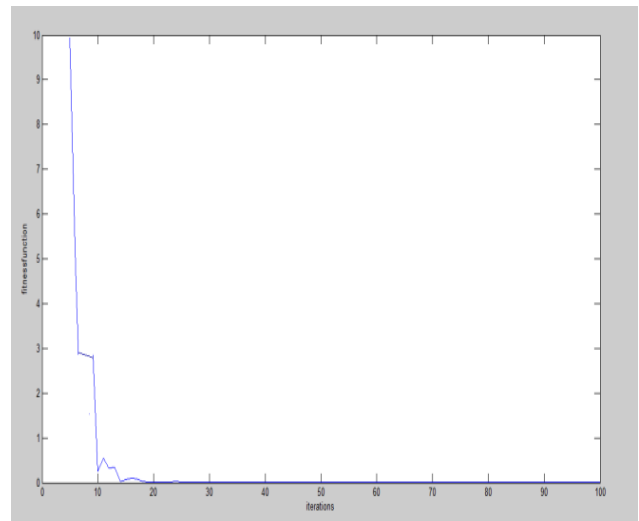


Figure (iv) Convergence graph of APSO

VI .RESULTS –VERIFICATION

Using IE3D an inset fed antenna operating for the frequency of 2.44 GHz with dielectric substrate 4.36 and thickness 1.6mm was designed as shown below.

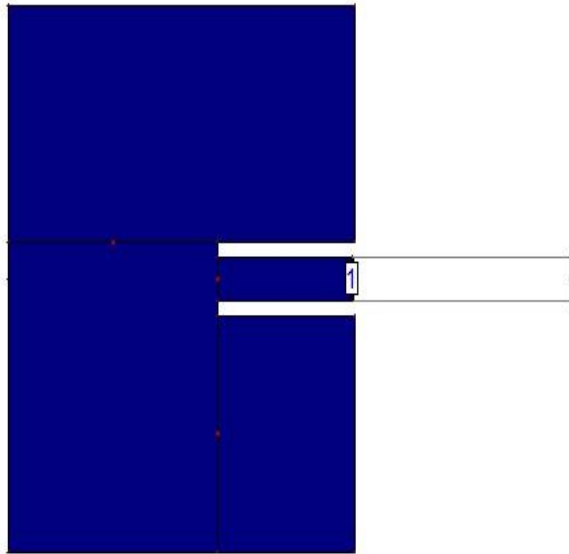


Figure (v) Inset fed microstrip antenna.

The antenna was designed for the protocol IEEE 802.11 i.e. for bluetooth communication purpose with length of the antenna as 29.061 mm and width of the antenna as 37.526 mm. Thickness of the feed point was taken to be 3 mm and the depth of the inset fed was the optimizing parameter. Using all the algorithms the optimized value was obtained as 10.956 mm.

With this design the antenna was simulated for a frequency range of 2 GHz to 3 GHz and the return loss was obtained around -26 dB at the frequency of 2.44 GHz as shown in figure(v).

The analysis of the antenna structure was carried further to study the radiation pattern of the optimised structure which is shown in figure (vi).The radiation pattern clearly shows that there is radiation only in the forward direction but no radiation in the backward direction which gives an accuracy of the impedance matching of the designed structure. This means that the antenna is very much optimized to 50ohm.

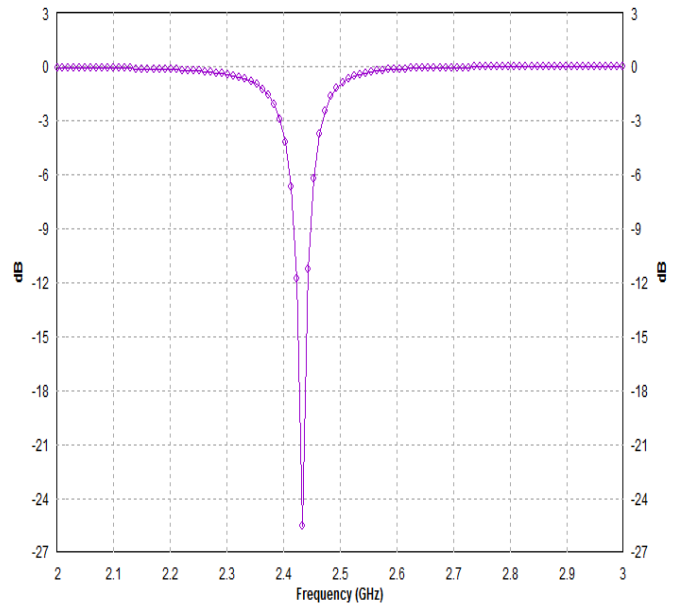


Figure (vi) Return loss

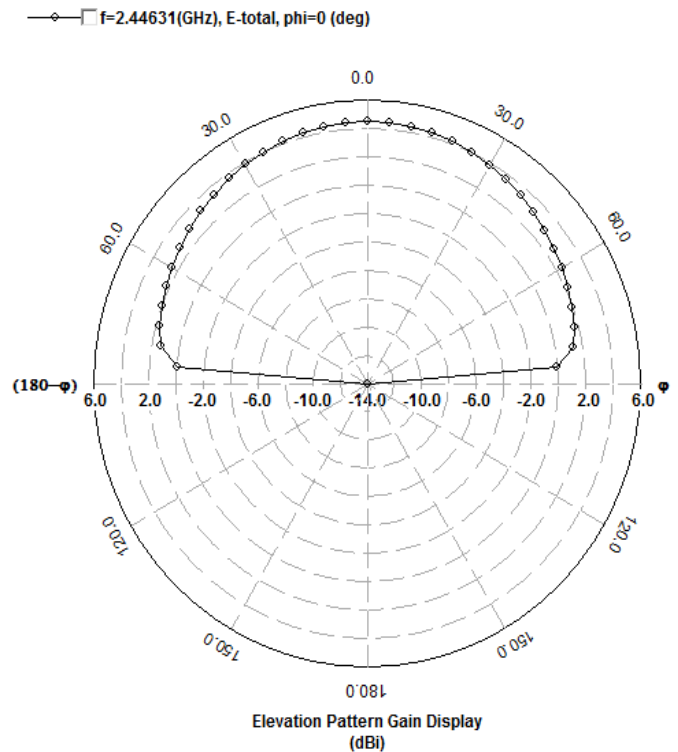


Figure (vii) Radiation pattern

Fi

VI.CONCLUSION

Optimization is a well used technique in electromagnetic community and with the advent of new techniques in this field our task becomes easier. In this paper we discussed optimization of microstrip patch antenna's physical parameters by using genetic, particle swarm and accelerated particle swarm optimization techniques. These techniques have been used to find the location of feed point of an inset fed rectangular antenna. All the techniques converge to the same theoretical value but with different number of iterations. In GA there are a large no of parameters to be adjusted compared to PSO and APSO. For accuracy up to 0.02 we compared all the optimization results and conclude that APSO is the best. The convergence graph clearly shows that APSO needs very less no of iterations to compute the same task and thus outperforms others. This is due to the fact that acceleration constants are also updated in APSO in addition to the position and velocity constants as in PSO. This reduces the time of computation and hence is faster than PSO.

The APSO algorithm selects the particles that are far away from the global solution and accelerates them towards global optima with an exploration power to avoid the premature convergence. Simulation results indicate that the proposed algorithm gives robust results with good quality solution and faster convergence. Thus results encourage the use of APSO for optimal design.

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Projection of Changes in Monthly Climatic Variability at Local Level in India as Inferred from Simulated Daily Data by Hadley Center Regional Climate Model Version 2.0

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Abstract- This study attempts to project the changes in monthly climatic variability at six locations situated in six different geographical regions of India. Changes in monthly variability in climatic parameters were calculated in terms of ratio of standard deviations from simulated daily data by Hadley Center Regional Climate Model Version 2.0 for present and 2050's climate. Increase in maximum temperature variability for both dry and wet days is most pronounced in the month of May in North, South and West India. In Central India maximum temperature variability for dry and wet days decreases in summer month (except for May) and increases in most of winter month. In North and south India maximum temperature variability for both dry and wet days decreases in most of the summer month (except for May) and increases in most of the winter months. In West India maximum temperature variability for both dry and wet days decreases in most of the month. In East India maximum temperature variability for both dry and wet days decreases in most of the months and in North East India it increases in most of the months. Minimum temperature variability in North India decreases in most of the months. In South India minimum temperature variability increases in May June July, October, November and December. In West and Central India minimum temperature variability increases in most of the months. In East India minimum temperature variability increases from January to April and then increases afterwards up to December. In North East India minimum temperature variability increases in most of the months. Number of rainy days in North and South, West and Central India decreases in most of the months whereas it increases in most of the month in East India. In North East India number of rainy decreases in most of the months. Rainfall intensity increases in all the geographic regions of India for most of the months. However decrease in some of the months has also been simulated.

Index Terms- Local; Climate; Variability; Regional, Wet, Dry,

I. INTRODUCTION

In the last decade, an overwhelming consensus has emerged among scientists that the world has entered an era of rapid global climate change, much of which is attributable to green house gas (GHG) emissions from human activity. The exact nature and degree of these changes for any given region will be difficult to predict. Assuming no emission control policies, the

Intergovernmental Panel of Climate Change (IPCC) predicted that average global surface temperatures will increase by 2.8°C on average during this century, with best-guess increases ranging from 1.8 and 4.0°C (IPCC 2007a). Global warming would alter natural climate and environmental systems in many ways, leading to an increased frequency of extreme weather events, rising sea levels, a reversal of ocean currents, and changes in precipitation patterns. These changes could impact social-economic activities, with serious implications for the well being of humans long into the future. Reliable projection of climate change due to radiative forcing of greenhouse gases are therefore essential requirement for impact studies. There have been several studies in the past on projection of climate change at different spatial and temporal resolution in different part of world. To date, most regional climate change information has been based on the use of coupled Atmosphere-Ocean General circulation models (AOGCMs) enabled by the World Climate Research Programme (WCRP) during the past 30. They have also provided valuable information on climate change at the global to sub-continental scale (IPCC, 2007). Although we have seen significant improvements in these models, especially in the past decade, due to better representation of atmospheric and Earth surface processes and enhanced computational capabilities, the horizontal resolution of most present-day AOGCMs is still of the order of a few hundred kilometers (Meehl et al., 2007). This prevents them from capturing the effects of local forcings (e.g. complex topography and land-surface characteristics) which modulate the climate signal at fine scale.

Rapid global climate change is expected to impact agriculture by causing shifts in temperature, precipitation, soil quality, pest regimes, and seasonal growth patterns. Many ecosystem models used to assess impact of climate change require climate projection at a very fine resolution or local level and at daily and sub daily temporal resolution. Providing climate change information at the regional to local is therefore necessary for realistic impact assessment. Recent advancement in regional climate modeling technology have made it possible to simulate the changes in climatic mean and variability for base climate as well as for enhanced CO₂ conditions at a very fine resolution or local level (Wood et al., 2004; Diffenbaugh et al., 2005; Mearns et al., 2009; Giorgi et al., 2009; Roy et al. 2011; Mearns et al. 2012; Dominguez et al. , 2012; Sobolowski and Pavelsky 2012; Li et al. ,2012). Accurate projection of extreme events, and climate variability are of fundamental importance to users of

climate information with respect to the regional and local impacts of climate variability and change. In India such studies are at nascent stage and rarely reported. Recent studies by Tripathi and Singh 2013 has shown that simulated climate do not replicate the features of observed climatology and therefore can not be applied directly into impact assessment models for impact studies. However, Carter et al., 1994 have shown changes from the present (control) to future (anomaly) climate are more realistic than the prediction of present or future climate alone. Present study therefore attempt to derive the changes in variability of climatic parameter at local level as inferred from the simulated daily climate by Hadley Center Regional Climate Model Version 2.0. Detail methodology adopted in the study is discussed in the following section.

II. METHODOLOGY

2.1. Simulated Base Line and Future Climatic Data

Location specific daily climate data for base Climate (1990's) and doubled CO₂ (2050's) climate are derived from the data generated by a state of the art Hadley Center Regional Climate Model Version 2 (HadRM2) in a numerical experiment with transient increase in greenhouse gases at fine resolution of 0.44° X 0.44° latitude by longitude (Bhaskaran et al., 1996). CO₂ is held constant in the control simulation at Base day values. The daily weather data on maximum and minimum temperature, rainfall and solar radiation for Six Locations scattered in six different regions of India were obtained by taking weighted mean of values of respective weather parameter at four nearest grid points surrounding these location.

2.2. Deriving Changes in Climate Variability from Present to 2050's Climate

Changes in monthly variability in climatic parameters were calculated in terms of ratio of standard deviations from simulated daily data for present (1990's) to future (2050's) climate. In most of the agricultural implications the maximum

temperature variance is dependent on the wet and dry days separately. The Fractional changes in standard deviation of monthly maximum temperature (for wet and dry days separately) minimum temperature, number of wet days and rainfall intensity (rain per wet days) were calculated for Six locations in India. Our results on these aspects are discussed in the following section.

III. RESULTS AND DISCUSSIONS

3.1. Changes in Maximum Temperature Variability

Changes in monthly maximum temperature variability from present to 2050's climate for six locations in different geographical regions of India are have been shown in Figure1. At Ludhiana (North India) and Coimbatore (South India) the maximum temperature variability for both dry and wet days decreases in most of the summer month (except for May) and increases in most of the winter months. At Anand (West India) maximum temperature variability for both dry and wet days decreases in all months except for the month of May, August and October when it increases at Anand in West India. At Powerkheda (Central India) maximum temperature variability for dry and wet days decreases in summer month (except for May) and increases in most of winter month. Increase in maximum temperature variability for both dry and wet days is most pronounced in the month of May at Ludhiana (North India), Coimbatore (South India) and Anand (West India). At Powerkheda (Central India) maximum temperature variability for wet days increases in May but for dry days it decreases in the month of May. At Pusa (East India) maximum temperature variability for both dry and wet days decreases in most of the months except for January, February, October and November when it decreases in East India. At Jorhat (North East India) maximum temperature variability increases in all months except for February, May, June and December when it decreases in North East India.

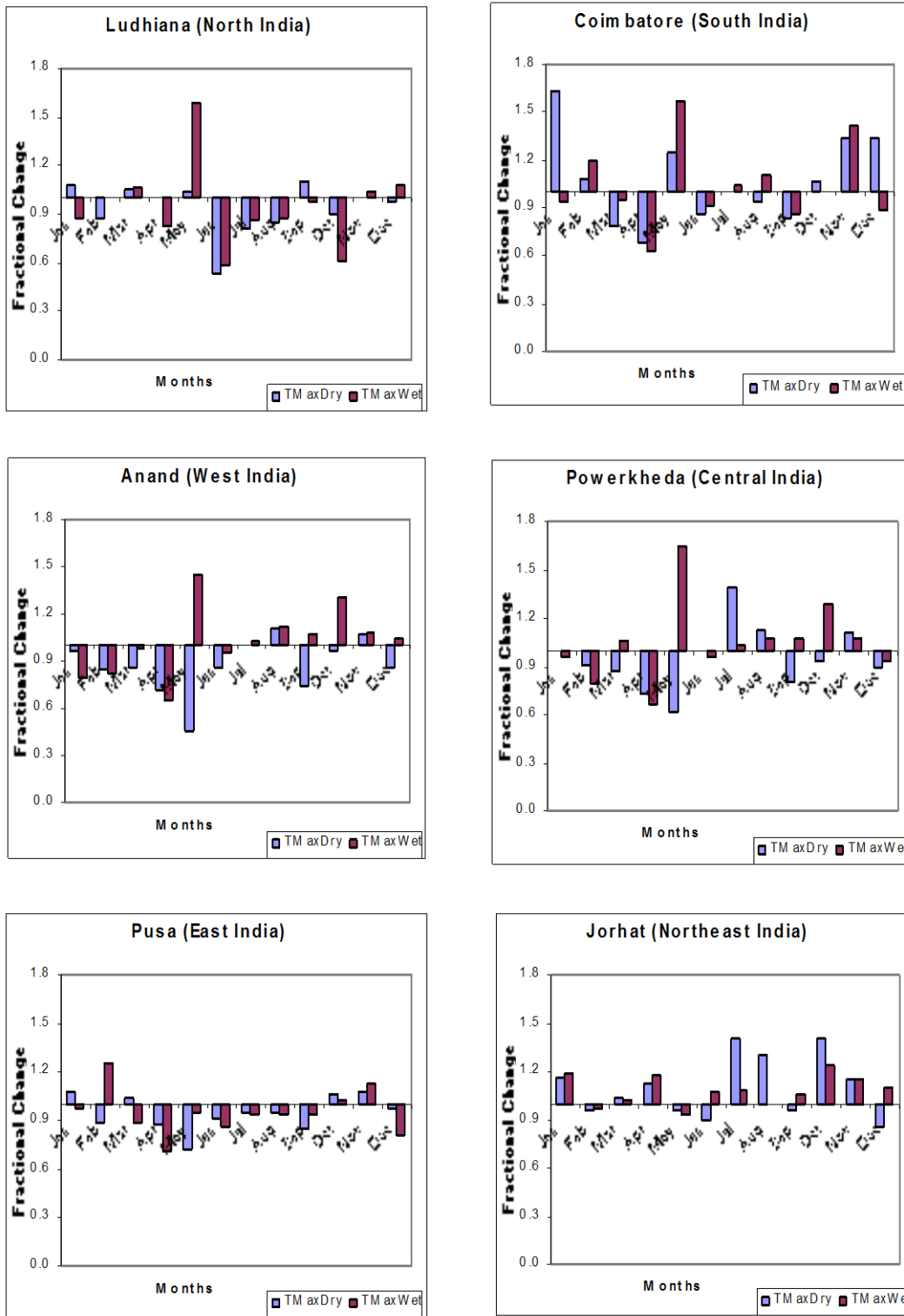


Figure 1: Fractional Change in Standard Deviations of Monthly Maximum Temperature (Separately for Wet and Dry Days) from Present (1990's) to 2050's Climate at Different Locations of India

3.2. Changes in Minimum Temperature Variability

The fractional changes in standard deviation of monthly maximum temperature from present to 2050's climate is shown in Figure 2.

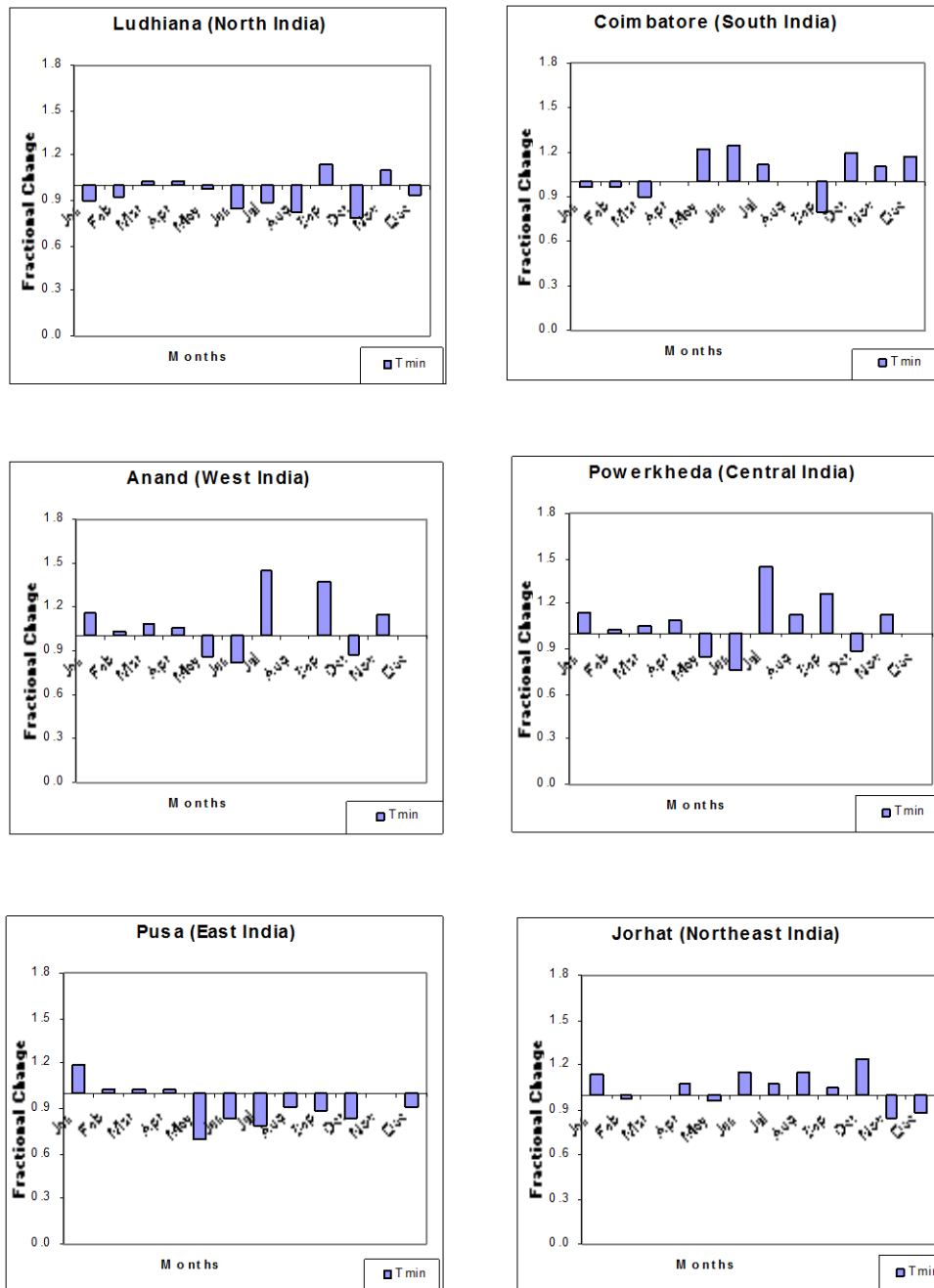


Figure 2: Fractional Change in Standard Deviations of Monthly Minimum Temperature from Present (1990's) to 2050's Climate at Different Locations of India

Minimum temperature variability at Ludhiana (North India) decreases in most of the months except for March, April and September when it increases marginally at Ludhiana (North India). At Coimbatore (South India) minimum temperature variability decreases in January, February, March and September where as it increases in May June July, October, November and December. In other months it does not change significantly at Coimbatore in South India. At Anand (West India) minimum

temperature variability increases in January, February, March, April, July, September and November where as it decreases marginally in other months. At Powerkheda (Central India) a more or less similar trend in change in minimum temperature variability is projected as in the case of Anand (West India). At Pusa (East India) minimum temperature variability increases from January to April and then increases afterwards up to December. At Jorhat (North East India) minimum temperature

variability decreases in February, May, November and December whereas it increases in other months.

Fig 3 shows the fractional changes in the no of rainy days from present to future

3.3. Changes in No. of Rainy Days

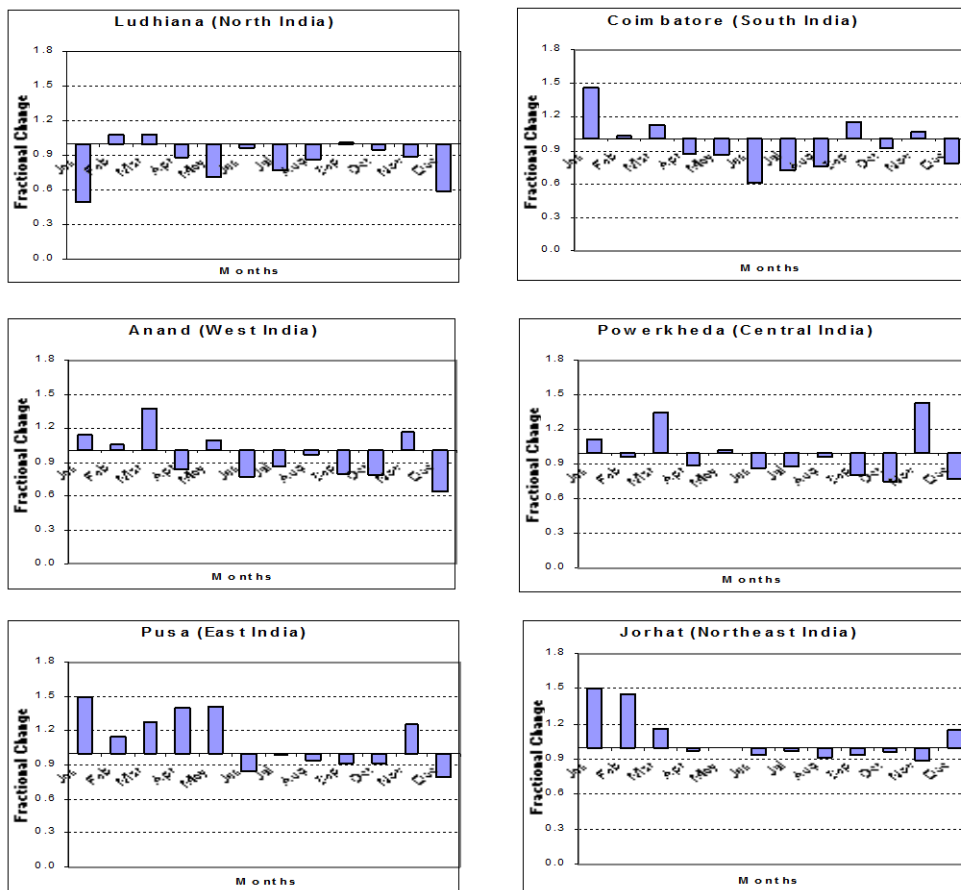


Figure 3: Fractional Change in Monthly Means of Rainy Days from Present (1990's) to 2050's Climate at Different Locations in India

climate for the six locations in different geographic regions of India. Number of rainy days at Ludhiana (North India) decreases in most of the months except for February, March and September when it increases marginally at Ludhiana (North India). At Coimbatore (South India) number of rainy days decreases in most of the months except for January, February, March and September when it increases marginally in South India. At Anand (West India) number of rainy days decreases in most of the months except for January, February, March, May and November when it increases in West India. At Powerkheda (Central India) number of rainy days decreases in most of the months except for January, March and November when it increases at Powerkheda in Central India. At Pusa (East India) number of rainy days increases in the month of January, February, March, April, May and November where as it decreases in other months. At Jorhat (North East India) number of rainy decreases in most of the months except for the months of January, February, March and December when it decreases at Jorhat in North East India.

3.4. Changes in Rain Intensity (Rain Per Wet Days)

Fig 4. Shows the fractional change in the rainfall intensity from present to future climate for the six locations in different geographic regions of India. Rainfall intensity increases in all the geographic regions of India for most of the months. However decrease for some of the months has also been simulated. At Ludhiana (North India) rainfall intensity increases in February, March, May, August, September and November where as it decreases in all other months. At Coimbatore (South India) rainfall intensity increases in all months except for February, April and October when it decreases at Coimbatore in South India. At Anand (West India) rainfall intensity increases in all months except for January, April and December when it decreases at Anand West India. At Powerkheda (Central India) rainfall intensity increases in all months except for January, April, June December when it decreases at Powerkheda in Central India. At Pusa (East India) rainfall intensity increases in all months except for December when it decreases at Pusa (East

India). At Jorhat (North East India) rainfall intensity increases in all months.

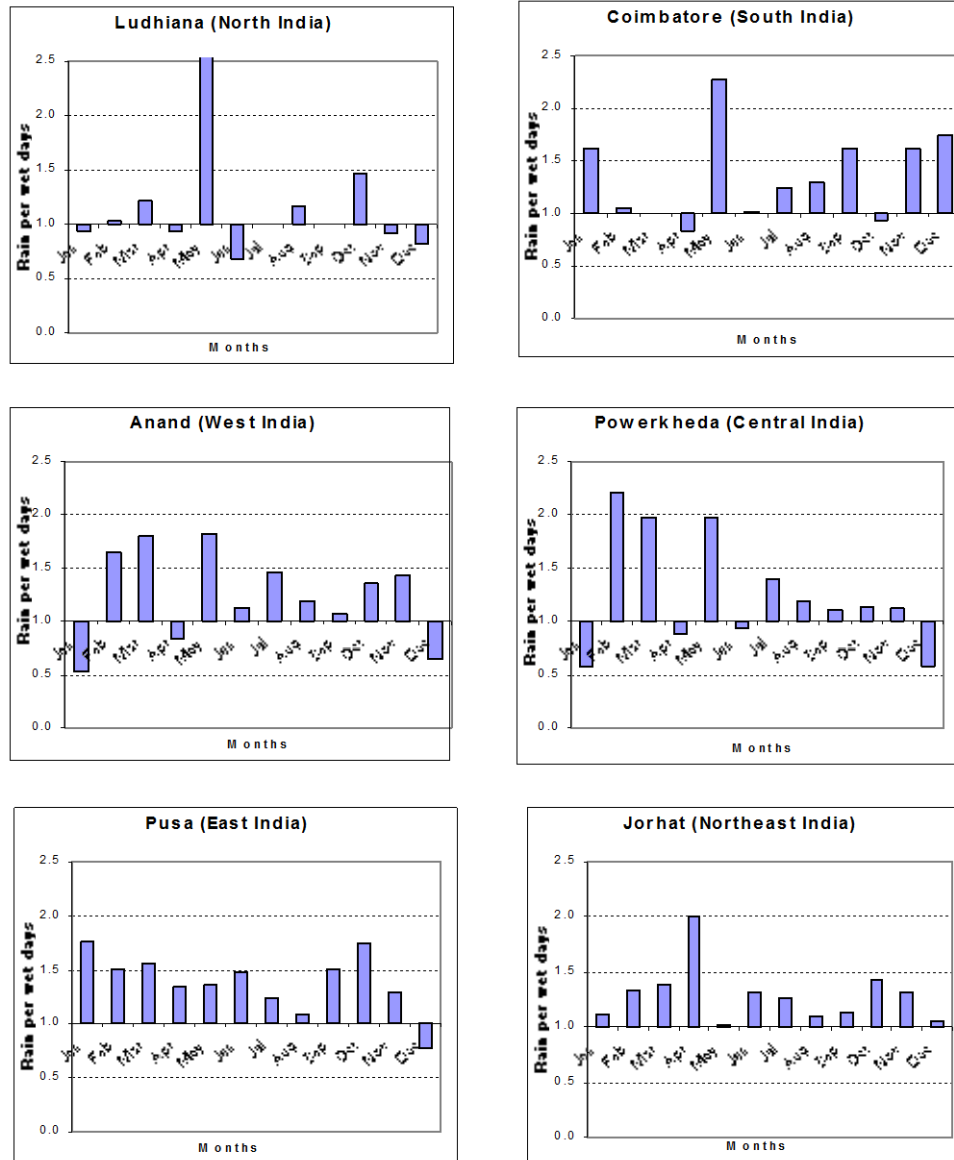


Figure 4: Fractional Changes in Rainfall Intensity (Rain per Wet Days) from Present (1990's) to 2050's Climate at Different Locations of India

IV. CONCLUSIONS

Changes in monthly climatic variability as inferred from simulated daily data by Hadley Center regional Climate Model Version 2.0 for present and 2050's climate has region specific trend in India. Increase in maximum temperature variability for both dry and wet days is most pronounced in the month of May in North, South and West India. In Central India maximum temperature variability for dry and wet days decreases in summer month (except for May) and increases in most of winter month. In North and South and West India maximum temperature variability for both dry and wet days decreases in most of the summer month (except for May) and increases in

most of the winter months. In East India maximum temperature variability for both dry and wet days decreases in most of the months and in North East India maximum temperature variability increases in most of the months. Minimum temperature variability in North India decreases in most of the months. In South India minimum temperature variability decreases in January, February, March and September where as it increases in May June July, October, November and December. In West India minimum temperature variability increases in most of the months. In Central India a more or less similar trend in change in minimum temperature variability is observed as in the case of West India. In East India minimum temperature variability increases from January to April and then increases afterwards up to December. In North East India minimum

temperature variability increases in most of the months. Number of rainy days in North and South, west and central India decreases in most of the months. In East India number of rainy days increases in the month of January, February, March, April, May and November where as it decreases in other months. In North East India number of rainy decreases in most of the months except for the months of January, February, March and December. Rainfall intensity increases in all the geographic regions of India for most of the months. However decrease for some of the months has also been simulated.

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Comparative Study on Seed Germination of *Vigna Radiata* with the Effect of Tannery Effluent

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Abstract- Disposal of tannery effluent will result in heavy metal contamination of land and will lead to many important health and environmental hazards. Aim of the work is to determine the effects of untreated tannery effluent and treated tannery effluent on seed germination and to biodegrade the effluent using fungi. Chemical methods of remove the heavy metals in tannery effluent will have metal bearing solid waste. Hence degrading tannery effluent using *Trichoderma harzianum* cultured from tannery effluent is an economical and easy method. *T.harzianum* isolated from the effluent is used to degrade the tannery effluent. Effect of tannery effluent on germinating seeds and relative toxicity are measured at different concentrations of tannery effluent. The degradation level of chromium is also analysed in this present work.

I. INTRODUCTION

The leather industry is associated with the generation of huge amounts of solid waste and disposal of this waste become a serious problem (Amita *et al.*, 2005). Chromium in the effluent is a major concern for tanning industry. Chemical precipitation methods are commonly employed for the removal of chromium but this leads to formation of chrome-bearing solid waste, plus it is uneconomical when the concentration of chromium in the effluent is low. Tanning is one of the major industries in India and the effluent which is discharged from this industry is highly complex and may cause serious pollution. The conventional physical and chemical methods used for removal of heavy metals from the effluent, such as precipitation with carbonates, sulphides and hydroxide, adsorption on activated carbon, use of ion-exchange resins and membrane-separation processes, are responsible for generation of pollution and are not cost-effective (Volesky and Holzen, 1995; Kratochvil *et al.*, 1998; Camargo *et al.*, 2003). An alternative to these methods is the removal of heavy metal contaminants by microorganisms. The metal removal ability of microorganisms, including bacteria (Cheung and Gu, 2005; Thacker *et al.*, 2007), microalgae (Kratochvil *et al.*, 1998; Matsunaga *et al.*, 1999; Gupta *et al.*, 2001; Gupta and Rastogi, 2008) and fungi (Tobin and Roux, 1998; Srivastava and Thakur, 2006), has been studied extensively. Fungi, in general, are well-known for their ability to biosorb and bioaccumulate metals (Pillichshammer *et al.*, 1995; Dursun *et al.*, 2003; Nouri *et al.*, 2005; Park *et al.*, 2005) and have also been reported to be involved in reduction (biotransformation) of Cr (VI) to Cr (III) form (Pal, 1997; Gouda, 2000; Acevedo-Aguilar *et al.*, 2006; Morales-Barrera and Cristiani-Urbina, 2008). The common Cr(VI) detoxification mechanisms reported in Cr-resistant microorganisms are periplasmic biosorption, intracellular

bioaccumulation and biotransformation through direct enzymatic reaction (Lovley, 1993; Lee *et al.*, 2000; Valls *et al.*, 2000) or indirectly with metabolites (Camargo *et al.*, 2003). In Cr(VI)-resistant filamentous fungi, such as *Aspergillus* (Gouda, 2000; Acevedo-Aguilar *et al.*, 2006), *Penicillium* (Acevedo-Aguilar *et al.*, 2006), *Trichoderma* (Morales-Barrera and Cristiani-Urbina, 2008) and *Phanerochaete* (Pal, 1997), the Cr(VI) detoxification through transformation of Cr(VI) to Cr(III) form was observed due to cellular metabolism processes based on the reducing power of carbon sources. During the skin processing two types of effluents are discharged (Manivasagam, 1987); vegetable tannin which does not contain chromium; chrome tannin which contains chromium.

Higher level of chromium in tannery effluent adversely affects seed germination. Treatment of tannery effluent using ion exchange, adsorption on to activated carbon are excessively energy consuming. Selective fungi which are efficient for degradation of pollutants can be isolated from tannery effluent itself. Treating tannery effluent by using fungi is an efficient biodegradation method. Recently tannery effluent contributes one of the major industrial pollution problems. Chemical precipitation methods for effluent treatment are expensive and will produce solid waste. Biodegradation using effective microorganisms are economical and easy to use. Tannery effluent contains some harmful toxic dyes. Higher level of toxic components in the effluent including chromium, aluminum and dissolved salts are lethal to flora and fauna in the environment.

II. MATERIALS AND METHODS

The tannery (Pretreated) effluent was collected from tannery plant in Chennai. For isolation of *Trichoderma harzianum*, the effluent was inoculated in Potato Dextrose Agar (PDA) media for 48-96 hours at room temperature. The isolate was identified based on their morphological structures, such as colour, diameter of the mycelia and microscopic observation of spore formation provided by standard monograph.

Pure culture of the isolated fungal strain was grown in Potato Dextrose Broth (PDB) at 30°C in a shaking incubator (100 rpm) for 72 h in dark condition. After incubation culture was centrifuged in a sterile centrifuge tube at 5000g for 10 min at room temperature to get the biomass in the form of a pellet. The pellet was washed thrice with sterile distilled water to make the biomass free from media components.

Throughout this study, all experiments were set up in a 250-ml Erlenmeyer flask containing different concentration (25%, 50%, 75% and 100%) of effluent. The inoculum size used

was 0.4 mg/ml and incubates 24hrs. After incubation period, pH (pH meter), Conductivity (Electrical Conductivity meter), Dissolved Oxygen and Biological Oxygen Demand (APHA, 1995) were measured.

Treated and untreated effluent sample was analysed in gas chromatography flame photometric detector. 0.5µl of untreated tannery effluent and 25% concentrations of tannery effluent was injected to gas chromatography flame photometric detector. The amount of chromium can be detected and measured from the chromatogram. The amount of analyte can be explained by single point extension method.

Response factor for standard run of chromium is calculated as,

$$\text{Response factor} = \text{Peak area} / \text{sample amount}$$

Amount of analyte is calculated by the following formula

$$\text{Amount of analyte} = \text{Peak area} / \text{Response factor}$$

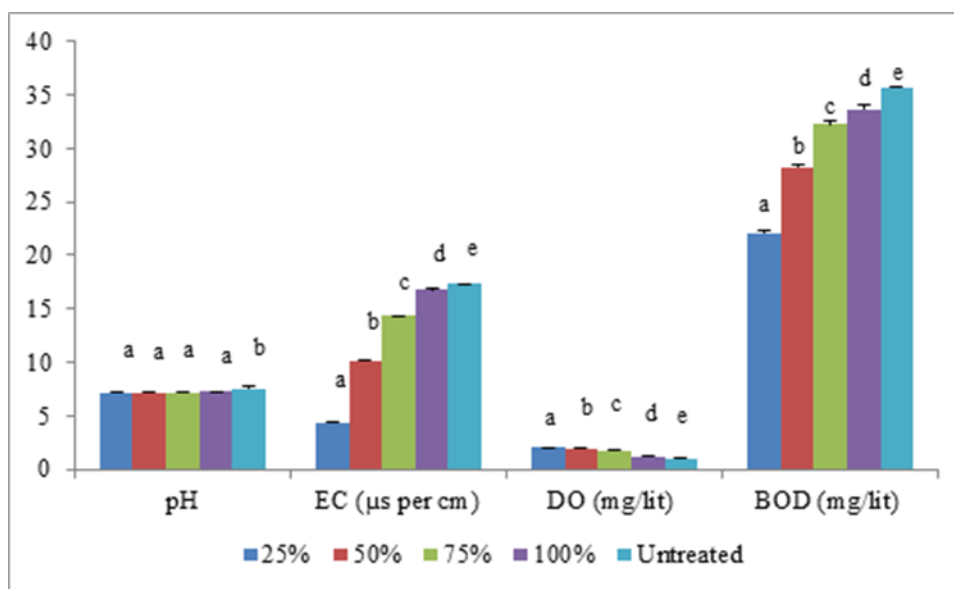
Effects of treated and untreated tannery effluent on *Vigna radiata* shoot length were studied. Different concentration (25%, 50%, 75% and 100%) of treated and untreated tannery effluent was introduced in a culture tube and a tube maintained as control in triplicate. The shoot length was measured after 24hrs, 48hrs and 96hrs. Relative toxicity was assessed on germinating seeds using both effluents.

III. RESULTS AND DISCUSSION

Physico-chemical parameters of untreated tannery and treated tannery effluent of pH, Electrical conductivity, Dissolved oxygen and Biological Oxygen Demand ranged was 7.15 to 7.58, 4.41-17.31 (µs per cm), 0.98-2.05 (mg/L) and 22.10-35.67(mg/L), respectively (Fig. 1). Karunyal *et al* (1994) reported that after treatment of vegetative effluent pH (6.0) and

BOD (7678mg/L) was not permissible limit. In the present study, also physico-chemical parameters showed near to permissible limit as per WHO (1992) with related to potable water. It may use to gardening of plants. Anova for physico-chemical parameters showed significant different at 5% level. Anova followed by post-hoc test performed that untreated effluent significantly different when compare to other concentrations. Electrical conductivity, dissolved oxygen and biological oxygen demand showed that between concentrations significantly different at 5% level. Chromatogram of tannery effluent for chromium species showed in fig. 2. Degradation of chromium was significantly reduced of chromium species in 25% tannery effluent after treatment by *T. harzianum* (Fig. 3).

Effect of tannery effluent of seed germination on *V. radiata* stem height was high in 25% treated effluent after 24hrs (1.53±0.04cm) (Fig. 4) and 48hrs (2.50±0.02cm) (Fig. 5) than control and untreated effluent. In 96 hrs duration, it was 3.32±0.10cm at control than effluent samples (Fig. 6). Anova for effect of different concentration of treated tannery effluent and untreated effluent on seed germination showed significantly different (P<0.05 level) at 24, 48 and 96hrs (Table 2-4). Karunyal *et al* (1994) have reported that seed germination using tannery effluent showed that high biomass and more leaf surface area in 25% concentration tannery effluent. Anova followed by post-hoc test performed that in 25% concentration treated effluent stem length was significantly height when compare to control and untreated effluent at 24hrs duration (Fig. 4). In the case of 48 hrs duration in 25% concentration treated effluent shows that no difference in stem height when compare to control (Fig. 5). In 96 hrs duration, different concentrations of effluent between control, treated and untreated effluent stem length significantly different at P<0.05 level (Fig. 6).



Anova followed by Tukey's test performed
Different alphabets of same parameters shows significant different at 5% level
Figure 1. Physico-chemical characteristics of treated tannery effluent

Table 1. Anova for physico-chemical characteristics of tannery effluent between concentrations

Parameters	df	F value	P value
pH	4, 10	30.828	0.000*
Electrical conductivity	4, 10	35509.63	0.000*
Dissolved Oxygen	4, 10	2139.78	0.000*
Biological Oxygen Demand	4, 10	961.61	0.000*

*-significant different at $P < 0.05$ level; NS-non significant different at $P > 0.05$ level

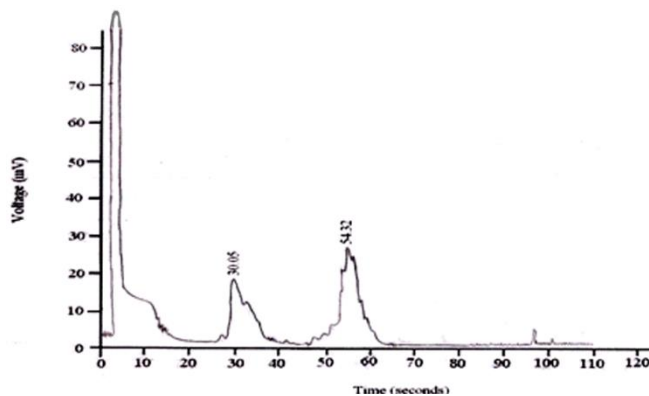


Figure 2. Chromatogram of untreated tannery effluent

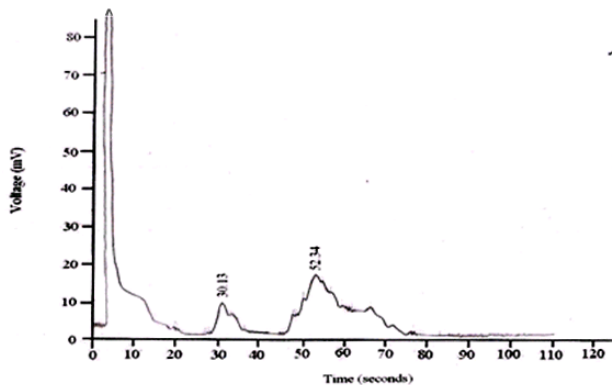
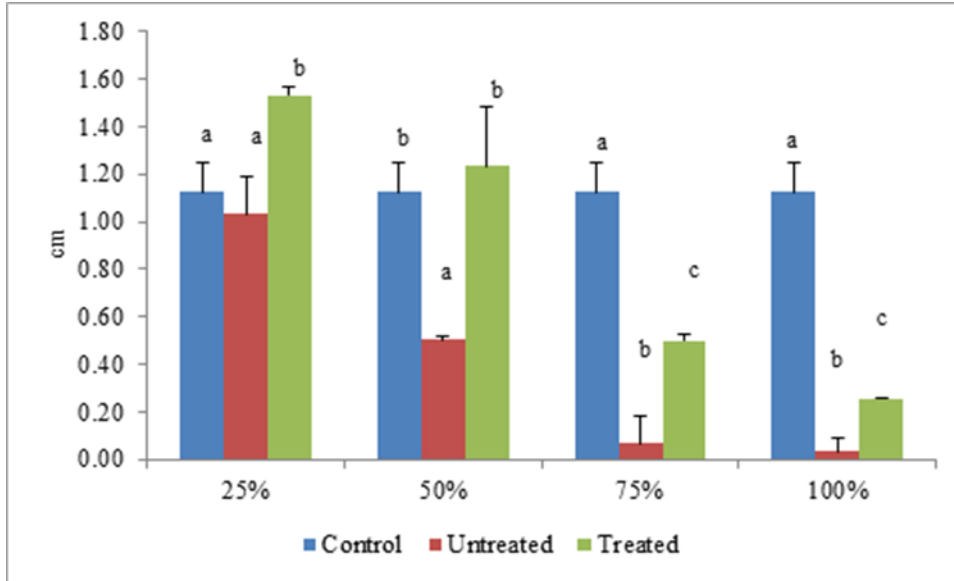


Figure 3. Chromatogram of 25% treated tannery effluent



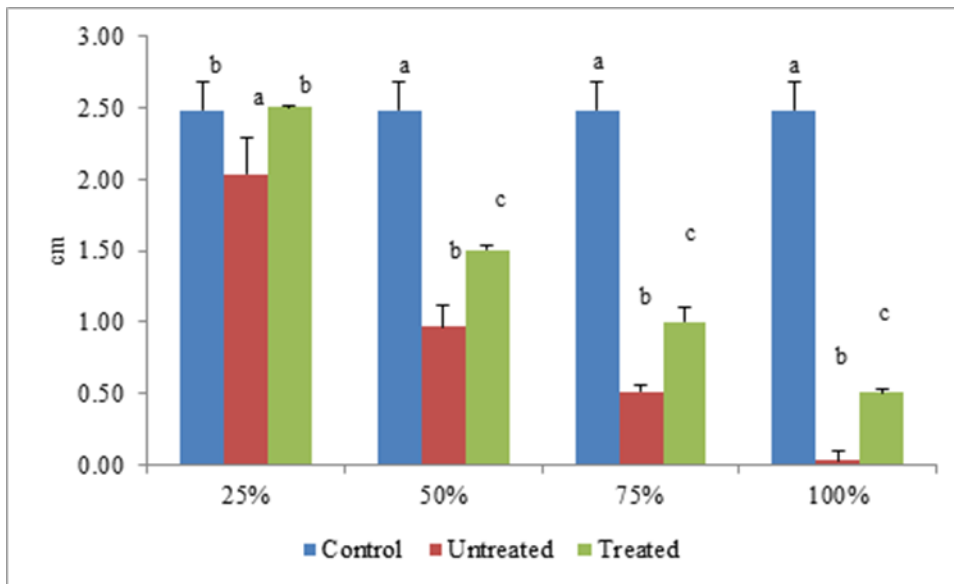
Anova followed by Tukey's test performed
 Different alphabets of same parameters shows significant different at 5% level

Figure 4. Effect of tannery effluent on Seed germination after 24 hours

Table 2. Anova for effect of tannery effluent on Seed germination after 24 hours

Parameters	df	F value	P value
25%	2, 6	15.65	0.004*
50%	2, 6	17.60	0.003*
75%	2, 6	85.02	0.000*
100%	2, 6	157.33	0.000*

*-significant different at P<0.05 level; NS-non significant different at P>0.05 level



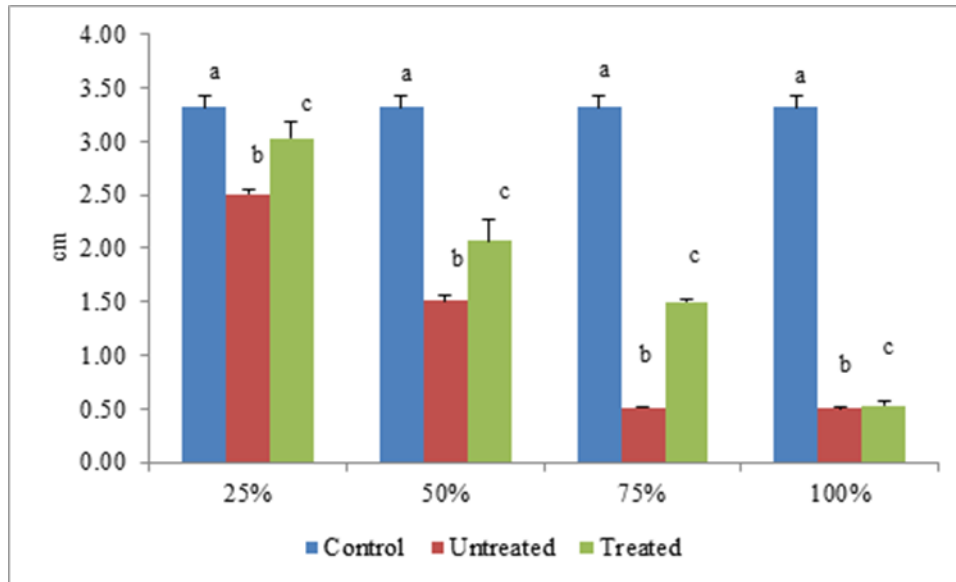
Anova followed by Tukey's test performed
 Different alphabets of same parameters shows significant different at 5% level

Figure 5. Effect of tannery effluent on Seed germination after 48 hours

Table 3. Anova for effect of tannery effluent on Seed germination after 48 hours

Parameters	df	F value	P value
25%	2, 6	6.25	0.034*
50%	2, 6	85.10	0.000*
75%	2, 6	189.67	0.000*
100%	2, 6	360.56	0.000*

*-significant different at P<0.05 level; NS-non significant different at P>0.05 level



Anova followed by Tukey's test performed
Different alphabets of same parameters shows significant different at 5% level

Figure 6. Effect of tannery effluent on Seed germination after 96 hours

Table 4. Anova for effect of tannery effluent on Seed germination after 96 hours

Parameters	df	F value	P value
25%	2, 6	42.38	0.000*
50%	2, 6	137.41	0.000*
75%	2, 6	1632.40	0.000*
100%	2, 6	1857.04	0.000*

*-significant different at P<0.05 level; NS-non significant different at P>0.05 level

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Implementation of Query Processor Using Automata and Natural Language Processing

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Abstract: The field of query processing has recently been coupled with natural language processing (NLP) that has shown dramatic shift in both research direction and methodology in the past few years. In past, most of the work was done on computational linguistics which drew focus on purely symbolic methods. Recently, more prominence is given to hybrid methods that combine new empirical corpus-based methods, including the use of probabilistic and information theoretic techniques, with traditional symbolic methods. The main purpose of Natural Language Query Processing is to interpret an English sentence and hence a complementary action is taken. Querying to databases in natural language is a convenient method for data access, especially for newbie's who have less knowledge about complicated database query languages such as SQL. This paper emphasise on the structural designing methods for translating English Query into SQL using automata.

Index Terms: Natural Language Processing (NLP), automata, SQL, ORACLE

I. INTRODUCTION

Natural Language Processing (NLP) is an approach to analyze text based data or verbal stimulations through both set of theories and set of technologies. It's a very active area of research and development, there is no universal definition that would satisfy everyone, but there are various aspects, which could be a part of anyone's knowledge. It is a division of AI which includes Information Retrieval, Machine Translation and Language Analysis. The major area of concern for NLP is to enable communication between user and system without storage or memorization of complex commands and procedures. In other words, NLP can help the system understand the languages that humans normally use for conversations among themselves. Natural language may be the easiest to learn and use, it has proved to be the hardest for a real time implementation. Despite of various challenges, natural language processing is widely regarded as a promising and important attempt in the field of computer researches. The main area of concern for most computational linguists is to enhance the capability of the computer to understand and generate natural language so that in due course of time people can deal with their computers through text or speech as if they were addressing another person. The Applications that would be generated with NLP capabilities would be able to fully realize and process natural language

along with translating languages correctly and in real time and also extracting information from a variety of data sources on demand of users.

II. RELATED WORK

The very first attempts at NLP database interfaces are just as old as any other NLP research. In fact database NLP may be one of the most important successes in NLP since it began. Asking questions to databases in natural language is a very convenient and easy method of data access, especially for casual users who do not understand complicated database query languages such as SQL. The success in this area is partly because of the real-world benefits that can come from database NLP systems, and partly because NLP works very well in a single-database domain. Databases usually provide small enough domains that ambiguity problems in natural language can be resolved successfully. Here are some examples of database NLP systems:

LUNAR (Woods, 1973) involved a system that answered questions about rock samples brought back from the moon. Two databases were used, the chemical analyses and the literature references. The program used an Augmented Transition Network (ATN) parser and Woods' Procedural Semantics. The system was informally demonstrated at the Second Annual Lunar Science Conference in 1971. [1] **LIFER/LADDER** was one of the first good database NLP systems. It was designed as a natural language interface to a database of information about US Navy ships. This system, as described in a paper by Hendrix (1978), used a semantic grammar to parse questions and query a distributed database. The LIFER/LADDER system could only support simple one-table queries or multiple table queries with easy join conditions. [4]

III. SYSTEM DESCRIPTION

To describe a system that supports this kind of query processing, first we need to understand **ORACLE**. Let us consider a database say **ORACLE**. Within this database I have placed certain tables which are properly normalised. If a user wishes to access the database he/she should be aware of SQL statements to read the data from the database. Our view is to create such processor that can eliminate this part and enables the user to access the database in his/her language.

For Example:

Suppose if we want to access a record of a student from

STUDBSAITM table whose name is “Jasmeen” then to view the record we need to fire the following query i.e.

```
SELECT * FROM STUDBSAITM WHERE s_firstname='Jasmeen'?
```

But a person who is not aware of such queries, will not be able to access the data from the database until he/she knows about the semantics and syntax of firing a query to the database. But by using NLP this can be done very easily.

Thus, the above query can be written as:

What are the details of student whose name is ‘Jasmeen’

Both the statements i.e. SQL and NLP will result in same output but being a normal person who have less knowledge about SQL can easily access the database.

IV. NLP SCOPE

- The natural language processing is done on Interrogative Statements; the input statement will be in English.
- Input is taken in the form of questions (wh- like where, who, whom, what etc.)
- A limited Data Dictionary is used where all possible words related to a particular system is stored.
- All the names in the input queries should be in single quotes.
- Data Dictionary used can be- STUD, G_M_INFO and MARKS.

STUD	G_M_INFO	MARKS
roll_no	roll_no	roll_no
Name	name	name
email_id	f_name	semester_no
phone_no	m_name	total_avg
gender	f_no	
	blood_grp	
	m_history	

Fig 1 Tables used in the system

V. NLP ARCHITECTURE

Generally NLP has following steps [6] :-

- Morphological analysis: Individual words are analyzed into their components and non word tokens are separated from the words.
- Syntactic analysis: Linear sequences of words are transformed into structures that show how the words relate to each other.
- Semantic Analysis: The structures created by the syntactic analyzer-are assigned meanings.
- Discourse integration: The meaning of an individual sentence may depend on the sentences that precede it

and may influence the meanings of the sentences that follow it..

- Pragmatic Analysis: The structure representing what was said is reinterpreted to determine what was actually meant

The system includes the following modules:

- GUI: Designing the front end or the user interface where the user will enter the query in Natural Language.
- Parsing: Derives the Semantics of the Natural Query given by the user and parses it in its technical form
- Query Generation: After the successful parsing of the statement given by the user, the system generates a query against the user statement in SQL and further gives it to the back end database.
- Data Collection: This module collects the output of the SQL statement and places it in the User Interface Screen as a result form.

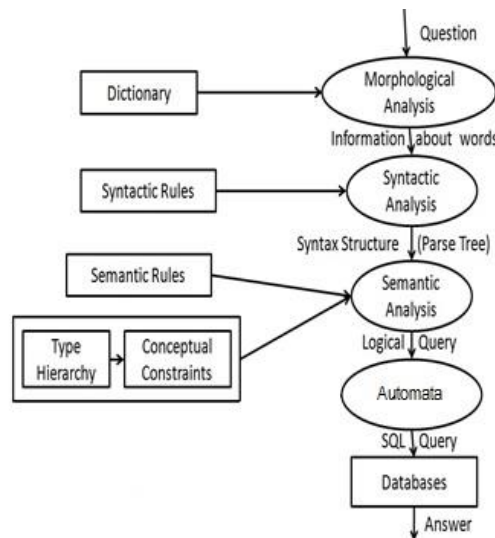


Fig 2 Stages in Natural Language Interpretation Process [6]

VI. AUTOMATA

An automaton is the study of mathematical model of computing called abstract machines or the computational problems that can be solved using them. An Automaton means "self-acting".

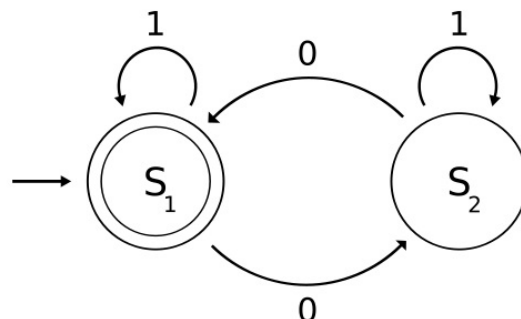


Fig 3 A simple Automata

The figure above illustrates a finite state machine, which belongs to one well-known variety of automaton. This automaton consists of

- States(represented in the figure by circles)
- Transitions (represented by arrows)

As the automata encounter a symbol of input, it jumps to a particular state that is fixed. Every time the same input encounters on the particular state it will reflect the same transition (or jump), according to its transition function (which takes the current state and the recent symbol as its inputs).

It does play a major role in theory of computation, compiler design, artificial intelligence, parsing and formal verification.

Hence, A deterministic finite automaton M is a 5-tuple, $(Q, \Sigma, \delta, q_0, F)$, consisting of

- a finite set of states (Q)
- a finite set of input symbols called the alphabet (Σ)
- a transition function
 $(\delta : Q \times \Sigma \rightarrow Q)$
- an initial state ($q_0 \in Q$)
- a set of final states ($F \subseteq Q$)

For e.g.-

Let us consider a automata ending with ab below is the figure illustrating the Finite state machine

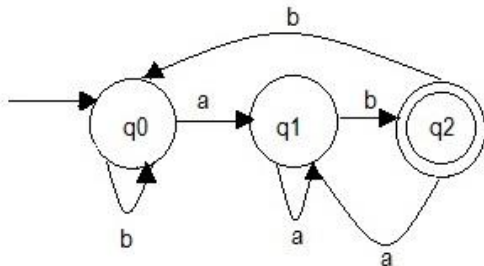


Fig 7 An automata ending with ab

for above example, we have $M(Q, \Sigma, \delta, q_0, F) = M(\{q_0, q_1, q_2\}, \{a, b\}, \delta, \{q_0\}, \{q_2\})$

Thus, all the strings except strings ending with ab will be rejected.

And hence we will use the same process to determine the keyword user is entering if the keyword matches the input symbol of a state then it moves to the next state otherwise it remains on that particular stage itself.

If at the end we reach the final state that means correct question has been asked.

VII. PROCESS INTRODUCTION

Firstly, the English input is checked by the NLP, then an automata matches table and attribute names and joins up tables if

the query involves more than one table. After that the post-processor can construct the resulting SQL query and output it.

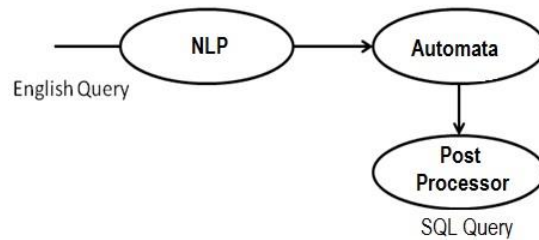


Fig 6 An architecture of System

The question

"What is student name with marks greater than '800'?" " is processed by the system as given below.

- The statement is checked through NLP for its technical correction
- The automata then attempts to find whether the question asked is appropriate according to the data dictionary we have.
- This sentence will only have one possible SQL query, so only one result is returned:

SELECT NAME FROM STUD WHERE TOTAL_AVG > 800

- The query is an SQL query.

Translating from one language to another always requires some kind of parsing. Parsing is the process of identifying structure in data. It determines whether the input data has some pre-determined structure and respond accordingly.

VIII. PROPOSED ALGORITHM

1. NLP Processing
2. Tokenization (scanning)
 - a. Split the Query in tokens
 - b. Pass the tokens to automata
3. Extract patterns using automata
4. Check for the articles and connectors and ignore them
5. Replace matching keyword with proper attribute names
6. Map value for identified attribute and corresponding table
7. Transform it into SQL

Let us consider the above example then the algorithm will work as follows:

- Input :- **"What is student name with marks greater than 800"**
- NLP Processing will check for any mistake in question forming
- Input is passed through following Automata

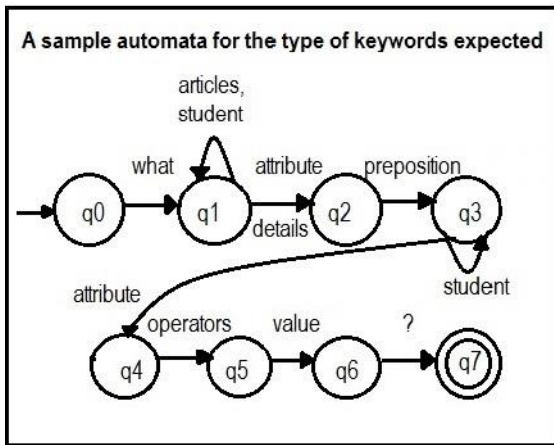
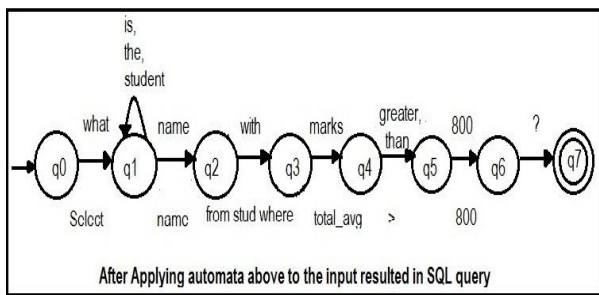


Fig 8 Query Processor Automata Module

And the generation of query by dividing it into tokens and then passing it through the automata in Fig 8 will result in



After Applying automata above to the input resulted in SQL query

Fig 9 Query Processor Automata Module Implementation

Similarly, automata for related places of articles and connectors are established and we can obtain SQL query easily.

IX. RESULTS

Hence using the above mentioned algorithm a normal query can result in corresponding SQL query.

The interface developed is shown below:-

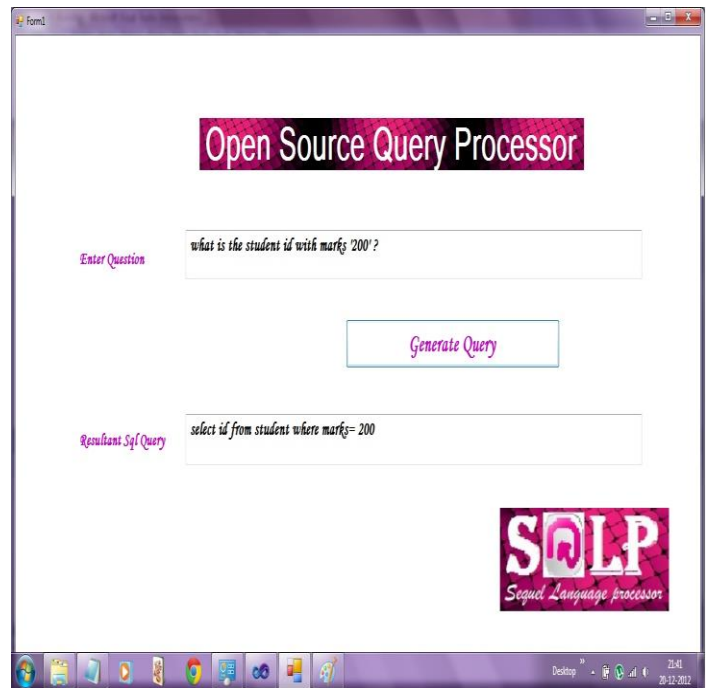
We have 2 textboxes

- 1- To Enter English Query
- 2- To display corresponding SQL query

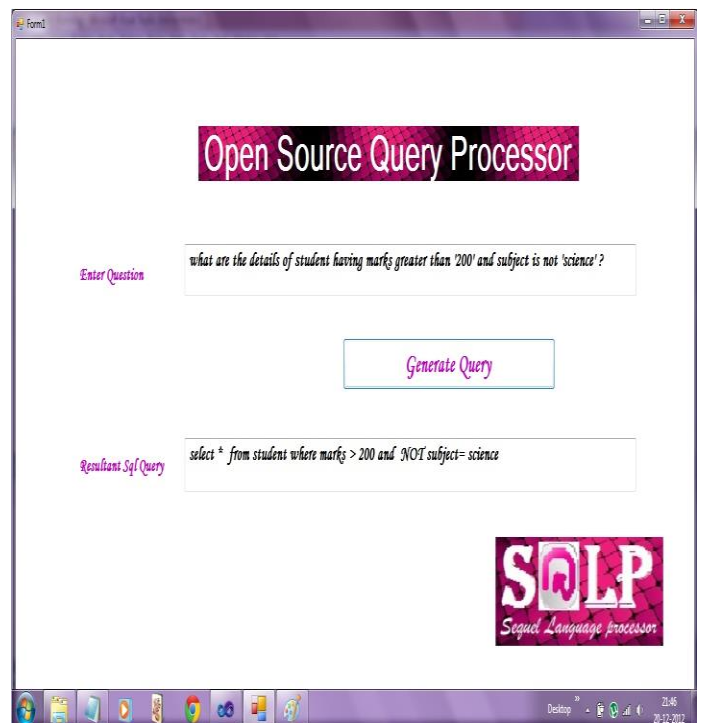
Steps to be followed:-

- Write the English query in front of Enter Question Label
- Click on Generate Query Button
- The resultant SQL query will be displayed in the next textbox
- If any non matching keywords or erroneous query is questioned then a Message box for “Not able to read it” is displayed

Screenshot-1



Screenshot – 2



X. FUTURE ENHANCEMENTS

- More new automata implementations can be added to it to increase its efficiency.
- So far, this system considers selection and a few simple aggregations. The next step of the research is, to accommodate more complex queries
- Somewhere to control a big database is difficult

XI. CONCLUSION

- Natural Language Processing can bring powerful enhancements to virtually any computer program interface.
- A system that is capable of handling simple queries with standard join conditions is introduced here but because not all forms of SQL queries are supported, further development would be required.

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Modelling of Process variables for fly ash based Al- 6063 composites using Artificial Neural Network

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Abstract - In this paper predictive model for Metal Matrix Composite (MMCs) has been developed with the use of Artificial Neural Network. Stir casting process has been used to fabricate the fly ash based AL-6063 particulate MMC. The hardness of fly ash based AL-6063 MMC is taken as output variable, however fly ash(FA) percentage of reinforcement in MMC, stirring speed of stirrer and pouring temperature of liquid phase of particulate reinforced MMC are considered to be input variable. This work is divided into two phases, in first phase twelve set of experiments have been performed with above mentioned input-output variables. Using these results artificial neural network has been trained with the help of feed forward back propagation technique in second phase. Maximum hardness of value 44.24 at 9 % of FA percentage at 730° C pouring temperature with 350 rpm stirring speed of stirrer was predicted through this model.

Index Terms: Artificial neural networks, feed forward back propagation technique, Hardness, particulate MMC, stir casting.

I. INTRODUCTION

METAL MATRIX COMPOSITES (MMCs) are considered as a group of newly advanced materials for their high strength and specific modulus, lightweight, low coefficient of thermal expansion, good wear resistance properties, high specific stiffness, superior elevated temperature properties. These composites containing particulate reinforcements often tend to exhibit clustering of the reinforcement particles depending upon the processing route adopted to produce the material [1]. Manufacturing of behaviour alloy based casting composite materials via stir casting is one of the prominent and economical route for development and processing of metal matrix composites materials [2].

Stir casting is one of the simplest ways of producing behaviour matrix composites. However, it suffers from poor incorporation and distribution of the reinforcement particles in the matrix. These problems become especially significant as the reinforcement size decreases due to greater agglomeration tendency and reduced wettability of the particles with the melt [3]

The most commonly used metal matrix composite consists of aluminium alloy reinforced with hard ceramic and soft particles. These hard ceramic particles are silicon carbide, alumina [4, 5], however soft particles are graphite, talc *etc* [6, 7]. These materials have different strengthening mechanisms when compared with conventional materials or continuously reinforced composites [8].

Although various authors have reported their contributions in the area of MMC, despite lack of generic predictive model has been

observed for MMC. Keeping these view, attempt has been made by authors to develop a predictive model for MMC.

Artificial neural networks (ANNs) are comparatively new behaviour techniques, which can be used to solve problems that are difficult for conventional computers or human beings. ANN is a parameterize model used for empirical regression and classification and its flexibility makes it able to discover more complex behaviours than traditional statistical models [9] Unlike traditional models which a specified relationship must be chosen before analysis, ANN is a general regression method and trained on a set of examples of input and output data [10] The result of this training is a set of weights that by combining with specified functions, represents the trend between inputs and outputs. Therefore, the training is a search procedure in the weights space for the best nonlinear representation of data behaviour. Once the network trained and the relationship determined estimation of new outputs for given inputs is straightforward.

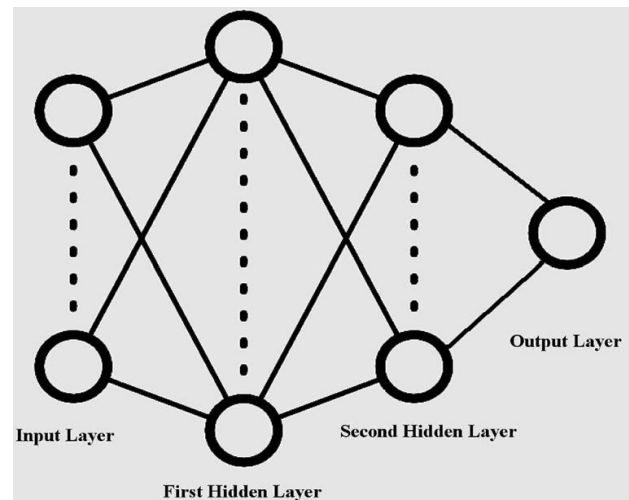


Figure1. Schematic architecture of artificial neural network [11] A feed forward network composes of an input layer, one output layer and hidden layer(s) which the number of neurons in hidden layer(s) only, is in our control and indicates the model complexity. Arrangement of layers and units in an ANN called architecture [12]. Figure 1 sketches schematic architecture of a feed forward ANN model. In each layer, units receive their input from previous layer's units and send their output to units in the following layer. Output of each hidden unit is the transfer function response to the weighted sum of its inputs. In this work, the nonlinear hyperbolic tangent transfer function and linear transfer function was used as hidden unit and output unit respectively.

II. EXPERIMENTAL

Preparation of the composite

Table 1 Composition of Al-6063 (wt pct)

Metal	Si	Fe	Cu	Mn	Mg
% composition	0.2 - 0.6	0.0- 0.35	0.0-0.1	0.0-0.1	0.45- 0.9
Metal	Zn	Ti	Cr	Al	
% composition	0.0- 0.1	0.0- 0.1	0.1 max	Balance	

The particulate reinforcement aluminium metal matrix composite (PRAMMC) selected for the present investigation was based on Al-Mg matrix alloy, designated by the aluminium association as Al-6063. This matrix alloy was chosen since it provides excellent combination of strength and damage tolerance at elevated and cryogenic temperatures. The Fly Ash (FA) particles which were used to fabricate the composite have average particle size of less than 40µm and average density of 2.5 mg/m³. The nominal chemical composition (in wt pct) of the matrix alloy is given in table 1.

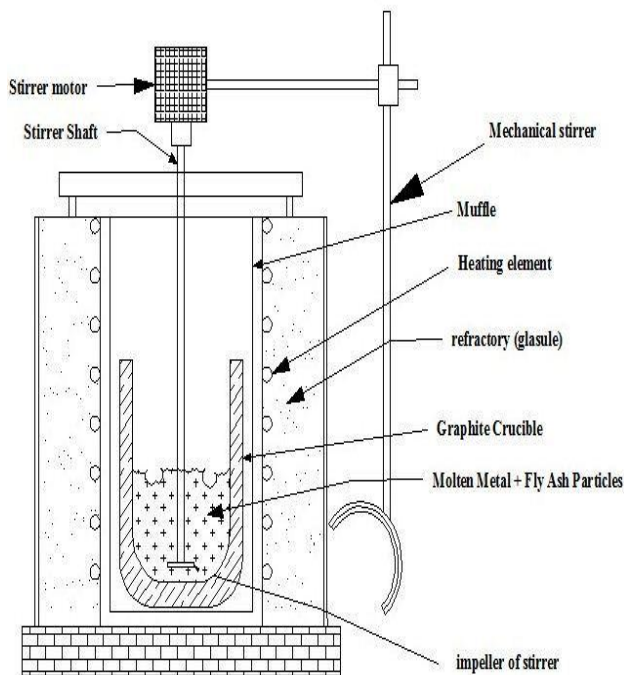


Figure2. Experimental set-up for preparation of composite

Stir casting technique is most economical to fabricate composites with particulates fibres [13]. For fabrication of this composite, the pouring temperature values are varied (720°C, 740°C, 760°C). FA particle reinforcement varied from 0 to 9 wt pct. The other input parameter (stirrer speed) is also varied (200rpm, 300rpm, 400rpm). It is to be mentioned that the value of these above mentioned input variables have been considered after trial and error basis. Other ranges of these variables were also used in experiment but due to non-homogeneity with liquid phase and spread of reinforcement (fly ash) not considered for

fabrication of composite. In this process matrix alloy (Al-6063) temperature was lowered gradually below the liquidus temperature to keep the matrix alloy in semi- solid state. At this temperature the preheated F.A particles were introduced into slurry and mixed. The composite slurry temperature was increased to fully liquid state and automatic stirring was continued for 5min. at defined stirring speeds of 200rpm, 300rpm, and 400rpm. The melt was then superheated above liquidus temperature and finally poured at defined temperature range into the mild steel permanent mould of 25mm diameter and 150mm in height. Pictorial View of experimental set up for fabrication of fly ash based Al-6063 MMC through above mentioned procedure is shown in Fig.2.

A Vickers hardness testing machine is used to measure the micro hardness of the fly ash composite samples. The specimens of 20 x 20 x 20 mm were cut from cast samples and then polished metallographic ally. During the test the diamond pyramid indenter with certain shape is penetrated into the surface of the specimens under certain test force which shall be removed after retained for certain period of time. After measuring the length of the diagonal lines of the indentation, the hardness value is gained by looking up chart as per length of the diagonal lines or by formula [14]:

$$HV = \frac{1.8544 F}{d^2} \text{ Kgf/mm}^2 \quad (1)$$

Plan of experiments

The experiments were conducted as per the standard orthogonal array. The election of the orthogonal array was based on the condition that the degrees of freedom for the orthogonal array should be greater than or equal to sum of those hardness parameters [15-16]. The hardness of fly ash based AL-6063 MMC is taken as output variable, however fly ash (FA) percentage of reinforcement in MMC, stirring speed of stirrer and pouring temperature of liquid phase of particulate reinforced MMC are considered to be input variable, which has also been mentioned in previous section. Table 2 indicates the factors (Input Variables) and their level (different set of values for these variables). The experiment consists of 9 sets (each row depicts the one experiment; however each column depicts parametric values in L9 orthogonal array). Pouring temperature (*T* °C); stirring speed and reinforcement (fly ash %) are assigned to first, second and third column respectively. The last column of table shows output variables namely hardness in Vickers. The experiments were conducted as per the orthogonal array with level of parameters given in each row.

Table 2 Experimental data using L₉ Orthogonal Array

Set	Pouring Temperature (T °C)	Stirring speed rpm	Reinforcement (FA %)	Hardness in Vickers
1	720	200	3	29.6
2	720	300	6	34.0
3	720	400	9	42.9
4	740	200	6	38.9
5	740	300	9	42.1
6	740	400	3	28.8
7	760	200	9	41.1

8	760	300	3	28.0
9	760	400	6	34.7

III. DEVELOPMENT OF PREDICTIVE MODEL USING ANN

Artificial neural network

Neuron is the main ingredient of Human Nervous System. Artificial neuron imitates the activity of neuron. It is a computational model inspired in the Artificial Neural Network. Figure3 shows natural neurons receive signals through synapses located on the dendrites or membrane of the neuron. When the signals received are strong enough (surpass a certain threshold), the neuron is activated and emits a signal through the axon. This signal might be sent to another synapse, and might activate other neurons [17].

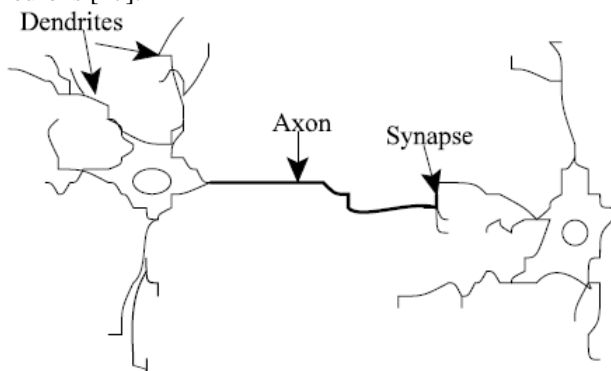


Figure 3. Natural neurons (artist's conception) [17]

Artificial Neural Network is iterative procedure to produce the result in terms of output. The iterations are high in number to readjust the weights on each neuron on the network. The weights are readjusted again and again to obtain least Mean Squared Error. Back propagation algorithm (Rumelhart and McClelland, 1986) is used for adjusting the appropriate weights on all neurons of network. [18]

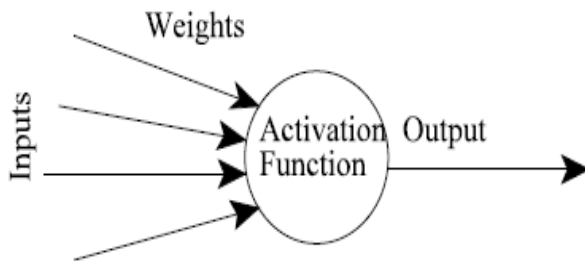


Figure4. An artificial neuron [17]

Figure4. Shows, weights are assigned with each arrow, which represent information flow. These weights are multiplied by the values which go through each arrow, to give more or less strength to the signal which they transmit. The neurons of this network just sum their inputs. Since the input neurons have only one input, their output will be the input they received multiplied by weight.

The Back propagation Algorithm

The back propagation algorithm (Rumelhart and McClelland, 1986) is used in layered feed-forward ANNs. This means that the artificial neurons are organized in layers, and send their signals “forward”, and then the errors are propagated backwards. The network receives inputs by neurons in the input layer, and the output of the network is given by the neurons on an output layer. There may be one or more intermediate hidden layers. The back propagation algorithm uses supervised learning, which means that we provide the algorithm with examples of the inputs and outputs we want the network to compute, and then the error (difference between actual and expected results) is calculated. The idea of the back propagation algorithm is to reduce this error, until the ANN learns the training data. The training begins with random weights, and the goal is to adjust them so that the error will be minimal.

The activation function of the artificial neurons in ANNs implementing the back propagation algorithm is a weighted sum (the sum of the inputs x multiplied by their respective weights w) we can see that the activation depends only on the inputs and the weights. If the output function would be the identity (output=activation), then the neuron would be called linear.

Predictive Model using ANN

Nine sets of experiments have been performed using L-9 orthogonal array and results in terms of input-output relations have been given in Table2 in previous section. However it has been reported [19] that generally twelve (12) sets of input-output relationships are required for accuracy in training. Keeping this view three (3) more number of experiments has been performed and their results in terms of input-output relationship are given in Table3.

Table3 Input-output variables for ANN model

Test no	Pouring Temperature (T °C)	Stirring speed rpm	Reinforcement (F.A %)	Hardness in Vickers
1	720	300	9 %	40.0
2	740	400	6 %	32.0
3	760	200	3 %	29.9

All these Input-output relationships (12 numbers) obtained through experimental data have been used for training the network. Input and output variables are normalized and fitted to Neural Network for training. Training is concerned with adjustment of weights among neurons. Input data has three (3) variables pouring temperature of liquid phase, stirring speed of stirrer, percentage of fly ash reinforcement (%), while the output data has one variable namely hardness of fly ash based Al-6063 composite. The various parameters (Number of Hidden Layer, Number of Neurons in each hidden layer, Learning rate, momentum, Mean Squared error, transfer function) concerned with training of ANN are adjusted through trial and error procedure. Following this two hidden layers with nine (9) neurons in each have been considered using Back propagation algorithm for training. Hyperbolic tangent sigmoid (tansig) transfer function is used for hidden layers, however linear transfer function (purelin) is used at the output layer. The

momentum and learning rate are taken to be 0.7 and 0.25 respectively. The mean squared error was set as 0.00001. Initially number of iterations was taken in the range of 30000 to 42000. Finally it has been seen 40000 iterations provide required MSE value so often. Hence 40000 iterations have been considered for this model. Training ended once the Mean squared error (MSE) was reduced to 0.00001 or the number of iterations reached to 40000.

Table4 Predicted values of output through Developed ANN based Model

Sr. No.	Pouring Temperature (T°C)	Stirring Speed (rpm)	Fly Ash %	Hardness in Vickers (HVN)
1	730	250	3.5	29.88
2	730	250	4.0	30.42
3	730	250	4.5	31.61
4	730	250	5.0	32.49
5	730	250	5.5	33.68
6	730	250	6.0	35.34
7	730	250	6.5	37.23
8	730	250	7.0	39.41
9	730	250	7.5	40.87
10	730	250	8.0	41.14
11	730	250	8.5	42.68
12	730	250	9.0	43.75
13	730	350	3.5	30.11
14	730	350	4.0	31.68
15	730	350	4.5	32.43
16	730	350	5.0	33.67
17	730	350	5.5	34.73
18	730	350	6.0	36.12
19	730	350	6.5	38.33
20	730	350	7.0	40.21
21	730	350	7.5	41.10
22	730	350	8.0	42.63
23	730	350	8.5	43.13
24	730	350	9.0	44.24
25	750	250	3.5	27.43
26	750	250	4.0	29.23
27	750	250	4.5	31.26
28	750	250	5.0	32.89
29	750	250	5.5	33.12
30	750	250	6.0	34.24
31	750	250	6.5	35.45
32	750	250	7.0	36.91
33	750	250	7.5	38.12
34	750	250	8.0	39.45
35	750	250	8.5	41.33
36	750	250	9.0	42.61
37	750	350	3.5	29.91
38	750	350	4.0	31.11
39	750	350	4.5	32.23
40	750	350	5.0	33.03
41	750	350	5.5	34.12
42	750	350	6.0	35.43
43	750	350	6.5	36.63
44	750	350	7.0	37.72
45	750	350	7.5	38.67
46	750	350	8.0	39.91
47	750	350	8.5	41.20
48	750	350	9.0	42.78

The output values may be predicted using this model, for different values of input variables. Some of the results in terms of input-output relationship for this predictive model are shown in Table4 It can clearly be seen that maximum value of hardness 44.24. Many other combinations of input variables were also tried, but not being reported due to non-improvements in results (Maximizing the Hardness).

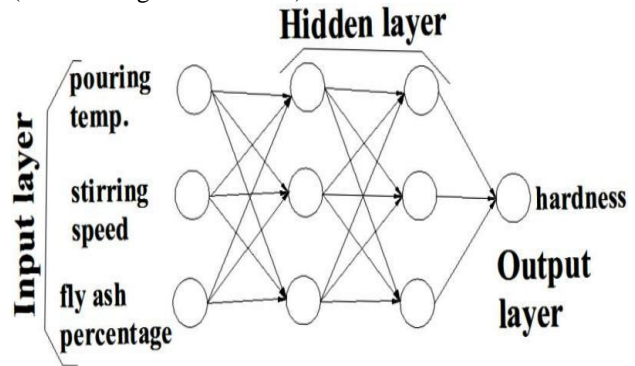


Figure5 ANN Architecture

The architecture of neural network used in this investigation shown in Figure5. Performance of the ANN model is illustrated when experimental data were given as input to network of the model. These data were further divided into three parts training, testing and validation by Network itself. It can be seen through Fig.6 to Fig. 8 c that developed ANN model performs reasonably good for prediction of hardness of fly ash based Al-6063 based MMC.

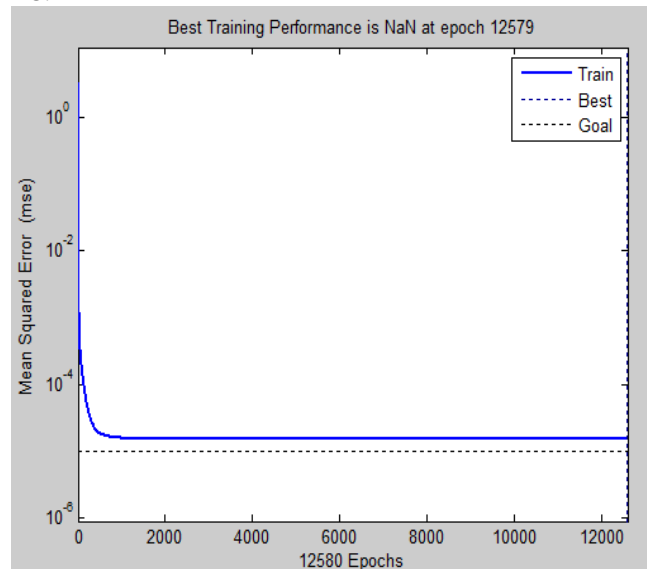


Figure6 Mean Squared Error for the network

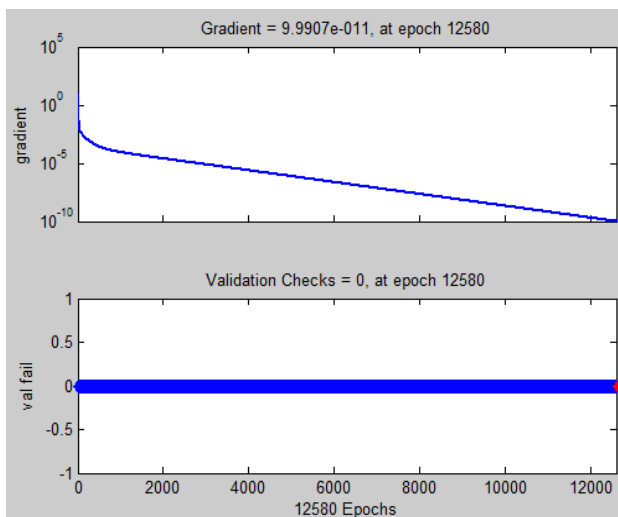


Figure7 Gradient during ANN training

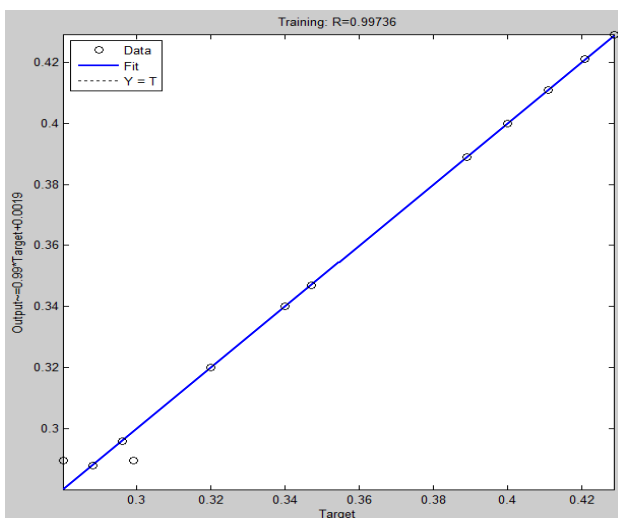


Figure8 Regression analyses of data used for training

Figure6 shows the error is minimized by increasing the epochs. Figure7 shows the gradient during training fall continuously due to readjusting of weights of neuron in 12580 epochs. Figure8 shows the regression line of data used for training. The highly trained data is closer to regression line. This indicates reasonably good performance of the network.

IV. CONCLUSION

Experiments were performed for fabrication of fly ash based Al-6063 composite. Three process variables stirrer speed of stirrer, pouring temperature of liquid phase and percentage of reinforcement (fly ash) have been considered as input, however hardness in Vickers was taken to be output variable. It has been observed through experimental data that the hardness has non linear relation with variables (Fly ash composition, Pouring temperature, Stirring speed). Hence attempt has been made to develop more accurate and computationally efficient non-parametric approaches for the prediction of Hardness in Vickers. Using these experimental input-output data ANN based model is developed. The various parameters of ANN for

experimental data are adjusted on trial and error basis to minimize MSE (Mean Squared error). The ANN based modeling approach is used for accurately predicting the hardness for all possible combinations of fly ash percentage, pouring temperature, stirring speed of stirrer, so that a suitable combination of these variables may be recommended to increase the hardness.

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Web Services Based On SOAP and REST Principles

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Abstract- Interest in Web services is rapidly increased from their start of use. To exchange information among the application in standard way is the main goal of web services. This communication between the applications is based on SOAP and REST principle. SOAP communications causes network traffic, higher latency and processing delays. To overcome this limitations the REST'ful architecture is used. REST is a lightweight, easy and better alternative for the SOAP. In this paper comparison on performance of SOAP based and REST'ful web services based on different metric for mobile environment and multimedia conference is taken into consideration.

Index Terms- Web services, SOAP, REST, Multimedia Conferencing, Mobile Computing.

I. INTRODUCTION

Previous technologies such as RMI, CORBA and DCOM were used to create client and server applications. These are used in highly coupled distributed systems, in which both server and client are dependent on each other. Compatibility and security problems arise when we use these technologies. This kind of traffic will block by firewall and proxy servers. Highly coupled systems are mostly used for intranet applications because platform and technology used is already known or same on both server and client side. Therefore we are using a web service which is standard way to distribute services over the internet. The clients don't have any prior knowledge of the web services before they actually use it, therefore WEB SERVICE are platform independent and loosely coupled. There are two types of web services based on SOAP principle and REST principle. Various applications such as conferencing, web application can be developed using SOAP and REST'ful web services. In SOAP based web services XML is used to define simple object access protocol (SOAP). REST'ful web services follows REST principle for distributed hypermedia systems. REST design style is defined as network architectural style because REST'ful web services depend on HTTP, HTML and other web technologies.

The goal of this paper is to make survey on SOAP and RESTful web services to show that RESTful web services having better performance. We give an overview of SOAP, REST, with multimedia conferencing, mobile computing services as an example for illustration. We then conclude the paper.

II. RELATED WORK

The main purpose of web services is to create web applications. According to the geographic distribution in [1] most of the web services hosted in United States. This shows the rapid acceptance of web service. To provide the

infrastructure for the application distributed systems model uses web standards such as SOAP, WSDL, and UDDI. Web service uses xml for the communication as the XML language is worldwide accepted. The basic web service platform is XML + HTTP. To access the web service XML based SOAP communication protocol is used. Web service description is written in the web service description language. To publish and discover web service UDDI is used. These web standards and the use of the XML enables the systems to exchange information and interoperate at different location and in different environment. REST is becoming more popular now days due to its performance and ease of use as compare to SOAP web services. Because SOAP web service produces network traffic and causes higher latency. Research is going on to improve the performance of SOAP based web service. Because the SOAP follows the standard message format for communicate. The performance enhancement techniques are based on metrics in categories as throughput, network traffic, and response time [2]. The improving service execution time has been investigated in various aspects of SOAP processing addressing serialization, parsing and deserialization. There are few proposals which addressed the issue of improving SOAP security policy evaluation performance through improving underlying techniques such as parsing, caching, and multicasting. Numbers of alternatives are available for SOAP and REST'ful web service on principal level, conceptual level and technology level [3].

III. SOAP

The SOAP based web service architecture is as shown in fig 3.1. Which defines 3 entities: - service provider, service registry, and service requester. The service provider is the service, the network addressable entity that accepts and executes request from consumer. The service consumer is an application, service or some other type of software module that requires a service. A service registry is a network- based directory that contains available services. The service consumer finds the service description in the registry which is published by the service provider. Using this description consumer starts interacting with the service. The communication among these entities is based on XML and SOAP protocol. SOAP messages composed by envelope, header and body [4]. The envelope element identifies the XML document as a SOAP message. A header element contains call and response information. Messages and method invocations are defined as XML documents and are sent over a transport protocol SMTP, FTP, HTTP.

IV. REST

The term representational state transfer was introduced by Roy Fielding. REST style architecture is client server architecture in which client sends request to server then server process the request and return responses. These request and

responses build around the transfer of representations of resources. A resource is something that is identified by URI. Representation of resource is typically a document that captures the current or intended state of a resource. REST is less strongly typed than SOAP. The REST language is based on the use of nouns and verbs. REST does not require message format like envelope and header which is required in SOAP messages. So as XML parsing is also not required bandwidth requirement is less. Design principle of REST is as follows- addressability, statelessness and uniform interface. Addressability- REST models the datasets to operate on as resources where resources are marked with URI. A uniform and standard interface is used to access the rest resources i.e. using fixed set of HTTP methods. Every transaction is independent and unrelated to the previous transaction as all data required to process the request is contained in that request only, client session data is not maintained on server side therefore server responses are also independent. These principles make the REST application simple and lightweight. The web application which follows the REST architecture we call it as RESTful web service. Restful web services uses GET, PUT, POST and DELETE http methods to retrieve, create, update and delete the resources.

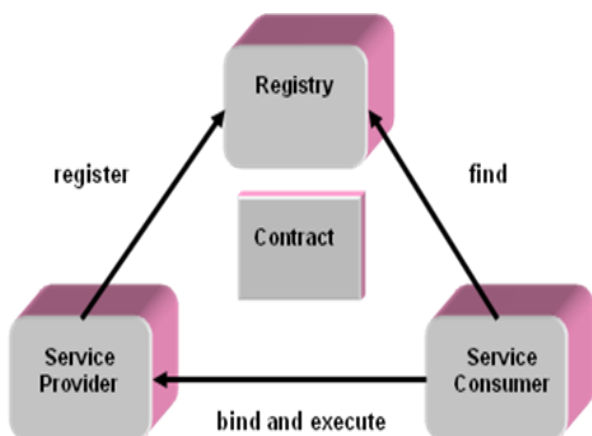


Figure 3.1: Web service architecture.

V. PERFORMANCE COMPARISON OF WEB SERVICES

Previously we are using the SOAP based web services in mobile computing environment, multimedia conferencing and many other applications. But the use of SOAP messages require large bandwidth, encoding and decoding of XML based SOAP messages consumes resources; these are the unacceptable performance overheads. Therefore we are using RESTful web services as an alternative to get better performance. For their performance comparison we are considering two applications such as multimedia conferencing and mobile computing.

The main requirement of mobile computing is connection of mobile system to a conventional distributed computing environment, for that we are using web services. Now considering performance of SOAP and RESTful web service in mobile computing environment where the service client is mobile application. [5] Evaluates the performance of both web

services which provides the same functionalities in mobile computing environment. Two benchmarks are implemented based on float and string data type as parameter to the web service. The service client runs on mobile emulator. Results are captured for SOAP and RESTful web services in terms of total response time and message size. Table I shows that,

1) Message size in RESTful web services (in both cases) is 9 to 10 times lesser than size of SOAP based web services message.

2) Similarly time required for processing and transmission is also 5 to 6 times lesser than SOAP based web services.

Now taking multimedia conferencing into consideration these are audio-video conferencing, distance learning, online games etc. we can develop SOAP based and REST based web services for such applications. Multimedia conferencing model (e.g. parlay-x's conferencing model) is based on 3 entities – conference, participants, and media [6]. Where participant is an entity which participate into the conference, conference is uniquely identified context to which we can add and remove participant. The media represents the media stream which support participant's communication. We can develop such multimedia conferences using web services based on SOAP and REST principle. Now comparing performance of SOAP and REST based web services in multimedia conferencing application. [7] Gives this performance evaluation by considering different scenario such as Get conference, Adding participant, removal of participant, Get participants, End of conference. For implementation of conferencing application API for web services conferencing gateway is used. The request handlers for both web services are part of this conferencing gateway to handle the SOAP and REST communications with their applications. Table II shows that Performance evaluation of all scenarios as:

1) End to end time delays of RESTful web services are 3 to 5 times less than the SOAP web services.

2) The network load for RESTful web services is nearly 3 times lesser than SOAP based web service.

Similarly in short messaging service (SMS) for sending and receiving a message RESTful web services are used rather than the SOAP [8]. This is because SOAP and RESTful web services provides same functionalities but request and responses of SOAP based web services are written in SOAP format and then enveloped in an HTTP message while RESTful web services not uses SOAP format and only uses HTTP as application layer protocol.

VI. CONCLUSION

As we know web services are widely used over internet. Web Service performance is became an important factor. From the above analysis we concluded a RESTful web service is a better alternative for SOAP based web services. SOAP based web services are produces considerable network traffic, high latency and the message size is also large this is not in the case of RESTful. The RESTful web services have better performance than SOAP based web services in wired and wireless communication network. The RESTful web services are lightweight, easy and Self-descriptive with higher flexibility and lower overhead.

TABLE II : PERFORMANCE RESULTS OF SOAP AND RESTFUL WEB SERVICES IN MOBILE COMPUTING [5].

Number of array elements	Message Size (byte)				Time (Milliseconds)			
	SOAP/HTTP		REST (HTTP)		SOAP/HTTP		REST (HTTP)	
	String Concatenation	Float Numbers Addition	String Concatenation	Float Numbers Addition	String Concatenation	Float Numbers Addition	String Concatenation	Float Numbers Addition
2	351	357	39	32	781	781	359	359
3	371	383	48	36	828	781	344	407
4	395	409	63	35	828	922	359	375
5	418	435	76	39	969	1016	360	359

TABLE II: PERFORMANCE RESULTS OF MULTIMEDIA CONFERENCING USING SOAP AND REST INTERFACES [8].

MULTIMEDIA CONFERENCING API	SOAP-based			REST-based		
	<i>Delay in a distributed environment (ms)</i>	<i>Delay on the same machine (ms)</i>	<i>Network load (bytes)</i>	<i>Delay in a distributed environment (ms)</i>	<i>Delay on the same machine (ms)</i>	<i>Network load (bytes)</i>
Create conference	848.4	381.7	767	171.4	102.7	273
Get conference information	818.6	335.3	546	172.3	98.6	177
Add participant	1325.3	334.2	578	368.8	103.3	200
Remove participant	1322.3	357	588	382.9	107.2	195
Get participants	787.1	342.7	615	197.8	104.8	195
Get participant information	766.2	346.7	619	169.8	105	204
End conference	1508.4	341.4	500	556.6	105.3	204

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Environmental Impact due to Agricultural runoff containing Heavy Metals – A Review

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Abstract- This paper is a collation and compilation of the research papers pertaining to the heavy metal contents in irrigation water used for agricultural purpose. The uptake of heavy metal by plants through contaminated soil gets accumulated and is a potential threat to animal and human health. The heavy metals in water bodies damage the aquatic organisms and fishes. Excess use of fertilizers and pesticides in agricultural activities to enhance productivity due to rapid population increase and development of technology threaten the groundwater and surface water on a large scale. This shows there is an obvious risk for human in the future. The pesticides used in crop cultivation should be free from heavy metals. Hence this study concentrates on effects of heavy metals present in irrigation water.

Index Terms- Irrigation water, Heavy metals, Agricultural runoff, Fertilizer, Pesticides

I. BACKGROUND

In India 70% of the total population depends on agriculture. India ranks second in world farming; irrigation has acquired increasing importance in agriculture worldwide. India's irrigation development particularly after independence has seen large number of storage based systems.

Today man is living in a "Chemical sphere" and these chemicals whether, natural or manmade, has the capacity to degrade the delicately balanced ecological system by poisoning air, water and land. Hence, while realizing the need of chemicals, it should be ensured that it will not spoil the environment. Global chemical pollution has been a matter of great concern with increase in public awareness towards environmental problems [17].

In most countries of the world, groundwater and surface water are at a serious risk of pollution due to chemicals used in agricultural activities. During the last two centuries, heavy metals released by human activities have superimposed new pattern of metal distribution on those which are naturally occurring.

The reuse of treated urban wastewater for irrigation is a relatively recent innovation. Although many studies have been carried out on various aspects of the system, knowledge is still limited on the associated heavy metal accumulation in soils. Most studies are done, to know the effects of using treated wastewater with sludge on vegetable crops rather than heavy metal polluted water. Thus, there is an urgent need to be focused on the benefits and limitations of the use of such water for irrigation [41].

II. SOURCES OF HEAVY METAL CONTAMINATION

Heavy metals are introduced to environment either by natural means or anthropogenic activities.

(a) Natural sources: In nature, excessive levels of trace metals may occur by geographical phenomena like volcanic eruptions, weathering of rocks; leaching into rivers, lakes and oceans due to action of winds.

(b) Anthropogenic sources: In ancient times, heavy metals were released in small amounts while mining and smelting of metal ores in open fires. With the industrial revolution, metals are extracted from natural resources and processed in industries from where heavy metals leak into atmosphere. Similarly, traces of heavy metals get deposited in the environment through discharge; domestic waste, agricultural runoff and automobile exhausts.

The various human activities through which heavy metals reach the environment are i) Smelting or processing of ores of metals, ii) Mining, iii) Burning of fossil fuels such as coal, petrol and kerosene oil, iv) Discharge of agricultural, industrial and domestic waste. v) Auto exhaust, and vi) Pesticides containing compounds of heavy metals.

Heavy metals are also widely used in household appliances, paints, photographic paper, photo chemicals etc., Pollution of ground water and surface water systems through anthropogenic activities is the major environmental problem faced all around the globe [3, 4]. Wastewater from urban area is being used profitably to irrigate crops in the vicinity of cities from the time unknown. Wastewater is still considered rich in plant nutrients and organic matter. However, the situation is changed now because, in many cities and towns the wastewater is sold for secondary use and it is a good source of income to municipalities [16].

Heavy metal is present in diminutive quantities in the water and is further added due to soil erosion and leaching of minerals. However, in the recent past, freshwater pollution due to heavy metals has become a hazard due to discharge of industrial effluents. Heavy metals like Mn, Fe, Ni, Cu, Zn and Cr are essential for the growth of organisms, while Pb, Cd, Hg and Ag are not biologically essential, but definitely toxic. Even the essential heavy metals may be beyond optimum threshold levels, hazardous and toxic. After entering the water, metals may precipitate, gets adsorbed on solid surface, remain suspended in water or taken up by fauna. A very important biological property of metal is its tendency to accumulate [6].

2.1 Contamination through domestic wastewater

The heavy metals like Pb, Cu, Zn and Cd are generally found in wastewater. Copper is one of several heavy metals that are essential to life despite being inherently toxic as non-essential heavy metals exemplified by Pb and Hg [15]. Plants and animals rapidly accumulate it. It is toxic at very low concentration in water and is known to cause brain damage in mammals [11].

Jannapura Lake, a perennial fresh water body located in Bhadravathi town of Karnataka state, India, is used for irrigation purpose. This lake receives untreated domestic wastewater from residential areas. Water samples collected during October 2004 to June 2005 were analyzed using Atomic absorption spectrophotometer for Cu, Zn, Pb, Cd and Ni. The concentration of all the heavy metals of concern in the water exceeded the permissible limits as per WHO Standards. The study indicated that the water of the lake was not suitable for drinking purpose. The concentration of Zn for irrigation and live stock watering are 1.0 mg/L and 0 to 20 mg/L respectively. High concentration of Zn in water is unsuitable for the sustenance of the aquatic life. But could be utilized for irrigation and live stock watering [6]. Although Zn has been found to have low toxicity to human, prolonged consumption of large doses can result in some health complications such as fatigue, dizziness and neutropenia [10].

Water, vegetable and sediment samples collected from Tyume River, South Africa was analyzed for the trace metals Cd, Pb, Co, Zn, Cu and Ni. High levels of Cd (0.044 ± 0.003 mg/L) and Pb (0.035 ± 0.001 mg/L) were found recorded, which may be detrimental to the health of the aquatic ecosystem and indirectly to human since the river water is used to irrigate farmland. The study revealed that open-beaker digestion is still a reliable method for quantitative determination of trace metals in environmental samples. The microwave-assisted digestion method also gives acceptable recoveries and thus applicable for trace metal determination in vegetable samples [31]. The chronic effect of Pb on human includes neurological disorders especially in the fetus and in children. This can lead to behavioral changes and impaired performance in IQ tests [14].

Dissolved trace metals Fe, Mn, Al, Cu, Pb and Cd were quantified for samples collected from Umtata River, South Africa. High level of Al, Cd, Pb, Zn and Cu were observed, which may affect the health of the aquatic ecosystem. The high levels of Al, Cd and Pb may have a detrimental effect on health of the rural community residing in the vicinity of river catchment without treatment [34]. The effect of Cd toxicity in human includes kidney damage, mutagenic, carcinogenic and teratogenic effects [12, 13]. It was indicated that, in acidic sandy soils especially metal leaching is substantial and the flux from soils to groundwater is high enough to eventually contribute to the Cd load in nearby surface waters [25].

Water samples were analyzed for heavy metals in Punnakayal estuary, Tuticorin, Tamilnadu, India, at two stations for one year. Heavy metal concentration varied slightly in water samples of both the stations. The metal concentration of the samples was high during monsoon [37]. Organic matter normally present in sediment of water is favorable binding site for heavy metals and humic substance. The organic matter plays a vital role in the sorption of metal on marine sediments due to the presence of charge surfaces [24].

The water samples collected from canal and Bara river (irrigation source) of Akbarpura area of District Nowshera,

Pakistan was analyzed for selected heavy metal contents (Cu, Zn, Fe, Mn, Cd, Ni and Cr) using Atomic absorption spectrophotometer. It was found that, the heavy metal contents in Irrigation canal water was much less for Cu, Pb, Fe, Cd, Ni and Cr compared to Bara river water. While Zn and Mn were found in deficient concentration [1]. It was reported that canal sediment could act as sink for a wide range of contaminants including heavy metals from various sources (Agricultural and wastewater discharge). No external addition of heavy metal occurs in case of irrigation canal [23].

A study on impact of heavy metal contamination of Bellandur Lake, Bangalore, India on soil and cultivated vegetation describes that Fe, Cr and Pb showed 50% higher concentration during rainy season, while Cd showed higher concentration during dry season. A marginal difference in concentration is found for Cu and Ni between wet and dry seasons. Zn showed less seasonal variation. Higher concentration of Fe, Cr and Pb during the rainy season is probably due to rainfall and run-off which cause erosion, thereby introducing into the lake soil, silt and even discarded iron waste besides wastewater from drains nearby, the high level of Cd during dry season might be due to concentration effects [26].

2.2 Contamination through fertilizers/pesticides

Excess use of fertilizers and pesticides in agricultural activities to enhance productivity due to rapid population increase and development of technology threaten the groundwater and surface water on a large scale. In most of the countries, soils and waters have been polluted by fertilizers and pesticides used during agricultural activities. These waters and soils continue to be polluted, as the necessary precautions have not been taken. This shows there is an obvious risk for human in the future [18].

Nitrate and heavy metal pollution resulting from agricultural activity was examined to know the risk in Eskipazar, Turkey and the surrounding area. Water discharged from agricultural activities is used as drinking water and for domestic purposes. In particular, periodically varying levels of pollutants, such as Pb and Hg were detected in wells featuring a high NO_3 pollution, high levels of Ca and SO_4 pollution was observed at a well drilled in alluvium. The study area had no sources of pollution, such as mineralization, industrial center, waste disposal area, etc. Thus, it is believed that the main causes of NO_3 and trace element pollution are fertilizers and pesticides used in agricultural activities [18].

Increased use of fertilizers to improve agricultural productivity has also affected the quality of groundwater, including nitrate pollution [21]. Nitrate in waters is an indicator that the water is at a risk of pollution [19]. The usage of water with a high nitrate level for drinking purpose reduces the oxygen carrying capacity of the blood and can lead to methemoglobinaemia in babies. Organic materials, such as farm manures, bio-solids or composts contain higher concentration of trace elements than most agricultural soils. The use of bio-solids and composts increases total amount of Cu, Zn, Pb, Cd, Fe and Mn in soils [20].

The use of phosphate fertilizers in agricultural field has shown to enhance leaching of Cd from soil, which reaches the lake water. It undergoes physical and chemical changes

depending on the pH and quality of water and sediment. The available metals in the water phase cause risk to human beings and biota [6]. Carbon and Nitrogen concentration increase in response to irrigation, but it is not clear whether this is due to decreased decomposition rate of crop residues in response to pollution in the irrigation water or to increased amounts of crop residue in the irrigated soils [30].

Intake of vegetables is an important path of heavy metal toxicity to human beings. Crops and vegetables grown in soils contaminated with heavy metals have greater accumulation of heavy metals, it depends upon the nature of vegetables and some of them have a greater potential to accumulate higher concentration of heavy metals than others. Dietary intake of heavy metals through contaminated vegetables may lead to various chronic diseases. Levels of Cd, Cu, Mn, Ni, Pb and Zn were determined in irrigation water, vegetables and soils of Makurdi irrigated farmland along river Benue, Nigeria. The water used for irrigation had the concentration 0.00013 ± 0.0004 , 0.0022 ± 0.0010 , 0.0024 ± 0.009 $\mu\text{g/g}$ for Cu, Mn and Zn respectively. While Cd, Ni and Pb was not detected in irrigation water. The concentration of all the heavy metals studied was detected in soil and plant samples. Heavy metal concentration varied among different vegetable and fruit studied. Among the vegetables and fruits examined Zn and Mn had the highest concentrations, but were below the recommended safe limits of heavy metals by WHO, FAO, EU Standards [5]. The sources of heavy metals to vegetable crops are growth media (soil, air, nutrient solutions) from which they are taken up by the roots or foliage [9].

Surface water and groundwater samples of certain locations viz., Bugudanhalli, Kallambella, Honnudiike, Hebbur, Kadaba, Maidala, and Kunigal situated around Tumkur, Karnataka, India were assessed for selected heavy metals (Cd, Cu, Fe, Hg, Mn, Zn and Ni). All surface waters except Honnudiike and Hebbur samples contained low concentration of these metals and are ideal for irrigation. The samples from Honnudiike, Kadaba and Hebbur had high iron concentration, only Honnudiike and Hebbur samples exceeded 5mg/L (required for irrigation). In groundwater, the concentration of all these heavy metals except Cu were also well in permissible limits and found suitable for drinking. The elements Cd, Hg and Mn were absent in all the samples [2].

The trace metals Cd, Hg and Zn, which may affect human health and aquatic ecosystem, were determined in Umtata, Buffalo, Keiskamma and Tyume rivers and Umtata dam, South Africa. Normal level of the metals were detected in water samples from the Umtata river and the Umtata dam but samples from Buffalo, Keiskamma and Tyume rivers contained elevated level of Cd. The levels of Hg and Zn were normal in samples from all the surface waters. The probable sources of the trace metal in the rivers are due to rural, urban and from agricultural runoff in the catchments although there could be contribution from natural and point sources [39].

The sources, distribution and mobility of heavy metals in Zhuzhou city, Hunan province, China were systematically studied based on environmental monitoring data and random sampling. There was no significant difference in total Pb and Zn in topsoil, which showed the balance between input and output. Heavy metals in the vegetable and rice were higher than the

edible standards and background value to some degree with minor exceptions. The maximum concentration level of heavy metals observed were in the order of Cd, Pb, Cu and Zn. Significant positive correlations were found only between cabbage uptake and total soil content for Hg, Pb and Cd, with no significant correlation for the other elements [22].

Heavy metal content in plants depends on its bioavailability in the soil and on the atmospheric deposition, with the media affected by wastewater irrigation and fertilization, and the latter either directly entering the plants through stomata or taken up by plant roots after its deposition on the soil surface [27].

2.3 Contamination through Industrial effluent

With the establishment of industries in suburban area, the domestic wastewater is mixed with industrial effluents and is coming out through culverts from the cities. These culverts and drains not only contain heavily polluted water but also give noxious and off smell gases. The polluted water even then is still used for growing vegetables in the nearby areas of the cities without knowing its adverse impact on the life of consumers. Wastewater mixed with industrial effluent used for irrigation in the vegetable growing area of Korangi, Karachi, Pakistan was tested for its heavy metal contents. Twenty four samples from different drains and four tube well water samples were collected and analyzed. Soil and plant samples were taken from the same area and analyzed to assess its heavy metal contamination. It was noted that 4% samples contained Zn, Cu, Fe and Cr above the critical values; while 7, 21, 14 and 36% samples were higher than the required values in Mn, Cd, Ni and Pb respectively. Soil analysis showed higher values of Zn, Fe, Mn, Cd, Ni and Pb at some places. Plant sample (Spinach) had greater concentration of many heavy metals than the recommended values. The area irrigated with tube well water was safe and heavy metal quantities were within the limits in soil and plants [16].

Industrial effluent is used by local farmers to irrigate agricultural land in Bursa province, N. W. Turkey. Water from seven irrigation points was sampled over four weeks in the summer and analyzed for pH, conductivity, and Cd, Cr, Cu, Fe, Mn, Ni, Pb and Zn. Adjacent soil samples were also collected at 0-20 and 20-40 cm depths; from ten irrigated and ten non-irrigated fields. The water was heavily polluted with heavy metal, and its diethylenetriamine pentaacetic acid (DTPA)-extractable concentration was significantly higher in the irrigated soils. Even relatively immobile heavy metals such as Pb had accumulated at both sampling depths at high level. Irrigation significantly increased the soil organic C and N contents and reduced the pH and calcium carbonate content. The year-upon-year accumulation of heavy metals will eventually cause phytotoxic thresholds to be exceeded, especially once the residual carbonate in the soil has been dissolved and soil pH starts to fall [30].

A study on metal pollution assessment of sediment and water in river Hindon, India, describes the longitudinal variations of dissolved, suspended and total metal concentration of Cd, Cr, Cu, Fe, Mn, Ni, Pb, and Zn. The higher concentration of Fe, Cu and Zn occurred in particulates, where as Mn, Cr, Ni, Pb and Cd were observed in higher concentration in dissolved form in the river water. Higher concentration of total Fe and Mn in the upper stretch of the river is due to effluent of the co-operative distillery

and runoff from agricultural fields respectively. In the downstream section, however the concentration of Fe and Mn decreased substantially due to dilution effect. In general, the concentration of all dissolved metals was lowest in winter months and highest during summer months. The concentration of dissolved metals decreased in the monsoon months due to dilution during higher flow. Higher percentages of almost all metals in particulate form occurred during the post-monsoon months due to suspended load carried by surface runoff during monsoon season. Any deviations from these trends may be attributed to the site-specific activities, which are likely to increase suspended solid concentration in the water column and thereby decreasing the dissolved metal [35].

Nigeria's industrial cities are resulting in an increased quantity of discharge and a wide range of pollutants reaching water bodies. Urbanization and industrialization have contributed to the large scale of pollution currently observed in most Nigerian cities notably those swarming with industries viz., Lagos, Kano and Kaduna states. There are no incentives for implementing pollution reduction measures. Wastes are disposed indiscriminately especially from small and medium scale industries. The lack of information on pollution is a serious hindrance to pollution management directly or remotely. Thus, in addition to treatment of wastewater before disposal, appraisal of water resources would offer proficient information to indicate areas of main concern. This would prove useful in detection of threats to human and environmental health [32].

Apart from natural sources, other probable sources of heavy metals in surface water included leaching from Ni-Cd based batteries [7]. Possible sources of Ni in surface water include anthropogenic sources, combustion of fossil fuels, old battery waste, components of automobiles, old coins and many other items including stainless steels and other Ni alloys. Among the known health related effects of Ni are skin allergies, lung fibrosis, variable degrees of kidney and cardiovascular system poisoning.

Ag, Cd and Fe in sediment were studied from Bahia Todos Santos, Baja California, Mexico during 2004. Spatial distributions of Ag, Cd and Fe were very similar to that of organic carbon and fine grain size, with values increasing from the inner to the outer parts of the bay. High concentration and enrichment of Ag (0.051-0.071 $\mu\text{g/g}$ dry weight) and Cd (1.9 $\mu\text{g/g}$ dry weight) in Bahia Todos Santos were associated to harbor dredging activities and to coastal upwelling, respectively. However, the distribution of Ag and Cd in most of the study area is controlled by grain size and organic carbon content [8].

Heavy metal contaminants Cd, Pb and Zn in water, sediments and fish of the Mae Kuang river, Northern Thailand was investigated by [33] during (July 2008-June 2009). It was found that the worst water qualities in dry seasons were caused by low water flow, municipal effluents and industrial discharges. Pb and Cd in water were below detection limits, while Zn concentration in water ranged 0.01-0.11 mg/L. The Pb, Cd and Zn concentration in sediment were 3.13-27.56, 0.02-0.43 and 3.42-10.32 mg/kg, respectively. Cd and Pb residues were found in *Henicorhynchus siamensis* and *Puntioplites proctozysron* flesh, while the concentration of Zn in these fish was 4.57-6.58 mg/kg. Pb and Cd residues in snake head (*Channa striata*) were 0.05-2.13 and 0.02-0.24 mg/kg wet weight.

Heavy metal concentration of Zn, Pb, Fe, Mn, Cu, Ni and other physico-chemical parameters were studied in Karanja reservoir, Bidar district, Karnataka, India. Water samples were collected monthly and were analyzed by Atomic adsorption spectrometer. Heavy metals were within the permissible limits, except Fe and Ni which were recorded higher in southwest monsoon, where as Mn has showed higher concentration in northeast monsoon and in summer. All other physico-chemical parameters were within the permissible limit [40].

The water samples collected at regular intervals from five selected sites of river Gomti of Lucknow city, India was analyzed to know the seasonal variation in the concentration of heavy metal Cr, Pb and Hg by using spectrophotometric methods in the pre-monsoon period and the post-monsoon period. The concentration of Cr (VI) and Hg (II) were determined by using UV-VIS Spectrophotometer while Pb (II) concentration was determined using Atomic absorption spectrophotometer. The concentrations of all the three metals were found to be higher in the pre-monsoon period than in the post-monsoon period [29]. The spatial distribution of trace elements in sediments in the estuarine environment were influenced by so many factors including geochemical and biogeochemical processes like sedimentation, precipitation and flocculation of particulate substances and hence was difficult to find the principle. In addition, the spatial distribution of the sediment accumulation rates, which is most likely associated with the basin's hydrological conditions, seem to play a crucial factor for the observed changes [36]. Spatial distributions of different metals show that the industrial zone is the most polluted zone where there is highest average of total metals content. Globally, the sum of these concentrations decreased gradually with increasing distance from the industrial area [38].

The quality of Axios/Vardar River, Southeastern Europe was affected by heavy metal pollution from smelter and fertilizer plants in Veles, ferro-alloys plant in Jegunovee, the disposal of its solid waste near the river bed and also by the untreated industrial wastewater discharge deriving from the industries located in the watershed. The agricultural runoff from cultivated areas of Tetovo, Veles and Koufalia is a significant source of nutrient pollution. The study was based on long-term data (1979-2003) of nitrate, nitrite, ammonium, total phosphorous, BOD₅, Cd, Cr, Zn, Pb and water discharge from twenty two sampling stations along the river collected on a monthly basis. This river was a polluted river presenting high value of heavy metals and nutrients resulting from human activities. There was a need for monitoring program that will provide a representative and reliable estimate of the quality of water resources [28].

Anthropogenic pollution from urban wastewater, industrial effluent and agricultural runoff may be clearly seen in irrigating water. Seasonal variations and flooding water subsequently lead to pollutant dilution. Even though heavy metal contents in water and sediments are below the acceptable levels, a hazardous possibility may generate depending on rapid expansion of urban and industrial development in near future [33].

III. CONCLUSION

Heavy metals in irrigation water changes the soil properties, there by affecting the growth of crops. The crops

uptake these heavy metals and thereby get transferred to animals and humans through food chain causing severe health problems. The agricultural runoff containing heavy metals reaches natural water bodies affecting aquatic species and in turn ecosystem. In many of the countries, people have a misconception that using large amount of fertilizers would yield good amount of crops either, food or commercial crops. In country like India, people are nowadays more aware of ill effects of using fertilizers and pesticides beyond the required limit. Government of India has taken many initiatives in spreading awareness among farmers through electronic media, radio and various other programs, in the usage of fertilizers and pesticides. To overcome this problem, the pollutants have to be controlled at the source itself. Soil has to be tested for nutrient value before deciding the dosage of fertilizers. The rotation of crops has to be adopted with the use of organic manure which is free from heavy metals.

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Computerized Approach for Dental Identification Using Radiographs

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Abstract: Dental features have been widely used for forensic identification purposes in cases of mass disasters like, fires, floods, plane crashes etc. when other methods of identification (fingerprints, physical etc.) are not available. However with the increase in the number of cases to be investigated a move towards computer aided system is required. This paper presents a computerized approach for processing and matching of dental radiographic images, with the goal of human identification. Given a dental record, usually as a postmortem (PM) radiograph, we need to search the database of ante mortem (AM) radiographs to determine the identity of the person associated with the PM image by extracting some features namely average pixel intensity, length to width ratio and root center angle to retrieve a closest match.

Index Terms - forensic odontology, human identification, dental radiography, image comparison

I. INTRODUCTION

Forensic dentistry is the proper handling, examination and evaluation of dental evidence, which will be then presented in the in the court of law [1]. The main purpose of forensic dentistry is to identify deceased individuals for whom other means of identification are not available [3, 7]. Although some biometric identifiers can result in an excellent match (e.g. fingerprints and DNA), they are affected by early tissue decay and, as such, are not always suitable for identification[4]. However teeth are capable of withstanding extreme conditions making them a good choice for identification in the cases involving advanced decomposition [6]. Over the years various methods have been developed for dental identification most of them being manual. However, dental identification in the context of mass disaster situations and missing person cases can be both time-consuming and cumbersome due to the large number of victims. Hence in this paper we are trying to present a computerized method for identification using dental radiographs.

Given a PM radiograph, we search the database to find an AM radiograph that best matches with this PM record. The comparison is done based on three parameters i.e. average pixel intensity, length to width ratio and root center angle.

II. DENTAL IDENTIFICATION

Dental identification is based on comparison between known characteristics of a missing individual (ante-mortem) and recovered data from an unknown body (post-mortem). There have also been instances, in both the WTC and the Tsunami disasters where X-rays have been used for the comparison [2]. Radiographs have been proved to be advantageous in human identification due to immediate availability of the images and also due to some new devices there is elimination of film development and processing which allows odontology teams to work directly at the site of mass fatalities [10, 16]. The diversity of dental characteristics is wide, making each dentition unique [7]. Being diverse and resistant to environmental challenges, teeth are considered excellent post-mortem material for identification with enough concordant points to make a meaningful comparison.

A. Methodology

The main purposes of forensic dentistry is to identify deceased individuals for whom other means of identification are not available. Such cases arise in various situations typical of which are mass disasters, fires, finding human remains. The main procedure followed for identification is the comparison of ante-mortem and post-mortem radiographs. Various methods used for dental identification are as follows:

1. Dental Charting [7]

This is one of the oldest methods for dental identification which involves comparing dental profiles of the given dentitions. Dental profiles are dental charts which are completed by odontologists [15]. Fig.2 shows an example of a dental chart. The chart notes, for each tooth individually, various distinctive features like tooth

present/absent, crown, root morphology, dental restorations etc. The comparison thus involves preparing dental chart of the dentition in question, and comparing this chart with those in a database. However this method becomes very complex and is very time consuming.

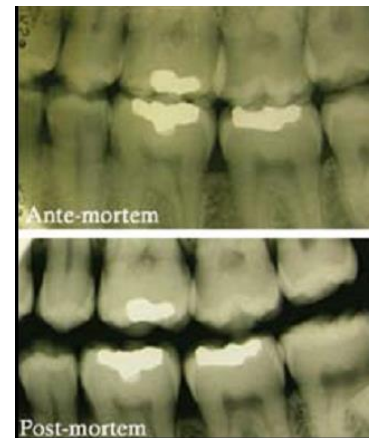


Figure 2. Ante-mortem and Post-mortem radiographs

B.C. CORONERS' SERVICE
 DENTAL IDENTIFICATION FORM

CORONER CASE No: 98-129-0008 DATE: 09 December 1998
 INVESTIGATING CORONER: S. Bellanin EXAMINATION SITE: Vancouver City Hospital
 LOCATION: Bot Hoady
 CORONERS FORENSIC UNIT CASE #: 98-123 AUTOPSY No: _____
 POLICE FILE No: 98-2317 HOSPITAL: _____
 POLICE AGENCY: Crime Art Hoady PATHOLOGIST: _____
 POLICE INVESTIGATOR: Cst. H. Gillman

CIRCUMSTANCES OF EXAMINATION: Maleatal remains found on Nov 09, 98 in the area of Royal Gist, Bot Hoady, B.C. Tantaline I.D. " - D.O.R. 01 Aug 19

18	17	16	15	14	13	12	11	31	32	33	34	35	36	37	38
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

CODE: Shade all restorations on Chart. Outline Prosthetic Appliances. Write the appropriate description.

A. Amalgam	TC: Temporary Crown	EN: Root Treatment	X: Missing
S. Composite	GC: Gold Crown	SR: Bridge Work	FX: Posthumously missing
G: Gold	PC: Porcelain Crown	DR: Bracket & shade	NR: Not Restored
SE: Resin Sealant	P/M: Porcelain / Metal Crown	PP: Partial Denture	
TF: Temporary Filling	SC: Stainless Steel Crown	DB: Bracket & described	

1. Mottled Enamel
 2. Enamel Hypoplasia
 3. Discoloration
 4. Staining
 5. Caries
 6. Abrasion
 7. Attraction

8. Enamel
 9. Fractured Enamel
 10. Rotation
 11. Malpositioned Teeth
 12. Malocclusion
 13. Unerupted Teeth
 14. Supernumerary Teeth

15. Retained Deciduous Teeth
 16. Unusual Restorations
 17. Unusual Appliances
 18. Cyst Formation
 19. Post
 20. Pin
 21. Caries

22. Congenitally Absent
 23. Extirpated roots retained
 24. Buccal restorations composite
 25.

Post mortem dental array: Yes/No
 Plates: Yes/No
 Study Models: Yes/No
 Jaws described: Yes/No

Observation: Unremarkable
 Remarks: Caudal alveolar process, not high-contrast images. likely to be "paw-skipped" #22. Extirpated root #1

Figure 1. Example of a dental chart

2. Comparative Dental Identification Using Radiographs [17, 18]

Digital radiography, which is used for a decade or more by radiologists in most large hospitals, has recently become the solution of choice in mass casualty situations. Here comparison is done by odontologists by manually comparing the AM and PM radiographs. It follows a semi-automatic process of matching the radiographic dental images for human identification. For this, they extract shapes of the teeth from both, the AM and PM images, and compare these extracted shapes. The comparison results are based on the distance between the shapes. Fig.1 shows an example of AM and PM radiographs.

III. IMPLEMENTATION

The method followed in the paper for comparison of radiographs is a computerized approach to speed up the process and make it more efficient. The algorithm is given below which will be implemented in MATLAB.

A. Algorithm

Fig.3 gives an overview of the steps which is followed for comparison of AM and PM images.

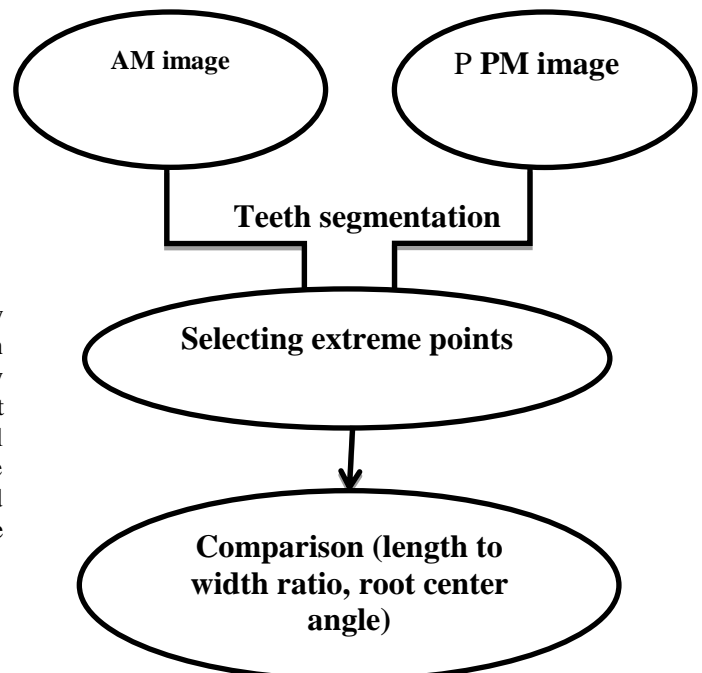


Figure 3. Flowchart showing the steps of comparison

1. Database Formation

A database of the AM images is formed by cropping the required tooth from the radiograph and isolating it. Fig.4 shows an image of the same. Database images used in this paper are shown in Figure 5. A set of three AM images were used as database images for comparison.

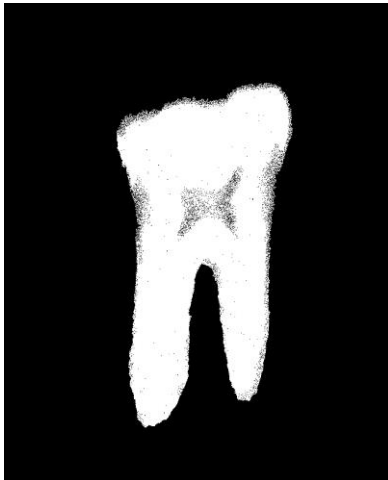


Figure 4. Sample image of database images



Figure 5. Database images (AM images)

pixel obtained. Fig.5 and Fig.6 show radiograph images with length and width marked.



Figure 6. Image showing length of tooth



Figure 7. Image showing width of tooth

If (x_1, y_1) and (x_2, y_2) are the extreme co-ordinates then the length and width can be calculated as:

$$S = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

1. Root Centre angle

In fig.0 denotes the root center angle which is compared for AM and PM images. It can be calculated as:

$$\theta = 180 - \left\{ \tan^{-1} \left(\frac{x}{y} \right) + \tan^{-1} \left(\frac{x}{z} \right) \right\}$$

2. Comparison

Comparison of the AM and PM images is done by using the following parameters:

1. Length to width ratio

The average length and width measurements are taken and length to width ratio of each tooth is compared for AM and PM images. Measuring the length and width is an automated process in MATLAB. Here two extreme points are selected along the length of the tooth by scanning the radiograph from left, right and then selecting the first white



Figure 8. Image showing root centre angle of tooth

IV. Results and Analysis

The algorithm discussed above in sec.3 was implemented on three sets of AM and PM radiographs and the positive results were obtained. Fig.8 shows the values obtained for comparison and graphs of the same.

Table 1. Comparison results for the radiographs

Radiograph	Average Vertical length	Average Horizontal length	Length to Width ratio	Root – Centre angle (degrees)
AM - 1	462	280.5	1.647	42.69
PM - 1	439.5	279	1.4798	41.62
AM - 2	538.5	271.5	1.9834	40.5901
PM - 2	482	266.5	1.8086	43.16
AM - 3	462	272.5	1.61	37.69
PM - 3	431	296.5	1.4536	37.95

The time taken to compute vertical length and root center angle was observed to be 1.38 sec and for computing width it was found to be 0.78 sec. Hence the total time taken for the whole comparison process is 2.16 sec.

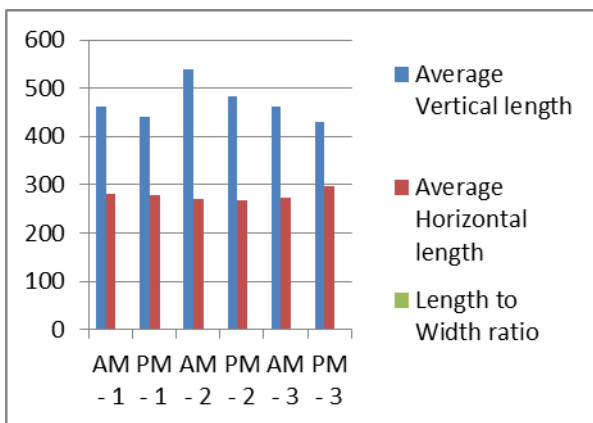


Figure 9. Graph showing the comparison based on length,width and length to width ratio

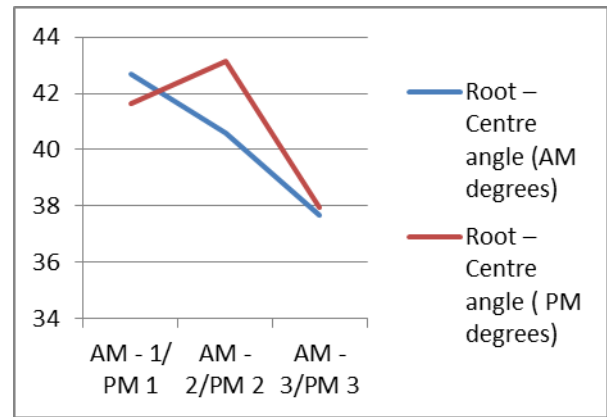


Figure 10. Graph showing the comparison based on root center angle

V. CONCLUSION

We proposed a computer-aided framework for matching of dental radiographs based on length to width ratio and root center angle. Experimental results on a small database indicate that this is a feasible approach. The errors can occur due to incorrect radiographic technique: the images are very blurred, or the region of interest is partially occluded so there is not enough information available to characterize the teeth.

The three PM images selected were positively identified and compared with the available database AM images. Also the method proved to be time efficient compared to other methods as discussed in sec. A.

Although there was an average error of 1.3 degrees in root center angle due to alignment of tooth in radiographs.

ACKNOWLEDGEMENT

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Optimized Bully Election Method for Selection of Coordinator Process and Recovery of Crashed Process

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Abstract- In distributed systems one process or a node is required in such a way that it can act as leader node or a coordinator. Election algorithms are meant for electing process or node that acts as leader node also called as coordinator from among currently alive processes such that at any instance of time there will be single coordinator for all the processes in the system. So, election algorithms are momentous in any distributed system. Bully algorithm is one of the standard approaches for electing the coordinator in distributed systems. In this paper, we have presented a bully algorithm that minimizes the number of messages while electing the new coordinator and when a process recovers from a crashed state in distributed systems and thus reduces the network traffic caused.

Index Terms- Bully Election algorithm, Coordinator, Election message, OK message, and Process Status table

I. INTRODUCTION

A distributed system is a collection of processors interconnected by a communication network in which each processor has its own local memory and other peripherals and the communication between them is done by message passing over the communication network [1]. Distributed systems require that there should be a coordinator node in the entire system that will perform coordination activity which is needed for the smooth running of other nodes in the system. Many leader election algorithms such as the Bully algorithm, Ring algorithm, Chang and Robert's algorithm, Peterson's algorithm, etc. have been proposed over the years. We will be discussing bully leader election algorithm in detail. In this paper initially we have described concept of bully election algorithm in section I and then its related work done by various authors to reduce number of messages in section II. In section III we will discuss our proposed modification and compare the modified recovery mechanism with one of initially modified recovery method. In section IV we will discuss number of messages required while electing coordinator and when a process recovers from failure. An algorithm for choosing a coordinator to play a distinct role in the system is called as election algorithm. The assumptions on which bully election algorithm is based are as follows [1, 2]:

1. It is a synchronous system and it uses timeout mechanism to keep track of coordinator failure detection.
2. Each process has unique number to distinguish them.
3. Every process knows the process number of all other

processes.

4. Processes do not know which processes are currently up and which processes are currently down.
5. In election a process with highest process number is elected as coordinator which is agreed by all other live processes.
6. A failed process can rejoin in the system after recovery.
7. The communication subsystem does not fail.

The algorithm works as follows, when process P notices that the coordinator is crashed, it initiates an election algorithm and sends election message to all the processes having higher priority number than itself. If process P doesnot receive any response from processes having higher priority number than it then process P declares himself as coordinator by sending coordinator message to all the processes having priority number lower than it. If process P receives response from any process having higher priority number than it then process P now knows that higher process is alive and waits for final result. The receiver of election message gives response to sender by sending OK message to it to indicate that it is alive. Now it will initiate election unless it is already holding one. Finally all give up except one which is the new coordinator. The new coordinator announces it victory by sending coordinator messages to all process having process number lower than it. The working is as shown in figure 1.

As a part of recovery action as shown in figure 2, this method requires that a failed process (say P_k) must initiate an election on recovery. If the current coordinator's priority number is higher than that of P_k , then current coordinator will win the election initiated by P_k and will continue to be the coordinator. On the other hand, if of P_k 's priority number is higher than that of current coordinator, it will not receive any response for its election message. So it wins the election and takes over coordinator's job from current coordinator. Therefore, the active process having the highest priority number always wins the election. Hence the algorithm is called **bully algorithm** [1].

II. RELATED WORK

As the basic well known bully election algorithm proposed by Garcia Molina large numbers of messages are exchanged due to which traffic in network is increased. So to decrease this number of messages various authors have suggested modifications in this bully algorithm to reduce number of messages.

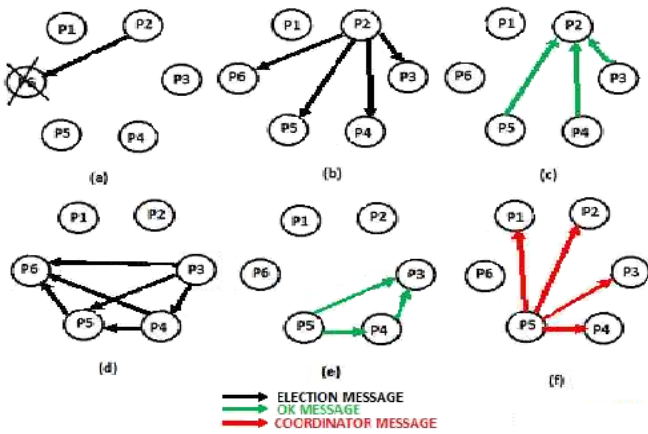


Figure 1: Election of Coordinator by Garcia

(a) P2 request service from P6 (b) P2 sends election message to P3, P4, P5 and P6 (c) P3, P4 and P5 send OK message to P2 (d) P3, P4 and P5 initiate election (e) P4 sends OK message to P3, P5 sends OK message to P3 and P4 (f) P5 sends coordinator messages to P1, P2, P3 and P4.

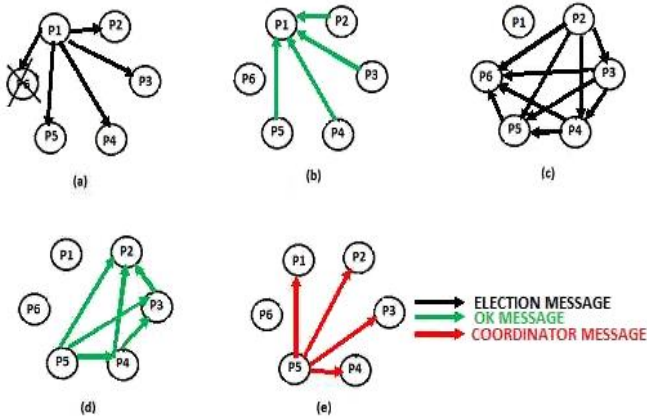


Figure 2: Recovery Process by Garcia

(a) P1 sends election message to P2, P3, P4, P5 and P6 (b) P2, P3, P4 and P5 send OK message to P1 (c) P2, P3, P4 and P5 initiate election (d) P3 sends OK message to P2, P4 sends OK message to P2 and P3, and P5 sends OK message to P2, P3 and P4 (e) P4 sends OK message to P3, P5 sends OK message to P3 and P4.

In [3] the number of messages that should be exchanged between the processes is reduced and furthermore the number of stages required to elect the coordinator is decreased from at most five stages to four stages. According to this paper, when the process P finds that coordinator has crashed, sends election message to all other processes with higher priority number for which it will receive response as OK message with its unique priority number to process P. If no process responds to process P, it will broadcast one coordinator message to all processes, declaring itself as a coordinator. If some process response to process P by comparing the priority numbers, the process P will select the process with the highest priority number as coordinator and then sends to it the grant message. At this stage the coordinator process will broadcast a message to all other processes and informs itself as a coordinator. Now suppose process P1 recovers from its failed state and is now unaware about who is the coordinator. So P1 holds the election by same procedure mentioned above. So if we look at traditional bully algorithm then number of stages and number of messages being passed is reduced to some extent. In [4], when a process (say) P_i finds that coordinator has

somehow failed it refers to its process status table, to see who is process having the second highest priority number. It then initiates an election, by sending an election message to the process (say) P_j , having priority just below the failed coordinator; i.e. process with the second highest priority number. When P_j receives an election message (from P_i), in reply, P_j sends a response message OK to the sender, informing that it is alive and ready to be the new coordinator. Therefore, P_j will send a message coordinator to all other live processes (having priority less than P_j) in the system. Hence, P_i starts its execution from the point where it was stopped. If P_i does not receive any response to its election message, within a fixed timeout period; it assumes that process P_j also has somehow failed. Therefore, process P_i sends the election message to the process (say, P_k) having the priority just below the process P_j . This process continues, until P_i receives any confirmation message OK from any of the process having higher priority than P_i . It may be the case that, eventually P_i has to take the charge of the coordinator. In that case, P_i will send the coordinator message to all other processes having lower priority than P_i . According to [5], when a process P comes to know that coordinator has crashed it sends election messages to all the processes with higher process numbers. If process P does not receive any response then P wins the election and if process P receives the response (i.e. ok message along with process number of the responder) then process P will compare process numbers of all message and select highest process number as coordinator and process P will send coordinator messages to all the processes informing who is the new coordinator. Now suppose process P1 recovers from its failed state and is now unaware about who is the coordinator. So instead of holding an election process P1 will send query message to process P2 and process P3. Now P2 and P3 will give response by sending answer message to process P1. Now P1 will come to know that current coordinator is process P5. Now suppose process P6 recovers from its crashed state and process P6 knows that it is the process with highest process number so it will directly send coordinator messages to all the processes in the system. In [6] the process of coordinator election is proposed but on recovery how the process can rejoin itself is not specified. In this algorithm whenever a process finds the coordinator is dead, it sends an election message to a process which has the biggest number. With considering that the biggest process will be new coordinator, so it's not necessary that other processes to be busy for this problem. Whenever a process receives the election message, it should introduce itself as a new coordinator. The receiver of message process may be dead such as the coordinator. So if the sender doesn't receive the response, initiator process sends the election message to the next biggest process. This procedure maybe repeated for several times.

III. PROPOSED METHOD

As we are considering distributed systems, hence, some assumptions also need to make about the communications network. This is very important because nodes communicate only by exchanging messages with each other. The following aspects about the reliability of the distributed communications network should be considered [4].

1. Messages are not lost or altered they are correctly delivered to their destination in a fixed amount of time; i.e., no communication failure occurs.
2. Messages reach their destination in a fixed amount of time, but the time of arrival is not fixed.
3. Nodes know the physical layout of all nodes in the system and know the path to reach each other.
4. A node never pauses and always responds to incoming messages with no delay.

This research tries to reduce network traffic present in distributed systems during leader election and process recovery. Suppose process P_i detects coordinator has failed so it checks the status table and sends election message to second highest priority message (say P_j). On receiving message from P_i , process P_j immediately sends coordinator messages to every live process. After receiving coordinator message from P_j each live process would update its process status table.

Consider the example in figure 3, suppose there are six processes P_1, P_2, P_3, P_4, P_5 and P_6 respectively in the system. Among these six processes P_6 is considered as highest priority and P_1 is with lowest priority. So P_6 is the coordinator as it has highest process number and let process P_1 is down. Suppose P_2 wants some service from coordinator. So P_2 sends a request to the coordinator P_6 . Now if process P_2 does not receive a response within a fixed period of time, then process P_2 assumes that the coordinator has somehow crashed. Having a look at the current process table, process P_2 will send an ELECTION message to the process having priority just below the failed coordinator's priority (P_5 in this case). On receiving election message from P_2 process P_5 sends coordinator messages to all live processes. The process status table when new coordinator P_5 is elected is shown in table I.

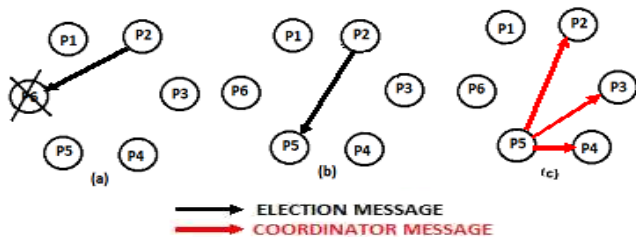


Figure 3: Election of Coordinator in Proposed Method
(a) P_2 request service from P_6 (b) P_2 sends election message to P_5 (c) P_5 sends coordinator message to P_2, P_3 and P_5 .

Now suppose process P_m recovers from failure so there can be two cases:

Case 1:

If the current coordinator's priority is higher than P_m 's priority, in that case, P_m will send its priority number and an UPDATE messages to all other live processes in the system, to tell them to update P_m 's status (from CRASHED to NORMAL) in their own process status table.

Case 2:

If P_m 's priority is higher than the current coordinator's

priority; then P_m will be the new coordinator and update the process status table and sends the COORDIANATOR message to all other live processes in the system, and takes over the coordinator's job form the currently active coordinator.

Table I: Process Status Table When P_5 Is Elected As Coordinator

Process Priority	Status
P1	CRASHED
P2	NORMAL
P3	NORMAL
P4	NORMAL
P5	COORDINATOR
P6	CRASHED

Now suppose in example above if process P_1 recovers from its failed state and is now unaware about who is the coordinator and status of processes. So it immediately, sends a REQUEST message to any of its live neighbors (in this case Process P_2). So, as soon as any of P_1 's live neighbors receives a REQUEST message, it sends a copy of the current process status table to P_1 . After receiving the process status table, P_1 checks whether its own priority number is less than the process having the highest priority (i.e. current coordinator's priority) or not. Since P_1 is smaller than current coordinator so it will send its priority number and an UPDATE messages to all other live processes in the system, to tell them to update P_1 's status (from CRASHED to NORMAL) in their own process status table as shown in figure 4. The process status table when P_1 recovers from failure is shown in table II.

Table II: Process Status Table When P_1 Is Recovers From Failure

Process Priority	Status
P1	NORMAL
P2	NORMAL
P3	NORMAL
P4	NORMAL
P5	COORDINATOR
P6	CRASHED

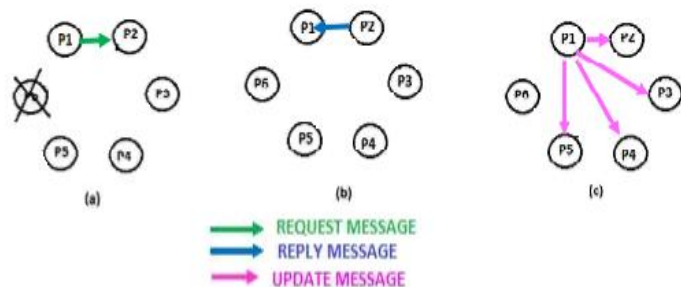


Figure 4: Proposed Recovery Process

(a)P1 sends Request message to P2 (b)P2 sends Reply message to P1 (c)P1 sends update message with its process number to P2,P3,P4 and P5

Suppose Pm recovers and we send Query messages to process having process number higher than itself then in response it will get answer message in which process Pm will understand who the current coordinator according to algorithm is in [5].

In our example now process P1 recovers from failure so it will send query messages to process P2, P3, P4, P5 and P6. As response P1 will receive answers from the live processes and will understand that the current coordinator is P5 as shown in figure 5.

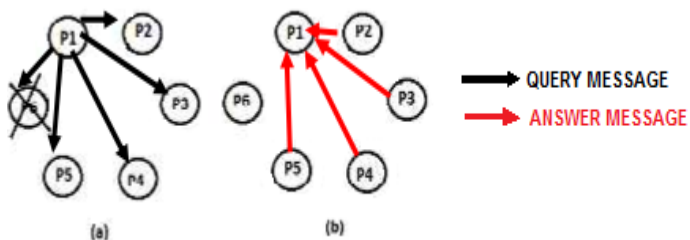


Figure 5: Recovery Method of Pawan Kumar Thakur

(a)P1 sends query messages to P2, P3, P4, P5 and P6 (b) Process P2, P3, P4 and P5 send answer message to process P1.

If we compare both methods of recovery we can see that in first method we maintain a status table which is requested by process when it recovers by neighbor through which it also comes to know about which processes are alive and the current coordinator by sending just one request message whereas in second method we send query message to all the processes having process number higher than itself and then everyone replies with answer message through which it understands who is the current coordinator. From both methods less number of messages is sent in first method. So first method i.e. our proposed (first) method is better than this second method.

IV. RESULTS

The analysis of bully algorithm’s proposed by various authors with best case and worst case and also with respect to different network size is analyzed in this chapter.

1. According to algorithm in [1] the number of messages required for various numbers of nodes is as shown in table III.

Table III: No. of messages required for various numbers of nodes according to algorithm in [1]

No. Of Nodes	No. Of messages in electing a coordinator	No. Of messages when process recovers from failure
6	20	29
10	72	89
15	178	205

2. According to algorithm in [3] the number of messages required for various numbers of nodes is as shown in table IV.

Table IV: No. of messages required for various numbers of nodes according to algorithm in [3]

No. Of Nodes	No. Of messages in electing a coordinator	No. Of messages when process recovers from failure
6	13	15
10	25	27
15	40	42

3. According to algorithm in [4] the number of messages required for various numbers of nodes is as shown in table V.

Table V: No. of messages required for various numbers of nodes according to algorithm in [4]

No. Of Nodes	No. Of messages in electing a coordinator	No. Of messages when process recovers from failure
6	5	7
10	9	11
15	14	16

4. According to algorithm in [5] the number of messages required for various numbers of nodes is as shown in table VI.

Table VI: No. of messages required for various numbers of nodes according to algorithm in [5]

No. Of Nodes	No. Of messages in electing a coordinator	No. Of messages when process recovers from failure
6	12	9
10	24	17
15	39	27

5. According to algorithm in [6] the number of messages required for various numbers of nodes is as shown in table VII.

Table VII: No. of messages required for various numbers of nodes according to algorithm in [6]

No. Of Nodes	No. Of messages in electing a coordinator	No. Of messages when process recovers from failure
6	5	-
10	9	-
15	14	-

6. In our proposed method the number of messages required for various numbers of nodes is as shown in table VIII.

Table VIII: No. of messages required for various numbers of nodes according to Proposed Modification

No. Of Nodes	No. Of messages in electing a coordinator	No. Of messages when process recovers from failure
6	4	6
10	8	10
15	13	15

From above results we have analyzed number of messages required to be exchanged for various numbers of nodes and can say that in each paper number of message is reduced.

V. CONCLUSION

In original bully algorithm the number of messages to be exchanged is very large. To overcome this drawback we have proposed an optimized method by combining ideas from initially modified algorithms. From analysis we can say that our proposed method requires less number of messages than from all other algorithms and also we compared our recovery method with initially modified recovery method.

We measure performance of our algorithm by number of messages passed in system. From the above discussions about original bully algorithm and modified bully algorithm we can say that our proposed method is better since it requires less number of messages to be sent in system in both cases when electing coordinator and on recovery of any process.

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Comparison of Traffic Smoothing Algorithms for MPEG Videos

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Abstract- In a typical video application, such as video-on-demand, videos are continuously streamed from a video server to a set of receivers. The constant-quality video encoding technique and variable bit rate (VBR) encoding techniques used. Variable bit rate (VBR) video transmission leads to the burstiness of video traffic, hence high fluctuation in bandwidth requirement. Traffic smoothing algorithms are very efficient in reducing burstiness of the VBR video stream by transmitting data in a series of fixed rates.

In this paper, we examine traffic smoothing algorithms and their performance analysis, using a MPEG encoded video and simulation results showed that our approach has small bandwidth requirement, high bandwidth utilization and low computation cost.

Index Terms- Segmentation, Traffic smoothing, Variable bit rate (VBR) video, wavelets.

I. INTRODUCTION

Video applications, such as video-on-demand services, necessitate the utilization of a large amount of network bandwidth and storage space. In live video, there is a requirement that transmission decisions be made in real time and some initial delay between sender and receiver is tolerable [4]. As the popularity of video-on-demand services increases, much of network traffic will be transmission of data from prerecorded video sources.

Usually, video sources are encoded to reduce storage and bandwidth requirements. Some videos are encoded using a method called constant-bit-rate (CBR) encoding, which simplifies network bandwidth allocation. However, CBR coding produces video with varying quality, for the number of bits used to encode each frame must remain the same for every frame, even during periods of fast action or high detail when more bits are needed to represent such frames with more variation. Such variable-quality encoding is not appropriate [5].

A method called variable-bit-rate (VBR) coding produces video streams with constant quality, and for a given bandwidth VBR encoded videos have a higher perceivable quality than CBR video streams [5] [6] [7]. Yet there is a trade-off for this increase in quality; VBR encoded video streams exhibit significant rate variability. Without intelligent traffic shaping, transmission of VBR video streams would lead to inefficient network bandwidth utilization. This intelligent traffic management is implemented by a class of algorithms, known as bandwidth smoothing algorithms.

II. TRAFFIC SMOOTHING FOR VBR VIDEO

A video server can significantly reduce the bandwidth requirements for transmitting stored video by pre-fetching video data into the client playback buffer in advance of each burst. Figure1 shows transporting pre-stored video stream through networks to the client side. We consider a discrete-time model at the frame level. That is $t \in \{1, 2, \dots, N\}$, where N is the length of the video in frames. The server stores the entire video stream and generates a transmission plan based on the overflow and underflow constraints on the client buffer. The server writes the stream as a series of CBR rates denoted by $r(t)$ into a network for transmission. On the client side, the playback buffer has capacity of B bytes. $S(t)$ denotes accumulated video data transported to the client. $B(t)$ represents the buffer occupancy at time t , and $L(t)$ the accumulated video data that played back.

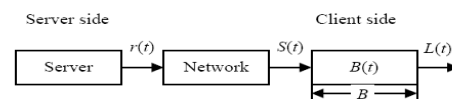


Figure1 Transport of pre-stored video through networks

To permit continuous playback at the client site, the server should always avoid underflow by serving enough data. On the other side, since the data received at the decoder is stored in a buffer, and if the client receives too many data that exceed the capacity of the client's buffer, the data corresponding to a video frame will be useless and the frame will thus be considered lost, this situation is called decoder buffer overflow.

Consider a video sequence with N frames, where frame i is f_i bytes long. In order to avoid buffer underflow, the server must always transmit more data than the decoder consumes, so that by the time the client decodes the t^{th} frame, $t=1, 2, \dots, N$, it must have received at least $L(t)$ bytes from the server, where

$$L(t) = \sum_{i=1}^t f_i \quad (t = 1, 2, \dots, N)$$

In the same way, a client should receive data no more than f_i by frame time t to prevent playback buffer overflow.

$$U(t) = B + \sum_{i=1}^t f_i$$

A feasible transmission schedule $S(t)$ should stay within the constrained region set by the constraint curves $U(t)$ and $L(t)$ shown in Fig.2. That is

$$L(t) \leq S(t) \leq U(t)$$

where

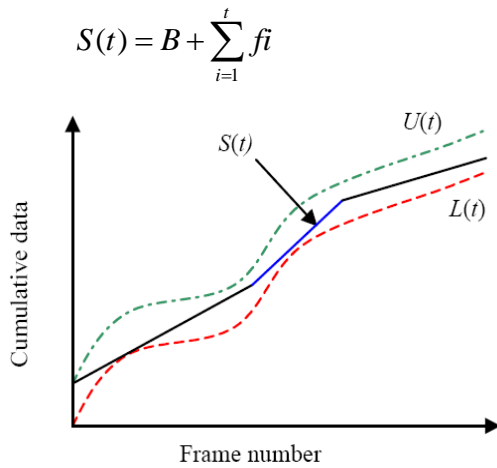


Figure.2 Transmission schedule

III. BANDWIDTH SMOOTHING ALGORITHMS

3.I): Segment-Based Traffic Smoothing Algorithm:

In this section, a segment-based traffic smoothing algorithm is proposed.[2] We construct a feasible transmission schedule based on the following criteria. 1) each CBR transmission segment should be as long as possible, in order to make the traffic as smooth as possible. 2) to avoid underflow, the server should transmit enough data to permit continuous playback at the client site; to avoid overflow, the server must limit the amount of prefetching to client buffer; so the transmission rate must be increased or decreased to ensure feasibility. 3) in order to minimize the possibility of overflow or underflow but make each video segment as long as possible, the starting point of a segment should be far away from the boundary of the constrained region, so the middle point of the constrained region is selected as the starting point of each run.

Half of the capacity of the client buffer size ($B/2$) is selected as the initialization buffer size. Taking the average transmission rate of each segment as the transmission rate of the segment makes the buffer occupancy at the starting of each segment the same as the initialization buffer size. Each run ends at the middle of the capacity of the client buffer where it starts, each portion of the video stream corresponding to a run is called a segment. And so algorithm is also called segment-based traffic smoothing algorithm.

A cost function $C(j,k)$ associated with a transmission schedule, which represents the maximum client buffer requirement over interval $[j,k]$, is given by,

$$C(j,k) = \max_{j \leq t \leq k} \left| \sum_{i=j}^t r_i - f_i \right|$$

where

$$r(i) = \frac{\sum_{t=j}^k f_t}{(k-j)}$$

is the transmission rate during frame slot i of the smoothed video stream which equals the average rate of the segment over interval $[j,k]$. The cost must be obviously smaller than $B/2$ to

guarantee no overflow or underflow of the playback buffer, because half of the capacity of client buffer size ($B/2$) is selected as the initialization buffer size.

3.II): Piecewise Constant Rate Transmission and Transport (PCRTT)

The piecewise constant-rate transmission and transport (PCRTT) algorithm [4] divides the video stream into segments with fixed size intervals to create a transmission schedule. The transmission rate for the algorithm is set by taking the average frame size for each segment; each segment corresponds to one run in the transmission schedule.

Transmission rate during frame slot i of the smoothed video stream which equals the average rate of the segment over interval $[j,k]$ is given by,

$$r(i) = \sum_{t=j}^k \frac{f_t}{(k-j)}$$

Then the algorithm raises the transmission schedule to avoid client buffer underflow. An initial delay is introduced to the plan so that the client buffer will contain data when playback begins. From the transmission schedule, the algorithm computes the minimum client buffer size to avoid overflow.

The main advantage of this method over other methods is that for small buffer sizes, PCRTT creates bandwidth plans that have near optimal peak bandwidth requirements, while requiring very little computation time. Since a PCRTT plan consists of fixed-size intervals, the bandwidth changes occur after constant times. This can be useful for the multiplexing of several streams. Another advantage of PCRTT is that it can produce bandwidth plans with a meaningful lower bound on the minimum time between rate changes

3.III): Dynamic Programming Based Smoothing:

This dynamic-programming (DP) smoothing algorithm is a bandwidth smoothing algorithm which permitting rate changes at any multiple of L without restriction. The algorithm produces the optimal transmission schedule. We assume that the video length N is a multiple of the segment size L , $N = ML$, with M time segments numbered from 0 to $M-1$.

We apply DP to find the optimal transmission schedule for subset of the video stream containing frames $[0, kL-1]$ for $k \in \{1, 2, \dots, M\}$. Fig.3 provides an explanation of DP approach. First, we focus on the first two segments of the video stream $[0, 2L-1]$. There are two possible transmission schedules, and finding the winning one with the smaller cost involves little computational effort. Then, we consider the optimal segmentation of the first three segments $[0, 3L-1]$. There are four possible ways of placing rate changes into the transmission schedule no rate changes, at frame L , at frame $2L$, and at both L and $2L$ but our previous comparison allows us to reduce the comparisons to three options, since we know the optimal transmission schedule for the two cases where there is a rate change at frame $2L$. figure 3 explains the description for this algorithm is presented in [1].

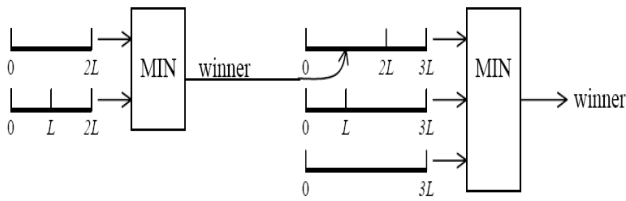


Figure.3: fig shows dynamic programming process.

If we define C_k^* as the minimum cost associated with the best transmission schedule x^* for frames $[0, kL-1]$, then the relation

$$C_k^* = \min_{0 \leq t \leq k} \left[\max(C_t^*, \Delta C_{tk}) \right]$$

Is satisfied for $k \in \{1, 2, \dots, M\}$ where $\Delta C_{t,k}$ is the minimum cost associated with transmitting at rate $u(j)$ over $tL \leq j \leq kL-1$ and $u(j)$ is the transmission rate at frame-time n . when $k=M$,

$$\Delta C_{t,k} = \max_{i \in [tL, kL-1]} \left| \sum_{j=0}^i (u(j) - f_j) \right|$$

to find the optimal transmission schedule for the video stream, once the minimum costs found for $k \in \{1, 2, \dots, M\}$, then a backtracking function $b(k)$ of k , is defined as

$$b(k) = \arg \min_{0 \leq t \leq k} \left[\max(C_t^*, \Delta C_{t,k}) \right]$$

to recover the optimal transmission schedule.

3.IV): Wavelet-based Traffic Smoothing (WTS) Algorithm:

Recently, wavelets [8]–[9] have been well developed as a multi resolution signal analysis and processing tool and applied successfully in many fields, such as image compression, denoising and network traffic modelling. Since wavelets can analyze and reconstruct signals with multiple resolutions, they are suitable for approximating video traffic at multiple scales. We use the Haar wavelet due to its simplicity and the averaging (smoothing) effect the low-pass Haar filter has on video traffic. Existing traffic smoothing algorithms do not address variability on multiple levels because they implicitly treat a video stream as having only one resolution. In contrast, proposed WTS algorithm provides traffic smoothing at multiple resolutions. The wavelet tree structure in WTS makes the algorithm flexible in its behaviour.

The discrete Haar wavelet transform represents a 1-D signal $x(t)$ of length N in multiple resolutions. The analysis at different scales can be represented by a binary tree T_{max} of lowpass wavelet coefficients as shown. Assume that T_{max} has depth J_{max} . In the wavelet transform, j indexes the scale of analysis: $j=0$ indicates the coarsest scale or lowest resolution of analysis, which corresponds to the root of the binary tree; the larger the j , the higher the resolution of the analysis. We index each node of T_{max} at depth j ($0 \leq j \leq J_{max}$) by a tuple (j,k) and associate it with the low-pass wavelet coefficient given by

$$u_{j,k} = \frac{2^j}{N} \sum_{i=N \frac{k}{2^j}}^{Nk+1-1} x(i),$$

for $k=0, \dots, 2^j-1$.

The wavelet-based traffic smoothing (WTS) algorithm [8] calculates a binary tree in which each node represents smoothing at different resolutions. The full tree corresponds to the original video, with each segment of the video stream matching to a leaf node, while a node at a higher level stores one transmission rate for multiple segments of the video. This algorithm builds a binary tree by setting transmission rates for all leaf nodes to the average frame size for each segment; then, in a bottom-up traversal, non-leaf node transmission rates are set to the average rates of each node’s children. Next, the algorithm associates a cost with each node at resolution j and offset k using as the cost metric the minimum client buffer requirement when $r_{j,k}$ is set as the transmit rate over frames

$[2^{-j}KN, 2^{-j}(K+1)N-1]$ is given by

$$C_{j,k} = \max_{t \in [2^{-j}KN, 2^{-j}(K+1)N-1]} \left| \sum_{i=0}^t r_{(j,k)} - f_i \right|$$

Finally, the WTS algorithm prunes the binary tree to the smallest size that satisfies the constraint requiring the maximum cost of the pruned tree’s leaf nodes to be less than the client buffer size. Typically, a node higher in the tree, one which generates a longer run, requires a larger client buffer size to avoid buffer underflow than does one of its child nodes, so a balance is made between runs of greater length and the client buffer size required by a transmission schedule comprised of such runs.

IV. PERFORMANCE EVALUATION RESULTS

In this section, we compare the segment based algorithm, DPS, PCRTT and WTS smoothing algorithms based on widely accepted performance metrics including rate changes per unit time, peak rate requirements, and variability of bandwidth requirements.

To evaluate how these algorithms perform over time, we utilize M-PEG encoded video. For our comparisons we select a 13245ms long video, encoded at different frames per second quality, resulting in an average bit rates. By testing performance of smoothing algorithms across a wide range of typical client buffer sizes, we get an accurate measure of how they perform under realistic settings.

SUMMARY TABLE

Name of algorithm	Segment based algorithm	DPS	PCRTT	WTS
Rate variation (min-max)in bytes	760	3036	3036	29
	330586	324345	324345	467883
Peak rate(bytes)	330586	324345	324345	467883
Max Buffer size (bytes)	165421	14687	297733	137040

a) Bandwidth variability:

A transmission schedule with a lower bandwidth variation is desirable, as it requires fewer resources from the server and network. Bandwidth variation is decided by the rate changes. The DPS and PCRTT algorithm results in fewer rate changes. Segment based algorithm results in fewer rate changes than the WTS algorithms but its rate changes are more than DPS & PCRTT for a given buffer size.

b) Peak bandwidth requirements:

The peak rate of a smoothed video stream determines the peak bandwidth requirement across the network. Hence, most bandwidth smoothing algorithms attempt to minimize the peak rate. Table results shows DPS & PCRTT algorithm require same low peak rate and segment based algorithms require low peak rate, whereas WTS require less high peak rate.

c) Buffer utilization:

Buffer occupancy is higher for video streams with high activity and high variability in the original frame sizes. If the original stream is less bursty, buffer utilization can be improved because all intervals demand almost the same buffer size.

Buffer occupancy during the playback of a video stream is the number of bytes at the buffer. And it is determined by subtracting the decoding rate at the buffer output from the smoothing rate-plan at the buffer input. From the results presented as in table, DPS and segment based algorithms require less buffer size than PCRTT & WTS.

V. CONCLUSION

In this paper, we examine existing algorithms such as Segment based bandwidth algorithm, PCRTT, DPS and WTS, Their experimental results shown in table. Comparison of the traffic smoothing algorithms based on 1. less rate variability, 2. lower peak rates, and 3. smaller client buffer size requirements.

DPS algorithm gives best results as its rate variation is less, it has low peak rate value, and maximum buffer size requirement is also less comparative to other algorithms.

PCRTT algorithm gives same results as DPS but its buffer size requirement is more than DPS.

Moderate results are given by the algorithm called segment based. Its rate variation is moderate,

Peak rate requirement is similar to DPS & PCRTT algorithms; its maximum buffer size requirement is also low.

The algorithm WTS fails to give good results on the performance metrics as it require large value of peak rate, large buffer size and its min to max rate variation is also high.

From the results we can conclude that WTS performs worst for the given analysis but still WTS is applicable for the network with multiple-clients, whereas the other methods are for single client users.

Thus the applications that require the storage and transmission of compressed video, such as video-on-demand services and digital libraries, such bandwidth smoothing techniques plays an important role in efficient network management.

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Detecting Copy move Forgery using DCT

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Abstract- The use of digital photography has increased over the past few years, a trend which opens the door for new and creative ways to forge images. Now a day's several software's are available that are used to manipulate image so that the image is look like as original. Images are used as authenticated proof for any crime and if these image does not remain genuine than it will create a problem. Detecting these types of forgeries has become serious problem at present. To determine whether a digital image is original or doctored is a big challenge. To find the marks of tampering in a digital image is a challenging task. A copy-move image forgery is done either for hiding some image entity, or adding more minutiae resulting in forgery. In both the case, image reliability is lost. Although this technology brings many advantages but it can be used as a confusing tool for hiding facts and evidences. In this paper we detect region duplication forgery by applying Discrete Cosine Transform. We divide the image into overlapping blocks and then search for the duplicated blocks in the image.

Index Terms- Image forgery, Copy move forgery, PCA, Wavelet Transform, Region Duplication Detection.

I. INTRODUCTION

In today's world it is easy to manipulate the image by adding or removing some elements from the image which result in a high number of image forgeries. Using the manipulation tools that are available on internet it is easy to tamper the digital images without any trace. Therefore verification of originality of images has become a challenging task. An image can be manipulated with a wide variety of manipulation techniques such as scaling, rotation, blurring, resampling, filtering, cropping, etc. We need image forgery detection technique in many fields for protecting copyright and preventing forgery. The verification of originality of images is required in variety of applications such as military, forensic, media, scientific, glamour, etc. Image tampering is a digital art which needs understanding of image properties and good visual creativity. Detection of image tampering deals with investigation on tampered images for possible correlations embedded due to tampering operations. Detecting forgery in digital images is an rising research field with important implications for ensuring the credibility of digital images.

Digital image forgery detection techniques are classified into active and passive approaches. In active approach, the digital image requires some pre-processing such as watermarking, signature, etc. Passive approach is different to active approach; this approach does not need any watermark embedded in advance.

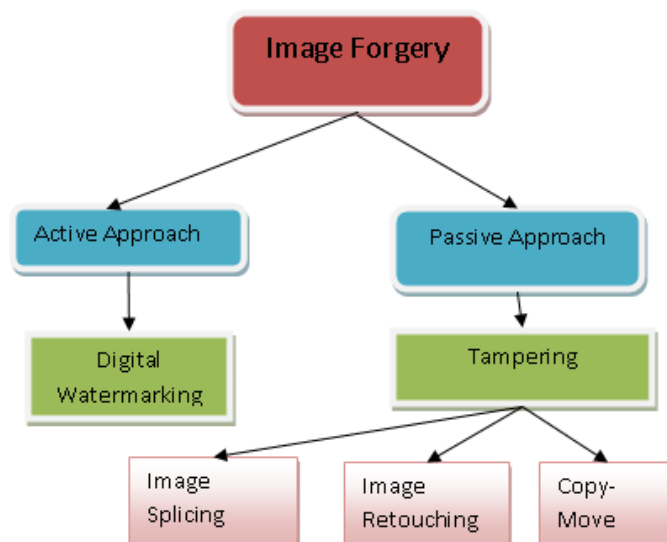


Fig. 1 Classification of Image Forgery

The copy move forgery is one of the difficult forgery. This is the most common kind of image tampering technique used, where one needs to cover a part of the image in order to add or remove information. Copy-Move is a special type of image manipulation technique in which a part of the image itself is copied and pasted into another part of the same image. Image-splicing is defined as a paste-up produced by sticking together photographic images. In a copy-move attack, parts of the original image is copied, moved to a desired location, and pasted. Detecting copy-move in an image indulges broad search of local pattern or region matches.

The structure of the paper is as follows. In section II we review the work which is already done in detection of forgery in digital images. In section III we proposed the method to detect copy-move forgery in digital images. Experimental results are shown in section IV. Lastly, we conclude the paper in section V.

II. RELATED WORK

There were several techniques proposed to detect image forgery in the literature of digital image forensics. Copy move forgery is one of the popular method to create the image forgery in which the part is copied and moved to the other place in the same image. There are so many techniques to detect such type of forgeries. One approach to detect copy-move forgery detection, proposed by Fridrich et al. [3], basically performs a rigorous search by comparing the image to every cyclic-shifted versions of it. But

the complexity of this approach is very high, it requires $(mn)^2$ steps to execute for a image of size $M \times N$ so it is difficult to implement it practically.

There is a technique based on the Radon transform and phase correlation in order to improve the robustness in forgery detection. In this the proposed technique can detect forgeries even if the forged images were undergone some image processing operations such as rotation, scaling, Gaussian noise addition, etc [7]. Popescu et al [4] proposed a copy-move image forgery detection algorithm using block matching approach and Principal Component Analysis (PCA). In order to detect images through rotation, scaling and other operations quickly and efficiently, image tamper detection based on Radon and Fourier-Mellin transform is presented [5]. M. sridevi attempt to verify the authenticity of image using the image quality features like markov and moment based features. They are found to have their best results in case of forgery involving splicing [6].

One of the distinguish property of copy move forgery detection is the feature extraction process. Some methods are based on dimensionality reduction [4], [8], moments [9], [10], color properties [11], frequency domain transform [3].

Other technique to detect copy move forgery is by using Discrete Cosine Transform (DCT). Junfeng He et.al. proposed the method that can detect forged jpeg image and locate the doctored part by applying the DCT transform on images. This method has many other advantages like fast speed etc.

III. PROPOSED APPROACH

There is an approach that can detect doctored JPEG images and further locate the doctored parts, by examining the double quantization effect hidden among the DCT coefficients. Our method detects region duplication forgery by dividing the image into overlapping blocks and then we search for the matching region in the image. We show the effectiveness of this technique on credible forgeries and compute its robustness also. We can check the efficiency of algorithm for noisy figure too.

C. Region Duplication Detection

The detection of copy move forgery in digital images is done as:

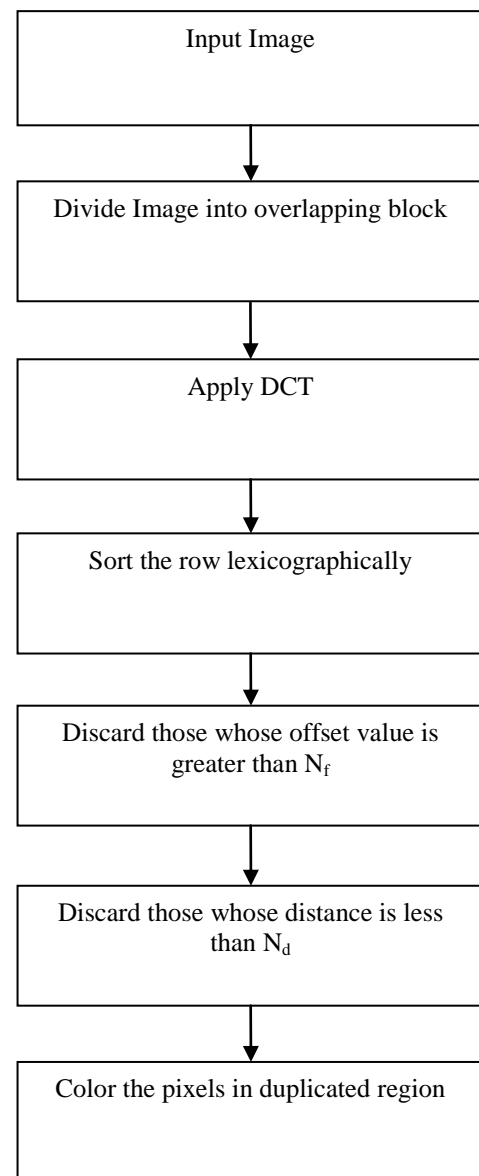


Fig. 2 Duplication Detection Algorithm

This research aims to prove that the use of DCT to detect forgery is better for jpeg images than using a predefined method PCA. We have further tried in this approach to make the program efficient by applying DCT instead of PCA. Since the PCA does not detect the forgeries for jpeg image efficiently, we apply DCT so that we detect forgery on jpeg image too. After that we compare both the approaches and find out the results and compare the results.

An experiment will be conducted to prove that the algorithm works and can be used to detect duplicated regions on a highly textured image. Once we've located the possible modified region, we need to estimate the size o the modified region and later execution time in a copy-move attack detection algorithm. We have chosen algorithm that detects copy move forgery in images of any format.

IV. EXPERIMENTAL RESULTS

We see that earlier method does not detect the forgery for jpeg format image, there is another method to detect image forgery. We can detect image forgery by using DCT also which

result in good detection for jpeg images as shown in figure. There are various steps of detecting Forgery in digital images. Here we detect region duplication image forgery in which part of image is copied and pasted. Shown in figures are original and tampered images. The tampering consisted of copying and pasting a region in the image to conceal a person or object. Shown other figures are the outputs of our detection algorithm as applied to the tampered image. In each map, the duplicated regions are shown with gray scale values.

Image 1



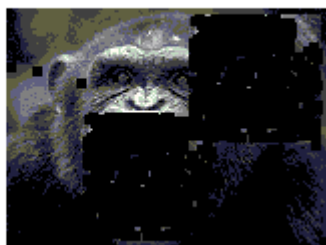
(a) INPUT IMAGE (.JPG)

Now we do some modification or changes in the input image and make the image tampered.



(b) TAMPERED IMAGE

After applying the algorithm we get the output image



(c) OUTPUT IMAGE

Fig. 3 Forgery detection result (a) Original image (b) Tampered image (c) Detection result(Output)

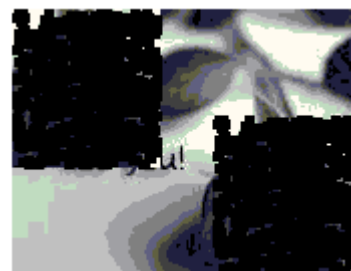
Image 2



(a) INPUT IMAGE



(b) TAMPERED IMAGE



(c) OUTPUT IMAGE

Fig. 4 Forgery detection result (a) Original image (b) Tampered image (c) Detection result(Output)

N. Experiment Configuration

The experiment is run on a 32-bit dual core machine with a processor speed of 3.2GHz using 1GB of DDR2 RAM. The research is run using Matlab since all of the algorithms are coded in Matlab. All images are converted into grayscale. We opt for grayscale since it is simpler to handle. We coded an algorithm to randomly create a copy-move attack on all of these images.

O. Result Analysis

TABLE I
 Comparison of execution time when block size = 4x4 (Using DCT)

Size of image	Avg. detection result	Execution time (seconds)	Execution time (using MEX function - seconds)
160x120	100%	58.2	10.85
174x132	99.9%	82.88	16.68
128x128	99%	21.86	3.96
208x144	70%	93.2	23.07

TABLE II
 Comparison of execution time when block size = 8x8 (Using DCT)

Size of image	Avg. detection result	Execution time (seconds)	Execution time (using MEX function - seconds)
160x120	100%	67.2	22.8

174×132	99.9%	201.22	29.18
128×128	99%	26.21	8.22
208×144	70%	184.3	29.10

P. Efficiency of Algorithm

The graph shows that when the block size is increases the efficiency of detecting the forged image correctly decreases. Therefore to detect the forgery correctly we should keep the size of block small.

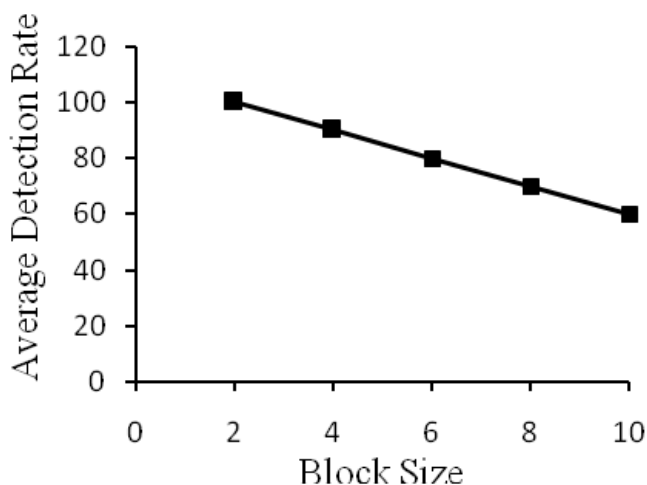


Fig. 5 Graph between Avg. Detection Rate and Block size

This graph shows that when block size is increase the average execution time of detecting the forged part of image is also increased.

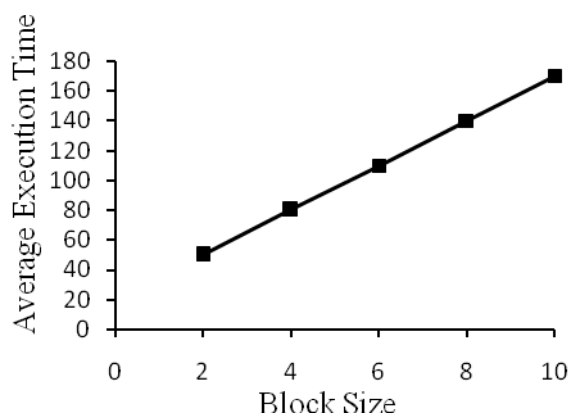


Fig. 6 Graph between Avg. Execution Time and Block size

V. CONCLUSION

Copy-move forgery is one of the most frequently applied forgery technique. In this we use a robust method to detect the duplicated region in the digital image. We have conducted some test on the algorithm against sample images from the internet. The result of the test is very encouraging since we got improvements in the detection rate and the detection time of the copy-move attack detection algorithm that we used. We are happy that the project is able to meet the outlined objectives proved that the use of DCT is better than using PCA for detecting copy-move attacks in highly textured images.

We can improve the efficiency of forgery detection by applying wavelet transform. For future work, we plan to further optimize the data structures to gain additional query performance and further improve accuracy. The process can be further extended to different formats and works for binary scale, gray scale and color images also.

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Design, Construction and Performance Evaluation of an Underground Storage Structure for Yam Tubers

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Abstract- An underground storage environment for yam tubers was designed and constructed at the college of Engineering, university of Agriculture, Makurdi. The structure which was tested between November 2011 and January 2012, consisted of walls made of burnt bricks, erected from the ground soil level of the underground pit. Thatch and bamboo sticks were used for roofing. Yams were stored in the underground pit structure and also in an open shed for comparison. Test results showed that temperature and humidity in the underground structure ranged from 28.77 oC to 32.70 oC and 70 % to 88 % respectively for 56 days, while that of the open shed fluctuated between 32.90 oC to 36.40 oC and 50 % to 78 % within the same period. The ambient temperature at the location of the storage structure was between 36.40 oC to 40 oC. The reduced temperature achieved in the underground pit together with the average relative humidity, made it possible to store yam tubers for 56 days. In the shed environment however, yams could stay for 35 days. There were no cases of sprouting in both storage environments. However, affloxiation rates were higher in the open shed due to exposure of the tubers to insects and rodents. Yam tubers stored in the underground pit had a cumulative weight loss of 11.0 % while in the open shed a cumulative weight loss of 15.0 % was recorded. The cost of construction of the underground storage structure is N19,000:00.

Index Terms- Design, Construction, Testing, Underground Storage Structure, Yam, Tubers.

I. INTRODUCTION

The Yam Plant

The term "yam" is used to embrace many tubers. Yams are any of the ten (10) economically important species of *Dioscorea* SPP., a genus in the monocotyledonous family *Dioscoriaceae*. These species have a worldwide variety and are cultivated for their edible tubers (enlarged, fleshy, usually underground storage stems). Yams are cultivated throughout the tropics and in parts of the subtropics. It occupies a prominent position in West African Agriculture but is also important in South East Asia (including some adjacent area of China), Japan, and the Caribbean. The crop is a staple food for millions of people in these regions, providing an important source of carbohydrate and more protein on a dry weight basis than commonly assumed (IITA, 1995)

Nutritionally, yams contain 80 – 90 % carbohydrates, 5 – 8 % protein and about 3.5 % minerals (FAO, 1990). They are also high in starch content. Yams are very important food crops in West Africa. Over 90 % of global yam production comes from this region (Onwueme, 1979). Yam production accounts for 4.1 % of the total output of roots and tuber crops (IITA, 1995).

However, in sub-Sahara Africa, yam accounts for 26.9 % of total root crop production. Apart from being a source of food, income, and food supplement for livestock, its production from land clearing to harvest by numerous cultivators have attached high cultural importance. (Gebremeskel and Oyewole, 1987; Onwueme and Sinha, 1991; Onwueme, 1979)

The most common problems faced by farmers are the losses of the produce during post-harvest and storage. Wastage of produce generally, occurs because the apparent surplus harvest during the harvest season cannot be consumed within a short period. However, few months after the harvest there is always a diminishing availability of yam produce. Therefore, it becomes imperative that the existing yam tubers are stored in structures for later use. (Williams and Raharatham, 1980)

This study is limited to the design, construction and evaluation of a pit storage structure for yam tubers. Evaluation of the storage structure is centered on effects of temperature, humidity, affloxiation, weight-loss and sprouting.

Conditions/Factors Influencing the Storage of Yams

Successful storage of yams requires the use of healthy and sound tubers, proper curing if possible combined with fungicide treatment, adequate ventilation to remove heat generated by respiration of sprouts and rotted tubers that develop, monitoring the presence of rodents and protection from direct sunlight and rain.

Yams can be best stored in a cool, dry and well ventilated surrounding. Ware yams, seed and commercial yams have similar storage requirements, notwithstanding cultivar differences. Fresh yam tubers can be successfully stored in ambient and refrigerated conditions and the recommended storage temperature is between the ranges of 12 °C to 16 °C. Optimum conditions of 15 °C or 16 °C at 70 to 80 % relative humidity have been recommended for cured tubers. (Cooke et al, 1988; Opara, 1999)

Storage environment for yams must inhibit the onset of sprouting (breakage of dormancy) which increase the rate of dry matter and subsequent shrivel and rotting of tubers. Tubers transit and storage life of 6 to 7 months can be achieved under these conditions (Plucknett, 1979; Passam et al, 1978; Opara, 1999).

Yams must be in an atmosphere where conditions that favor the growth of microorganisms are prevented or discouraged. The essence of maintaining such conditions is to avoid the causative agents of spoilage or storage losses in the produce. The major factors influencing the growth and productivity (reproduction) of microorganisms in yams include; moisture, temperature, relative humidity and the soil type (Kay, 1973).

To store yams effectively, moisture should be controlled at sufficiently low levels so that other factors do not set in, also, the type of soil conducive for storage is taken into consideration. There are considerable variations in the storage of different varieties of yam. *D. alata* is more difficult to store than *D. rotundata*. Under high storage temperatures (160 °C and above) and relative humidity (85 % and above) sprouting and decay occurs in water yams (*D. alata*) as compared to *D. rotundata* (white yam) (Maduwese and Onyike, 1981).

However, at high temperatures and lower humidity the case is the same. This is because water yam is water stressed and cannot stay long. Thus, for water yams to be stored, they will require lower temperatures and lower humidity. For instance by burying the tubers inside the ground and covering properly with earth, it can last a few weeks until is ready for use. (Maduwese and Onyike, 1981)

Dormancy in Yams

This is the temporary suspension of visible growth of any plant structure containing a meristem. In yams, it is that period during which sprouting is inhibited. Knowledge of the potential length of dormancy for stored tuber is important because once dormancy breaks, the tubers also senesce rapidly with loss of stored food (carbohydrates). (Coursey, 1967; Coursey, 1983) The environmental conditions affecting yam tuber dormancy are photoperiod, white and colored light, temperature, relative humidity and partial oxygen pressure. The length of tuber dormancy is endogenously controlled and conditions such as availability of soil moisture or cool temperature are ineffective triggers of sprouting.

The physiological age of tuber also affect their readiness to sprout. But approximately 6months after harvesting, dormancy disappears completely and budless set planted after that period must require nearly the same time to sprout (Onwueme, 1978).

Types of Storage Structures

The different forms and methods of yam storage depend on the intended final use. Yams for planting are usually stored fresh. Those for food are either consumed when fresh or processed into chips and stored dry.

There are several traditional low-cost storage methods and structures for yam tubers. The most common of them include leaving the tubers in the ground until it is required, storage under tree shades, yam barns, underground structures such as pits and ditches, mud structures, thatched huts and cribs. The storage structures are of different shapes and sizes depending on the ability of the farmer locality and cultural practices. The construction materials are usually wood, ropes, palm fronds, guinea corn stalks, and mud. (Osuji, 1985; Cooke et al, 1988; FAO, 2004)

Various problems are associated with the traditional method of yam tuber storage. Leaving the tubers in the ground until it is required is the simplest storage technique practiced by rural farmers. When carried out on the farm, the method of storage prevents the use of farm lands for further cropping. The method is susceptible to rodents and insect attacks, and sprouting usually occur leading to loss in quality of the tubers. Tubers stored in under shades provide good habitat for harmful reptiles and scorpions. They are exposed to rain, pests and rodents. In

addition, regular inspection of the tubers will require dismantling and rearranging of yam heaps which is a tedious, hazardous and undesirable process. Storage in underground and mud structures is prone to flooding, wetting, fungi infections, decaying and various forms of affloxiation. Storage in structures made of palm fronds, and guinea corn stalks are susceptible to fire out-break among others. (Osuji, 1985; Satimehin, 1987; Umogbai and Satimehin, 2004)

There are well ventilated weather-proof, insect and rodent proof strong shelters for storage of yam tubers. The financial cost of such structures discourages the peasant farmers who are the major producers of yams from constructing such improved storage structures. (Umogbai and Satimehin, 2004)

II. DESCRIPTION OF THE STORAGE STRUCTURE

The structure consists of walls made of burnt bricks. The roof is made of thatch using bamboo sticks as frame and spear grass for the thatch. Wall height from the ground level is 152.4 cm and the height of the roof from wall level is 100 cm, giving a total height of 252.4 cm.

The inner dimension of the structure is 130 cm x 130 cm. the depth of the pit inside the hut is 60.96 cm. It has an entrance door made of wood measuring 70 cm high and 45 cm wide, and two windows measuring 15 cm x 15 cm. The two windows are positioned opposite each other to provide cross ventilation and are covered with metal net to prevent insects and rodents from getting inside the structure. Fig. 1 is a pictorial view of the structure, while Fig. 2 shows the orthographic view. Fig. 3 is a photograph of the structure. The quantity and dimensions of construction materials for the storage structure are given in Table 1.

R7	Ground: soil surface	1	Soil
G6	Structure wall	1	Burnt bricks
S5	Window vent	2	
W4	Roof	1	Thatch
R3	Entrance door	1	Wood
E2	Entrance	1	
E1	Underground pit	1	Burnt bricks
SN	Component	Qty	Material

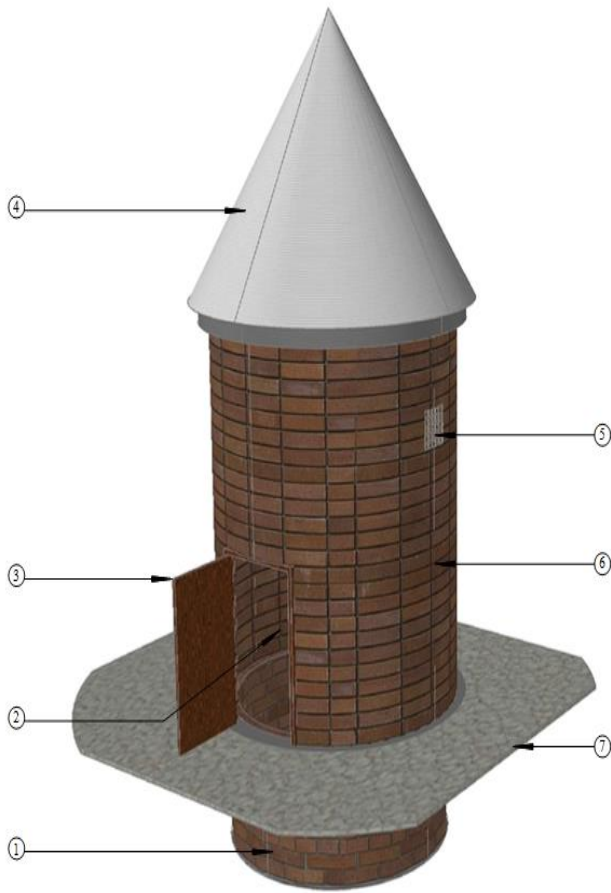


Fig. 1: A pictorial view of the underground yam storage structure

Table 1: Quantities and dimensions of construction materials

S/No.	Item	Material	Quantity	Dimension
1.	Burnt bricks	Fired clay	200	30 x 16 x 11 cm
2.	Door	Wood	1	70 x 45 cm
3.	Window	Net	-	15 x 15 cm
4.	Thatch	Spear grass	3bundles	-
5.	Ropes	Twine	4rolls	-
6.	Sticks	Bamboo	30	-
7.	Cement	Cement	Half bag	-

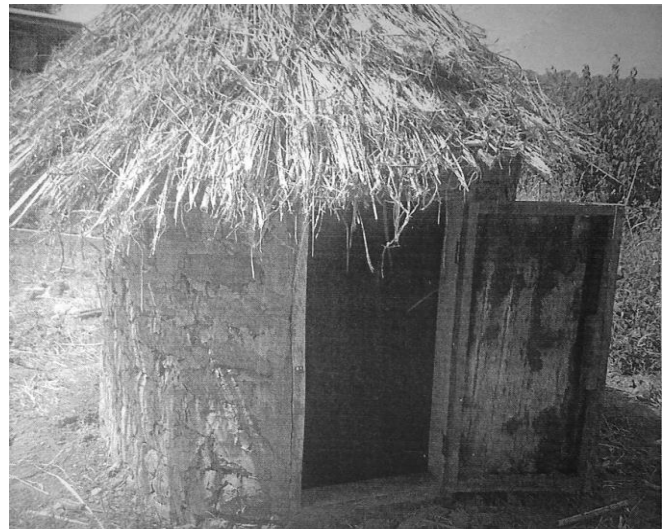


Fig. 3: The underground storage (front view)

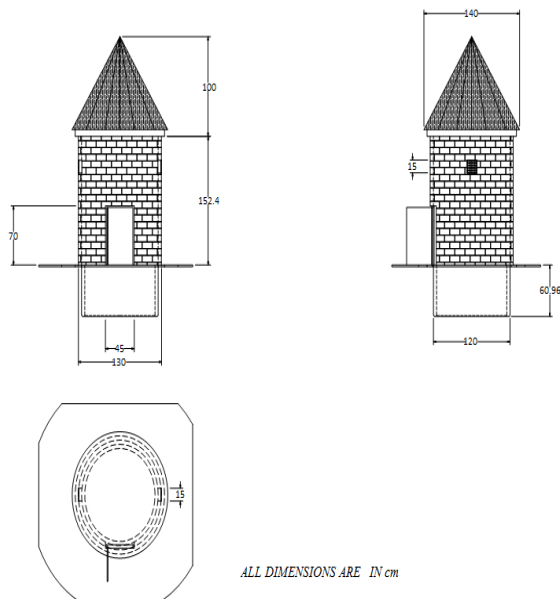


Fig. 2: Orthographic view of the underground yam storage structure

Evaluation of the Storage Structure

Matured yam tubers of *D.rotunda* from the second harvest period of 2011 growing season were obtained from the yam market in Makurdi. Proper inspection was carried out in order not to use yam tubers that were injured mechanically and also to avoid yams gathered from early harvest period which are quite difficult to store due to high water stress. Yams from first harvest normally have high water stress and rot very quickly as compared with those of second harvest which suffer little or no water stresses (Opara, 1999; <http://www.sciencedirect.com>). Forty yam tubers were used for the evaluation. Twenty were put inside the underground pit of the newly constructed storage structure while twenty were put in an open shed commonly used by local farmers. The shed was placed close to the constructed storage structure for good comparison.

Evaluation was centered on temperature, humidity, weight loss, affloxiation and sprouting. In order to maintain the storage environment and extend the shelf life of the stored produce, sodium hydroxide pellets were placed inside the storage structure to remove the excess carbon dioxide that could generate due to respiration (Burton, 1974).

Temperature

Temperature readings which are the degree of hotness or coldness of the storage structure and environment were taken on

a daily basis in the afternoon between 12:00 noon and 1:00 pm, using wet and dry bulb thermometers. This is the period of the day when there is great difference between temperatures of the storage structure and the ambient temperature. (Umogbai and Satimehin, 2004)

Relative Humidity

The amount of moisture contained in the atmosphere of the storage structure and in the shed was determined with the use of a hygrometer tables and psychometric chart, having taken the temperatures using the wet and dry bulb thermometers.

Weight Loss

The weights of the stored yam tubers in the storage structure and shed were taken on a daily basis using weighing balance.

Affloxiation/Sprouting

Visual inspection and counting was done for yam tubers in the storage structure and shed. The affloxiation and sprouting index were then determined as follows:

$$\text{Affloxiation} = \frac{\text{Number of Detriorated Tubers}}{\text{Total number of Tubers}} \times 100 \quad 1$$

$$\text{Sprouting index} = \frac{\text{Number of Sprouted Tubers}}{\text{Total number of Tubers}} \times 100 \quad \text{(Opara, 1999)} \quad 2$$

Simple statistical analysis of mean, standard deviation and error were used in computation of results.

$$\text{Mean} = \frac{\sum x}{n} \quad 3$$

$$\text{S.D} = \sqrt{\frac{\sum(x-\bar{x})^2}{n}} \quad 4$$

$$\text{P.E} = \frac{\text{Experimental value} - \text{Theoretical value}}{\text{Theoretical value}} \times 100\% \quad 5$$

Where: x = Temperature and humidity values
 n = Number of weeks
 \bar{x} = Mean
 S.D = Standard deviation
 P.E = Percentage error

III. RESULTS AND DISCUSSION

The variation in pit air temperature showed a slight patterned increase in the underground structure. It is likely that the two vents on both sides of the storage structure and the thatch roof facilitated the lower temperature recorded in the pit. (Fig. 4)

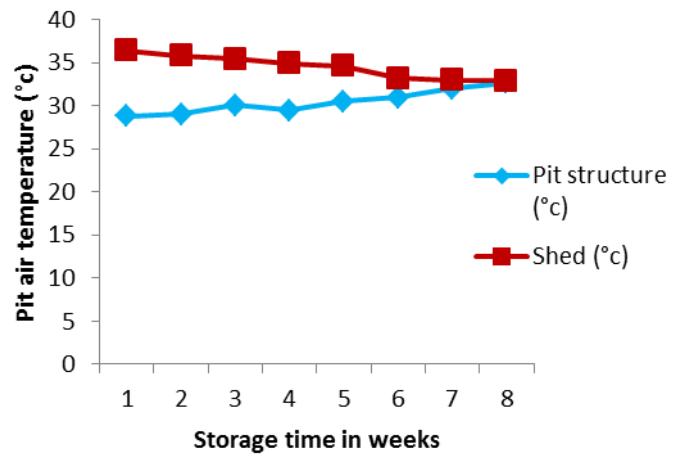


Figure 4: Variation of air temperature during storage period

This temperature distribution trend is significant, when analyzing weight loss in tuber particularly in a given environment where the subject of study is becoming pertinent. High temperature environment facilitate increased respiration rates, thereby exerting high tuber vapor pressure and enhance significant sprouting activity during the later storage life and subsequent weight loss of the tubers. The reason is because at high temperature, there is that tendency for an increased metabolic activity thus transpiration processes is associated with the total energy content of the tuber which results into greater weight loss (Kay, 1973).

Comparing the cumulative weight loss of the tubers stored in the underground structure and those stored in the shed, it was observed that yam tubers in the underground structure sustained a weight loss of 1.5 to 11.0 % in 8weeks of storage, while those in the shed had weight loss ranging from 3.0 to 15.0 % in the same storage period. (Fig. 5)

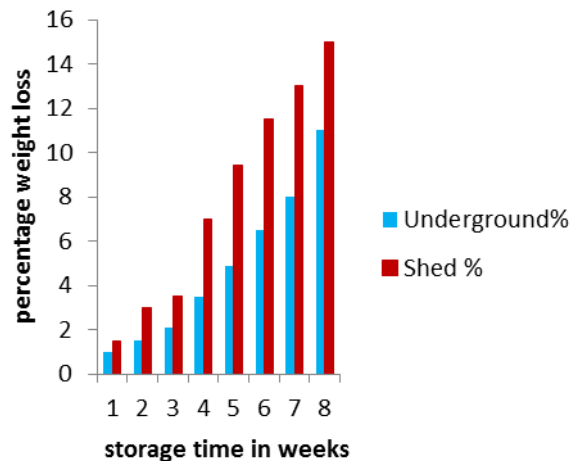


Figure 5: Weight loss against storage time

From figure 6, it was observed that relative humidity readings that were taken in the morning and evening are approximately the maximum values. Thus, relative humidity between the periods of week 1 to 3 was recorded to be very high due to the prevailing rainy season which gradually reduced towards the end of the year. Higher humidity is capable of

enhancing dehydration of tubers due to the generated ambient vapor pressure which are relatively high. This therefore ensures a greater driving potential for moisture exchange that would have been experienced in weeks 4 to 8. Also, it can be seen that humidity values attained in week 1 to 3 are near optimum and therefore will require necessary curing of the yam tubers.

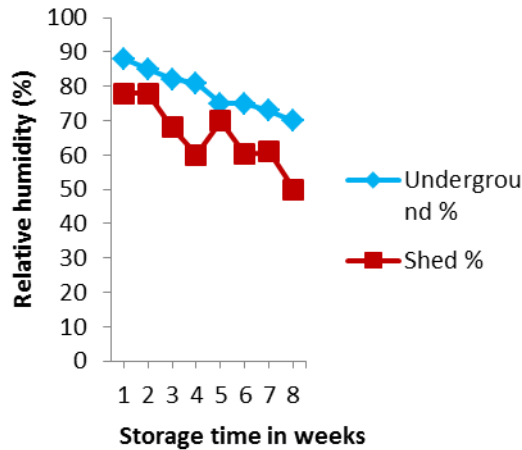


Figure 6: Relative humidity during storage

The high humidity values attained from week 1 to 3 was attributed to the soil moisture condition which was very high due to the rainy season at that particular period of the year. The air in contact with it was often laden with moisture and high humidity condenses moisture from air.

An important problem associated with the storage of root crops generally, especially underground is the mechanism that will regulate dormancy. It was observed that sprout development did not occur for the storage period of 8 weeks. The temperature in both structures were considerably high, however the presence of vents which gave adequate ventilation in the underground pit structure might have removed totally, the inhibition of localized heat pockets from the structure which tends to promote sprouting activity.

Table 2: Various temperatures in the storage area against time

Week	Ambient (°C)	Wet-bulb (°C)	Underground pit (°C)	Control environment (°C)
1.	36.40	27.50	28.77	36.40
2.	37.90	26.95	29.00	35.80
3.	38.70	27.30	30.10	35.40
4.	38.90	26.70	29.50	34.90
5.	38.60	27.05	30.50	34.60
6.	40.00	27.10	30.98	33.20
7.	40.00	28.00	32.00	32.95
8.	39.00	28.20	32.70	32.90

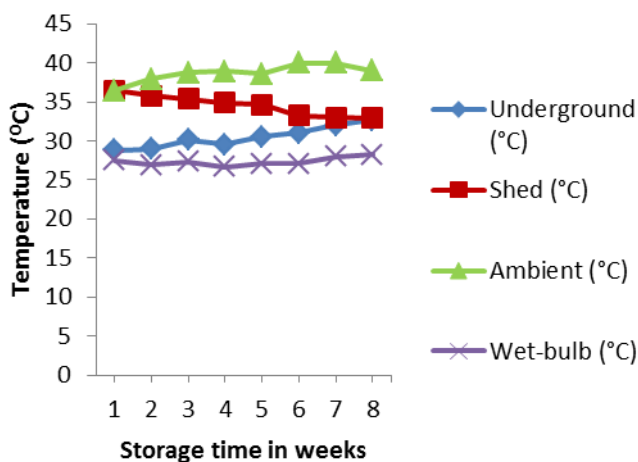


Figure 7: Various temperatures in the storage area against time.

One probable reason for the lower temperatures in the underground storage is the heat balance within the storage

structure. Table 2 and Figure 7 show the relationship between the ambient temperature, air temperature in the underground structure, wet bulb temperature and temperature in the shed. The lower temperatures recorded in the underground structure result from the sensible latent heat exchange between air and soil.

The heat exchange between air and soil was observed to cause affloxiation. The rate of deterioration of yam tubers in the underground structure for the storage period of 8 weeks occurred increasingly in the first few weeks of storage. This was due to initial high humidity recorded in the storage structure, as a result of the outgoing rainy season. The temperature of the underground structure was considerably low during the first few weeks together with the soil moisture very high. This subjected quite a good number of yam tubers to spoilage. However, in the shed environment, the higher temperature and lower humidity subjected the tubers to spoilage. Yam tubers were observed to develop cracks and break easily during the storage period. Also, the tubers in the shed eventually became very dry and subsequent deterioration occurred.

Table 3: Number of yam tubers that were affected by affloxiation for the period of 56days

Week	Underground pit	Shed environment
1.	10	-
2.	15	-
3.	20	-
4.	5	20
5.	-	15
6.	-	10
7.	-	5
8.	-	10

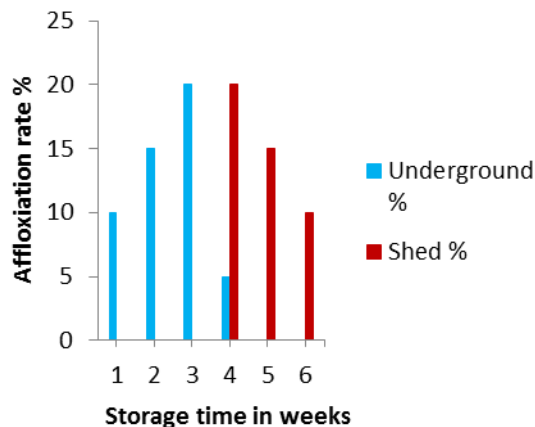


Figure 8: Affloxiation rate during storage period.

From observation, yams in the underground began to spoil in the first few weeks of storage, while the later storage period recorded no signs of tuber spoilage. On the other hand, the shed environment did not show any signs of tuber infestation in the first few weeks of storage. Tuber breakage and subsequent deterioration began in week four of the storage period of 8 weeks. (Table 3 and Figure 8)

IV. CONCLUSION

A total of 40 yam tubers (*Dioscorea rotundata*) stored in under tropical conditions for two months were used to obtain data on yam tubers as regard their storage qualities affected by environmental factors such as temperature, moisture and relative humidity. Weight loss, affloxiation and sprouting were also determined. Two storage environments were used for the experimental work. An underground pit structure and an open shed.

The yam tubers were observed carefully for cases of sprouting which did not occur. However, affloxiation rate were recorded, together with tuber weight loss associated with physical and pathogenic sources. From the results generated, the underground structure was observed to have a lower air temperature as compared to the shed environment but, the relative humidity in the shed environment appeared to be higher, thereby causing a faster deterioration and tuber loss.

Results show that, the underground pit storage structure would serve adequately for use by farmers in rural communities. The need for electricity for refrigeration and ventilation using electric fans would be eliminated. In general, test results revealed that yam tuber stored in the underground storage structure performed better and last longer than yams stored in the open shed.

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Rejuvenation of Cadmium Induced Electrolyte Imbalance by *Mentha Piperita*

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Abstract- Health hazards caused by heavy metals have become a great concern to the population. Excessive industrial effluents, pesticide application and biomedical activities load a large amount of metals and metalloids to the environment. Cadmium is one of these, with high rate of bioaccumulation and extreme toxicity at low concentration. Cadmium is exposed to air and water through a number of industrial sources including mining, pesticides, alloys, electroplating, food and cigarette-smoking etc. WHO permitted limit for cadmium in drinking water is 0.005 mg/L whereas in Indian standard it is 0.01 mg/L. In India there are some places where groundwater cadmium concentration is far beyond this limit. Pali, in Rajasthan is a place where this concentration is reported to be 0.224 mg/L.

Present study has been designed with the aim of social welfare as well as an eco-healthy approach to find out impact of orally administered cadmium on the hepatic enzymatic system in model organism albino rat and its amelioration by *Mentha piperata*.

Acute and sub-acute cadmium administration induces a significant hyponatremia, hypochloremia and hyperkalemia in albino rat, which were brought to normalcy after pretreatment with *Mentha piperata*, containing terpenoids as an antioxidant after acute and sub acute treatment.

Experimental results therefore reveal protective effect of pretreatment with *Mentha piperata* under stress of cadmium in albino rat.

Index Terms- Cadmium, *Mentha piperita*, serum electrolytes, albino rat.

I. INTRODUCTION

Natural and anthropogenic activities have been contributing to the spread of toxic chemicals into the environment, including several toxic metals and metalloids (Fig. 1) (Roy and Saha, 2002). Pollution due to heavy metal is the major challenge of present scenario. Cadmium is the industrially applicable heavy metal; most of electronic and electric goods consist of a noticeable amount of cadmium. Rechargeable Batteries contains about 6% of cadmium. Indiscriminate and illegal disposal of these goods have introduced a heavy flow of these metals in ground water table and thus in food chain. Major sources of cadmium exposure are mining, batteries, electronic and electrical goods, electroplating, vapor lamps, engraving, fertilizers, smoking, soldering, and old galvanized PVC water supply pipes etc.

Among possible target organs of heavy metals, the kidney and CNS appear to be the most sensitive ones. Any alteration in kidney or the part of kidney due to induction of cadmium may be responsible for improper renal functioning. Evaluation of serum electrolytes provides vital information about renal functions, hence have been considered as possible biomarkers of renal dysfunctioning

The various indigenous system of medicines such as Siddha, Ayurveda, Unani and sometimes allopathy use several plant species for the treatment of degenerative diseases (Bhakta *et al.*, 2001), *Mentha piperita* (peppermint) is one of them. These medicines are commonly used to obviate profound side effects of modern drugs (Abebe, 2002). It is a perennial herb that grows up to 1 meter (3 feet) high and has slightly hairy serrated leaves with pinkish-mauve flowers arranged in a long conical shape. It has underground runners by which it easily propagates. Peppermint oil is extracted from the whole plant above ground just before flowering by steam distillation

II. MATERIALS AND METHODS

Eighty adult male Wistar albino rats (*Rattus norvegicus*) of almost same age and weight (100 ± 10 gm), were procured from inbred colony. They were acclimatized at room temperature with 12 hr dark/light cycle and fed on standard diet and water *ad-libitum*. All experiments were performed as per animal institutional ethical committee (360/01/CPSEA/2001).

The experimental compound cadmium was obtained from Merck, India and its LD₅₀ was calculated to be 88 mg/Kg body weight by log dose /probit regression line method (Finney, 1971).

Mentha aerial parts were collected from local fields and subjected to hydro distillation for obtaining essential oil. Further, the oil was analyzed by GC/MS to find the major constituents. A safety trial was performed to set the safe dose of oil and it was found to be 500 mg/100 gm body weight.

Animals of acute and sub-acute sets were divided into four groups viz. control, cadmium treated, *Mentha* + cadmium treated and *Mentha* treated. Doses of respective sets and groups are listed in Table – 1.

Table – 1: Acute and sub-acute doses of cadmium chloride and *Mentha piperata* for *Rattus norvegicus*

Groups Sets	Group- A (Control)	Group- B (Cadmium treated)	Group- C (Mentha treated)	Group- D (Mentha + cadmium treated)
Set: I Acute (1 d)	Water	8.8 mg/kg body weight	500 mg/kg body weight	500 mg/kg body weight + 8.8 mg/kg body weight
Set: II Sub-acute (7 ds)	Water	1.26 mg/kg body weight	500 mg/kg body weight	500 mg/kg body weight + 1.26 mg/kg body weight
Set: III Sub-acute (14 ds)	Water	0.63 mg/kg body weight	500 mg/kg body weight	500 mg/kg body weight + 0.63 mg/kg body weight
Set: IV Sub-acute (21 ds)	Water	0.42 mg/kg body weight	500 mg/kg body weight	500 mg/kg body weight + 0.42 mg/kg body weight

At the end of designated days the animals of respective sets were sacrificed to determine the renal functions. The blood samples were collected from the ventricle of heart and serum was separated for the determination of **serum Na⁺** and **K⁺** by colorimetric method (Bassir, 1971) and **Serum Cl⁻** by thiocyanate method (Skeggs and Hochstrassman, 1964).

The data were analysed using one-way analysis of variance (ANOVA) followed by student Newman-Keul's (SNK) test. Differences with P<0.05 were considered as significant (Glantz, 1992).

III. RESULTS

Results in Table-2 show that cadmium intoxication induces significant hyponatremia, hypochloremia and hyperkalemia, after acute (1 day) and sub-acute (7, 14 and 21 days) treatments. However these altered levels of serum electrolytes were brought to normalcy preceding treatment with Mentha.

Table – 2: Effect of *Mentha piperita* against cadmium intoxication on serum electrolytes of albino rats.

Serum Electrolytes	Treatment days	Control	Cadmium treated	Mentha treated	Mentha + Cadmium treated
Na ⁺ (mEq/l)	1 day	141 ± 1.15	137 ± 0.58*	140.33 ± 0.33	138 ± 0.57*
	7 days	142 ± 1.00	135.33 ± 0.88*	140.66 ± 0.88	138.66 ± 0.33
	14 days	142 ± 1.52	134 ± 1.15*	141 ± 1.15	139 ± 0.23
	21 days	141 ± 0.58	132 ± 0.58*	142 ± 1.15	140 ± 1.15
K ⁺ (mEq/l)	1 day	4.17 ± 0.03	4.54 ± 0.04*	4.20 ± 0.01	4.44 ± 0.01*
	7 days	4.19 ± 0.02	4.82 ± 0.01*	4.21 ± 0.01	4.38 ± 0.02*
	14 days	4.18 ± 0.02	5.18 ± 0.10*	4.16 ± 0.02	4.35 ± 0.02
	21 days	4.17 ± 0.01	5.84 ± 0.07*	4.21 ± 0.01	4.30 ± 0.03
Cl ⁻ (mEq/l)	1 day	103 ± 1.15	98 ± 0.57*	102.5 ± 1.04	99.66 ± 0.33*
	7 days	102 ± 1.15	97 ± 1.00*	101.16 ± 0.68	100 ± 0.91
	14 days	102 ± 1.15	94 ± 0.57*	101.5 ± 0.76	98 ± 1.00
	21 days	103 ± 1.00	93 ± 0.57*	101 ± 1.15	99 ± 1.00

values are expressed as mean ± SEM.

* P < 0.05

IV. DISCUSSION

Rate and health effects of cadmium depend on its route of exposure. Cadmium is a cumulative toxin with a slow rate of elimination, accumulating mainly in the liver and kidneys. Cadmium poisoning is not reversible. It stays in the system for a very long time and excreted very slowly via metallothionein, the major excretory protein of kidney. Its biological half-life is 10 years, staying for a larger part of life. (Longe, 2005; Darwish et al., 2002) Besides cadmium's long half-life, the body lacks ability to metabolize it properly. Replacement of zinc and calcium inside the body is also an important mechanism of cadmium toxicity (Sutoo et al., 2002).

Cadmium is known to increase oxidative stress by being a catalyst in the formation of reactive oxygen species, changing body metabolism of different biochemicals. Toxicity is caused by lipid peroxidation, free radical production and depleting glutathione and protein-bound sulfhydryl groups. Cadmium inhibits glutathione peroxidases resulting in reduced defense against the lipid peroxidation. (Novelli et al., 2000, Congui et al. 2000) Cadmium also stimulates the production of inflammatory cytokines and downregulates the protective function of nitric oxide formation (Navas-Acien et al. 2004).

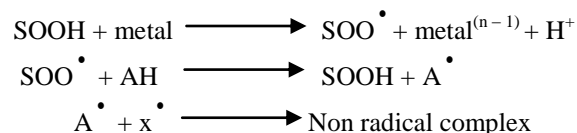
Cadmium intoxication caused significant hyponatremia, hypochloremia and hyperkalemia that might be due to attachment of cadmium with proteins of renal tubular epithelium and thus producing ROS. Cadmium causes peroxidation of polyunsaturated fatty acids (PUFA) in biological membranes, leading to decrease in membrane fluidity and membrane integrity which delocalizes the enzyme Na-K ATPase from basolateral to apical membrane, resulting in electrolyte imbalance (Schnellman and Kelly, 2008).

Besides cadmium damages juxtaglomerular apparatus, due to which renin secretion gets decreased, and probable disturbance in renin – angiotensinogen pathway generally causing aldosteron reduction resulting in electrolyte imbalance (Rhods and Tadnner, 1995; Wang and Giebisch, 1996 and Ellison, 2008).

Cadmium promotes lipid peroxidation, producing free radicals which damage the glomerular filtration membrane and

ultimately reduces GFR (Hussain, 2002). Damage in tubular epithelium causes diffusion and backleak of the filtrate across the tubular basement membrane back into interstitium and circulation. Thus both decreased GFR and backleak of filtrate leads to imbalanced serum electrolytes.

GC/MS analysis of *Mentha piperita* reveals that terpenoids including hydrocarbon and oxygen derivatives of mono and sesquiterpenoids like terpinol, limonene and p-cymene etc. are its major constituents. These terpenoids are found to possess antioxidant property (Youdin et al., 2002; Grassman et al., 2005 and Vickers et al., 2009). They may arrest oxidative stress at several levels of endogenous antioxidant mechanism. Being lipophilic in nature, they stabilizes hydrophobic interactions in the membrane thus minimizes lipid peroxidation. (Vickers et al., 2009) Reduction in oxidative stress could be well understood as below-



Where,

- S = Substance oxidized
- AH = Antioxidant molecule
- A[•] = Antioxidant radical
- x[•] = another radical

Inhibition of ROS stabilizes the membrane integrity, reverting Na⁺- K⁺ ATPase back at its location and recovery of Jxraglomerular apparatus thus in turn regaining the electrolyte imbalance.

The present findings conclude that *Mentha piperita* prevents the oxidative damage by cadmium induced ROS, due to its antioxidant property. Further, ameliorating the impaired renal functions associated with cadmium toxicity in albino rats and offers itself as a novel drug for future.

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Trio Framework for Secure Online Transaction Using Visual Cryptography

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Abstract- Nowadays as online transaction are becoming very common, a numerous number of attacks are been designed each day. Among them, phishing is the most popular attack. Phishing is a technique of hosting fake website in an attempt to get personal confidential information such as passwords, credit card information from unsuspecting victims for identity theft, financial gain and other fraudulent activities. As the phishing is becoming a serious threat for the online transaction. I present a preventive mechanism to overcome the phishing by the use of biometric along with the combination of visual cryptography. Image captcha along with the OTP helps us identify the fake website. This approach also authenticates the user. Biometric authentication systems are used to authenticate users. The use of steganography preserves the whole of integrity.

Index Terms- biometrics, image captcha, iris, phishing, steganography, visual cryptography

I. Introduction

Due to a substantial increase in internet content and resources, coupled with the evolution of communications, surfing social network sites and online transaction are nowadays becoming very common and there are various attacks are designed for these. In these types of various attacks, phishing is identified as a major security threat and new innovative ideas are arising for this by each passing second. Phishing is a form of online identity theft that aims to steal sensitive information such as online banking passwords and credit card information from users. Phishing scams have been receiving extensive press coverage because such attacks have been escalating in numbers and sophistication. One definition of phishing is given as “it is a criminal activity using social engineering techniques. Phishers attempt to fraudulently acquire sensitive information, such as passwords and credit card details, by masquerading as a trustworthy person or business in an electronic communication”. Another definition of phishing, states that it is “the act of sending an email to a user falsely claiming to be an established legitimate enterprise into an attempt to scam the user into surrendering private information that will be used for identity theft”. Identity theft can be described as “a crime in which the impostor obtains key pieces of information such as Social Security and driver's license numbers and uses them for his or her own gain”. Phishing [1] attacks rely upon a mix of technical deceit and social engineering practices. In the majority of cases the phisher must persuade the victim to intentionally perform a series of actions that will provide access to confidential information. In all cases the phisher must impersonate a trusted source (e.g. the helpdesk of their bank, automated support

response from their favorite online retailer, etc.) for the victim to believe. To date, the most successful phishing attacks have been initiated by email – where the phisher impersonates the sending authority (e.g. spoofing the source email address and embedding appropriate corporate logos). For example, the victim receives an email supposedly from support@mybank.com (address is spoofed) with the subject line 'security update', requesting them to follow the URL www.mybank-validate.info (a domain name that belongs to the attacker – not the bank) and provide their banking PIN number.

In order to combat phishing attacks, many solutions have been proposed, such as HTTPS/TLS [6] or Sign-In Seal [9]. Sign-In Seal requests users to upload a picture and to save authentication information in cookies. The browser will show the picture when user logs in the server next time. The disadvantage of Sign-In Seal is that it is ineffective when the cookies are deleted or the user changes computers then visits the website again. On the other hand, HTTPS/TLS uses the X.509 certificate to identify the server. In such a way, verification of the server certificate is demanded, which is a complicated process and is inconvenient for users. In addition, there are also many B/W lists, for instance, that detect phishing websites in APWG [2]. However, the new phishing website will be not immediately detected since it is not recorded in a B/W list. Even though laws prohibit phishing attacks, attacks are still inevitable. As a result, it is nearly impossible to be sure whether computer that is connected to the internet can be considered trustworthy and secure or not. Phishing scams are also becoming a problem for online banking and e-commerce users. The question is how to handle applications that require a high level of security. So here I introduce a new method which can be used as a safe way against phishing which is named as "Trio Framework for Secure Online Transaction Using Visual Cryptography". During the authentication, the server authenticates to the users, but sensitive information about users need aren't transferred to the server. In this approach website cross verifies its own identity and proves that it is a genuine website (to use bank transaction, E-commerce and online booking system etc.) and by the use of biometric user proves its identity to the server and this make both the sides of the system secure as well as an authenticated one.

This paper is organized as follows: Section II deals with the related work using Visual Cryptography and biometric authentication and Section III & IV presents the current and proposed Methodologies. Section V presents the implementation and Section VI deals with Results and Discussions. Section VII contains the conclusion.

II. RELATED WORK

In this section, the related techniques that include VSS [5], CAPTCHA [7], BIOMETRIC SYSTEM, OTP, and STEGANOGRAPHY are reviewed respectively as follows:

A. Visual Secret Sharing

Cryptography is the art of sending and receiving encrypted messages that can be decrypted only by the sender or the receiver. Encryption and decryption are accomplished by using mathematical algorithms in such a way that no one but the intended recipient can decrypt and read the message. Naor and Shamir [5] introduced the visual cryptography scheme (VCS) as a simple and secure way to allow the secure sharing of images without any cryptographic computations. This scheme is referred to as the *k*-out-of-*n* VCS which is denoted as (*k*,*n*)VCS. Given an original binary image, it is encrypted in *n* images, such that

$$T = S_{h1} \hat{\cdot} S_{h2} \hat{\cdot} S_{h3} \hat{\cdot} \dots \hat{\cdot} S_{hn} \quad (1)$$

where $\hat{\cdot}$ is a Boolean operation, S_{hi} , $hi \in \{1,2,\dots,k\}$ is an image which appears as white noise, $k \leq n$, and *n* is the number of Noisy images. It is difficult to decipher the secret image *T* using individuals S_{hi} 's. The encryption is undertaken in such a way that *k* or more out of the *n* generated images are necessary for reconstructing the original image *T*. In the case of (2, 2)VCS, each pixel *P* in the original image is encrypted into two sub pixels called shares. For biometric privacy, here 2-out-of-2 scheme is given. In this scheme for sharing a single pixel *p*, in a binary image *Z* into two shares *A* and *B* is illustrated in Table I.

Z	A	B	A⊕B
White	Black	White	Black
White	White	Black	Black
Black	Black	Black	White
Black	White	White	White

Table I: encoding a binary pixel *p* into share A&B

If *p* is white, one of the first two rows of Table 1 is chosen randomly to encode *A* and *B*. If *p* is black, one of the last two rows in Table 1 is chosen randomly to encode *A* and *B*. Thus, neither *A* nor *B* exposes any clue about the binary color of *p*. When these two shares are superimposed together, two black sub pixels appear if *p* is black, while one black sub-pixel and one white sub-pixel appear if *p* is white as indicated in the rightmost column in Table 1. Based upon the contrast between two kinds of reconstructed pixels can tell whether *p* is black or white.

B. CAPTCHA

Nowadays attackers usually use robot software to simulate user's behavior. For example, hackers may register the same server with different accounts or execute repeatable action. As a result, the system would be occupied for heavy loading. CAPTCHA [7] is the technique that uses rotating, resizing, distorting, truncating, noise and variant to interfere with pictures with words. CAPTCHA can prevent attackers from using Optical Character Recognition (OCR) technique to identify the words. Only human can recognize those words on

CAPTCHA image through Human Visual System (HVS). By using CAPTCHA, it is easy to determine whether a user participating in the process that recognizes the words on CAPTCHA image. CAPTCHA is usually used in free email registration, message postings, and e-commerce systems to prevent robot software.

C. Biometric Authentication

Since biometric information need not be memorized, biometric-based authentication currently has become popular and widely used to differentiate legitimate user from pretender. The biometric person authentication technique based on the human iris is well studied to be applied in any access control system requiring a high level of security. In this paper a system for personal verification based on iris patterns is presented. Iris recognition technology combines computer vision, pattern recognition, statistical inference, and optics. Its purpose is real-time, high confidence recognition of a person's identity by mathematical analysis of the random patterns that are visible within the iris of an eye from some distance. Because the iris is a protected internal organ whose random texture is complex, unique, and stable throughout life, it can serve as a kind of living passport or password that one need not remember but can always present. Because the randomness of iris patterns has very high dimensionality, recognition decisions are made with confidence levels high enough to support rapid and reliable exhaustive searches through national-sized databases. The algorithms for iris recognition were developed at Cambridge University by John Daugman [4].The verification algorithm, which consists of image processing to obtain iris information, iris normalization, feature extraction, and person verification. Filters are used for feature extraction. From such result iris bit template sequence is encoded. Then the Hamming distance is calculated from the iris template, which gives the estimate of the match in the verification process. Since biometric information need not be memorized, biometric-based authentication currently has become popular and widely used to differentiate legitimate user from pretender.

D. One-Time Password

In password-based authentication system, the server checks whether the password entered by the user is the same as saved one. User's personal information would be misused if the password is stolen. In order to address this issue, OTP is proposed. OTP can only be used once, and there's no relation between any two OTPs. On the other hand, if the attacker captures the OTP this time, she/he cannot login the server by reply attack. Moreover, the attacker cannot get any sensitive information about the user from intercepting OTP.

E. Steganography

Steganography [11] is art of hiding information inside information. Steganography can be applied to different types of media including text, audio, image, video, etc. However, text steganography is considered to be the most difficult kind of steganography due to the lack of redundancy in text as compared to image or audio. In our process the pin number of the user is hidden into the user iris template which avoids the weak links of the biometric system.

III. CURRENT METHODOLOGY

In the current scenario as shown in the Fig. 1, when the end user wants to access his confidential information online (in the form of money transfer or payment gateway) by logging into his bank account or secure mail account, the person enters information like username, password, credit card no. etc. on the login page. But quite often, this information can be captured by attackers using phishing techniques (for instance, a phishing website can collect the login information the user enters and redirect him to the original site). There is no such information that cannot be directly obtained from the user at the time of his login input. And user has no way of making sure the website is authenticate or not.

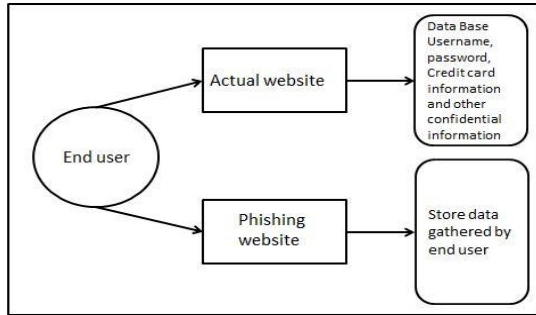


Fig.1 Current scenario

IV. PROPOSED METHODOLOGY

For phishing detection and prevention, we are proposing a new methodology to detect the phishing website. Our methodology is based on the Anti-Phishing Image Captcha and OTP validation and biometric verification scheme using visual cryptography and steganography. It prevents password and other confidential information going to fake websites and also verify the user to the genuine website.

The proposed approach can be divided into twophases:

A. Enrollment Phase

B. Login Phase

The notations used throughout the paper are listed as follows:

- EI_i : input eye image of the user
- UD_i : an unique identity of user
- PC_i : a unique pincode of user
- $VC(.)$: visual cryptography function.
- $VAR(.)$: variation of pincode generation function

A. Enrollment Phase

If a user visits a website first time, the user must register at the server. Assume that the connection between the user and the server in the registration is in a secure channel .Firstly the user details is asked such as username, date of birth, user phone number, email id, location. And then the user's eye image is scanned and a template is derived. Server generates a unique pincode and userID, and stores this along with other details in the database at the time of registration at the database of the secure website. The variations of pin code is generated which is the combination of pincode and details provided by the user. Meanwhile the iris image is steganographed with pincode and then shares are generated. Out of the two share only one share1 is stored at the database and other share2 is discarded. The userID, pincode and its variation are sent to the user. The user details, pincode and its variation, share1 are stored in the actual database of any confidential website as confidential data. The pincode variations are used to verify the website during login phase. Figure 2 shows the enrollment stage .

Enrollment process is depicted as:

1) User → Server: name, details, EI_i .

The user will make a registration request as follows:

1-1) input the name

1-2) Scan the input eye image . EI_i

1-3) details such as date of birth, location, phone number, mail

2) Server → User: UD_i, PC_i .

Upon receiving the registration request from the user, the server performs the following tasks:

2-1) Output the userID UD_i , pincode PC_i

2-2) Steganography the EI_i with the PC_i and generate the shares $VC(EI_i)$. Discard the share2.

2-3) Compute variation of PC_i $VPC_i = VAR(PC_i, details)$

2-4) Record $ID_i, PC_i, VPC_i, share1$.

2-5) send the ID_i, PC_i, VPC_i to the user.

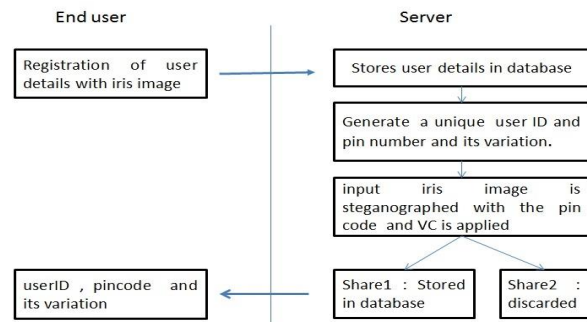


Fig.2 Enrollment Stage

B. Login Phase

1-1) WEBSITE VERIFICATION

When the user logs in, user inputs his/her userID. And then user is asked to input the OTP which is sent to the user's registered phone or mail. Website cross check the OTP send by user with its own if it matches ,it produces a captcha whose text will be one of the variations of pincode. User checks this pincode text on captcha and verifies the pincode is the valid one and enters the text present in it. If valid it can be confirmed that website is genuine. User text is crossed check with the input text. If same then it can be concluded that user is not a machine. The end user can confirm whether the website is genuine or fake by 1. By receiving the OTP to its mail or phone since only genuine website will be having this information 2. The variations of pincode are unique and are known only to user and genuine website. If the website is fake, then it'll fail in the above steps. Even by not sharing single personal details , user is still able to verify the website is fake or genuine .hence even if the website is phished , user loses no personal details and can successful know the identity of the website . Only when the user has the confident in the website he/she preform the next step.

1-2) USER AUTHENTICATION

User is asked to input the redundant data present in the captcha. Pincode is generated by removing the redundant data as specified by the user from the captcha .User's eye image is scanned and given as input to the website. The input iris image is steganographed with the generated by pincode. As result of performing VC on the image, share1 and share2 are generated .share1 is discarded. The share2 and the stored share1 of the user are overlapped and the input iris image is obtained. Now desteganographing is done and the pincode is generated. This

pincode and stored pincode of the user is compared. If it matches then user is a authenticate or else fake. If authenticate one then user is successfully logged in.

Figure 3 clearly explains the login phase

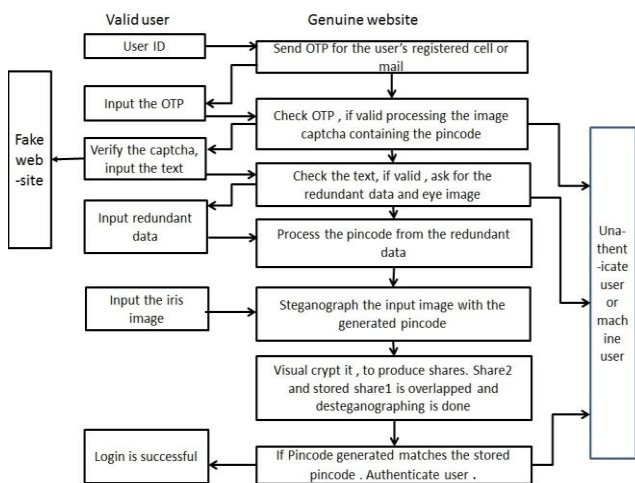


Fig.3 Login Stage

IV. CONCLUSIONS

This paper has introduced an anti-phishing user and website mutual authentication scheme. It is worthwhile to note that this methodology achieves three proposals. 1st user won't disclose any of personal details until it hasn't confirmed that the website is genuine or fake. If the website is a phishing website, then in that situation it won't be able to send the OTP and as well as can't display the image captcha for the specific user due to the fact the captcha is generated by the help of details and the unique pincode.

Second proposal cross validates the website that the user is not a robot. The image captcha is readable by human users alone and not by the machine. So by using the image captcha technique, no machine-based attacks are possible. Third proposal, by the use

of biometric website can validate the authentication of the user identity. With the steganography the weak links of the biometric system is avoided.

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Medicinal uses and Pharmacological activities of *Cyperus rotundus* Linn – A Review

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Abstract- *Cyperus rotundus* Linn belong to the family Cyperaceae. It is the world worst weed native to India. It grows in small clump up to 100cm high. The extensive distribution of the nut-grass is due to its ability to adapt to a wide range of soil types, altitudes, temperatures, soil pH and moisture levels. It therefore grows in a variety of different habitats and environments. It has wide range of medicinal and pharmacological applications. According to the Ayurveda, *C.rotundus* rhizomes are considered astringent, diaphoretic, diuretic, analgesic, antispasmodic, aromatic, carminative, antitussive, emmenagogue, litholytic, sedative, stimulant, stomachic, vermifuge, tonic and antibacterial. This paper provides review on medicinal uses and various pharmacological properties of *C.rotundus* rhizome.

Index Terms- Anti-inflammatory, Anti-pyretic, Anti-malarial, *Cyperus rotundus*, Nut grass.

I. INTRODUCTION

Herbal medicine is a major component in all traditional medical systems, and a common element in Siddha, Ayurvedic, Homeopathic, Naturopathic, Traditional Chinese medicine, and Native American medicine. Plant materials are used throughout developed and developing countries as home remedies, over-the-counter drug products and raw materials for the pharmaceutical industry, and represent a substantial proportion of the global drug market. A perfect example of medicinal plant credited with innumerable medicinal qualities validated by modern science and used since ancient times is *C.rotundus* Linn. Family - *Cyperaceae* are the largest family in the monocotyledons consisting of 109 genera and approximately 5,500 species [1].

C.rotundus L., (Family-Cyperaceae), also known as purple nutsedge or nutgrass, is a common perennial weed with slender, scaly creeping rhizomes, bulbous at the base and arising singly from the tubers which are about 1-3 cm long. The tubers are externally blackish in colour and reddish white inside, with a characteristic odour. The stems grow to about 25 cm tall and the leaves are linear, dark green and grooved on the upper surface. Inflorescences are small, with 2-4 bracts, consisting of tiny flowers with a red-brown husk. The nut is three-angled, oblong-ovate, yellow in colour and black when ripe. *C.rotundus* is

indigenous to India, but are now found in tropical, subtropical and temperate regions [2].

In Asian countries, the rhizomes of *C. rotundus*, which are used as traditional folk medicines for the treatment of stomach and bowel disorders, and inflammatory diseases, have been widely investigated [3-5]. *C. rotundus* is a traditional herbal medicine used widely as analgesic, sedative, antispasmodic, antimalarial, stomach disorders and to relieve diarrhoea [6-7]. The tuber part of *C. rotundus* is one of the oldest known medicinal plants used for the treatment of dysmenorrheal and menstrual irregularities [8-9]. Infusion of this herb has been used in pain, fever, diarrhoea, dysentery, an emmenagogue and other intestinal problems [10]. It is a multipurpose plant, widely used in traditional medicine around the world to treat stomach ailments, wounds, boils and blisters [11-14].

A number of pharmacological and biological activities including anti-*Candida*, anti-inflammatory, antidiabetic, antidiarrhoeal, cytoprotective, antimutagenic, antimicrobial, antibacterial, antioxidant, cytotoxic and apoptotic, anti-pyretic and analgesic activities have been reported for this plant [15-24].

Previous phytochemical studies on *C.rotundus* revealed the presence of alkaloids, flavonoids, tannins, starch, glycosides and furochromones, and many novel sesquiterpenoids [25- 29].

Edible Parts: Rhizome

II.MEDICINAL USES

According to the Ayurveda, *C. rotundus* rhizomes are considered astringent, diaphoretic, diuretic, analgesic, antispasmodic, aromatic, carminative, antitussive, emmenagogue, litholytic, sedative, stimulant, stomachic, vermifuge, tonic and antibacterial.

It may be a good remedy for indigestion in the light of constituents present in it, for example, there are many enzymes for carbohydrates and minerals which act as catalyst for various biochemical reactions and helps indigestion. It is also useful for dietary management of psychotic diseases and metabolic disorders [30].

They are used in treatment of Nausea and vomiting, dyspepsia, colic, flatulence, diarrhoea, dysentery, intestinal parasites, fever, malaria, cough, bronchitis, renal and vesical calculi, urinary

tenesmus, skin diseases, wounds, amenorrhoea, dysmenorrhoea, deficient lactation, loss of memory, insect bites, food poisoning, indigestion, nausea, dysuria, bronchitis, infertility, cervical cancer and menstrual disorders, and the aromatic oils are made of perfumes and splash [31-35].

III. CHEMICAL CONSTITUENTS

Several chemical compounds have been isolated from world's worst weed *C. rotundus* [36] and some of these chemicals possess medicinal properties and are used in Latin America, China, India and elsewhere [37-39]. Various preparations of *C. rotundus* have been used for centuries in perfumes, spices and traditional medicines in India, China, Arab and Africa. It is also an important ingredient of anti-aging Ayurvedic neutraceutical Chyavanprash [39].

Different phytochemical studies on *C. rotundus* revealed the presence of alkaloids, flavonoids, tannins, starch, glycosides, furochromones, monoterpenes, sesquiterpenes, sitosterol, fatty oil containing a neutral waxy substance, glycerol, linolenic, myristic and stearic acids [25, 29, 40-41]. The major compounds isolated from essential oil and the extracts of *C. rotundus* rhizome are Alpha-cyperone, Alpha-rotunol, Beta-cyperone, Beta-pinene, Beta-rotunol, Beta-selinene, Calcium, Camphene, Copaene, Cyperene, Cyperenone, Cyperol, Cyperolone Cyperotundone D-copadiene, D-epoxyguaiene, D-fructose, D-glucose, Flavonoids, Gamma-cymene, Isocyperol, Isokobusone, Kobusone, Limonene, Linoleic-acid, Linolenic-acid, Magnesium, Manganese, C. rotunduskone, Myristic-acid, Oleanolic-acid, Oleanolic-acid-3-o-neohesperidoside, Oleic-acid, P-cymol, Patchoulone, Pectin, Polyphenols, Rotundene, Rotundenol, Rotundone, Selinatriene, Sitosterol, Stearic-acid, Sugeonol, Sugetriol [42-45].

C. rotundus contains an essential oil that provides for the characteristic odour and taste of the herb, comprised mostly sesquiterpene hydrocarbons, epoxides, ketones, monoterpenes and aliphatic alcohols. Sesquiterpenes include selinene, isocurcumenol, nootkatone, aristolone, isorotundene, cypera-2,4(15)-diene, and norrotundene, as well as the sesquiterpene alkaloids rotundines A-C. Other constituents include the ketone cyperadione, and the monoterpenes cineole, camphene and limonene. *C. rotundus* has also been shown to contain miscellaneous triterpenes including oleanolic acid and sitosterol, as well as flavonoids, sugars and minerals [44-45]

The chemical composition of the volatile oils of *C. rotundus* has been extensively studied and four chemotypes (H-, K-, M- O-types), of the essential oils from different parts of Asia have been reported [46-52].

The H-type from Japan was found to contain α -cyperone (36.6%), β -selinene (18.5%), cyperol (7.4%) and caryophyllene (6.2%). The M-type from China, Hong Kong, Japan, Taiwan and Vietnam had α -cyperone (30.7%), cyperotundone (19.4%), β -selinene (17.8%), cyperene (7.2%) and cyperol (5.6%). The O-type from Japan, Taiwan, Thailand, Hawaii and the Philippines was characterized by cyperene (30.8%), cyperotundone (13.1%)

and β -elemene (5.2%). In addition, the Hawaiian O-type had cyperotundone (25.0%) and cyperene (20.7%) as the major compounds. Finally, the K-type, also from Hawaii, was dominated by cyperene (28.7%), cyperotundone (8.8%), patchoulanyl acetate (8.0%) and sugeonyl acetate (6.9%) [47-48].

IV. PHARMACOLOGICAL ACTIVITIES

Anti Inflammatory Activity

The alcoholic extract (70% alcohol) possessed anti inflammatory activity against carrageenan induced oedema and also found effective against formaldehyde induced arthritis in albino rats [53]. In another study the petroleum ether extract of the rhizomes showed anti-inflammatory activity against carrageenan induced oedema in albino rats. The triterpenoid obtained by chromatographic separation from petroleum ether extract revealed a high potent anti-inflammatory activity. This terpenoid was also found to possess significant antipyretic and analgesic effects similar to acetyl salicylic acid. *C. rotundus* has also reported as protective in inflammatory bowel disease.

In addition, the extract suppressed the production of O₂- by phorbol ester stimulated RAW 264.7 cells in dose- and time-dependent manners. Collectively, these results suggest that the methanol extract of rhizomes of *C. rotundus* could be developed as anti-inflammatory candidate for the treatment of inflammatory diseases mediated by overproduction of NO and O₂ [54].

Another study on alcoholic extract of *C. rotundus* showed highly significant ($P < 0.001$) anti-inflammatory activity against the exudative and proliferative phases of inflammation in two animal models (carrageenan induced oedema and formaldehyde induced arthritis in rats). Its anti-inflammatory relative effect was higher than that of hydrocortisone (75.9% versus 47.3% in carrageenan-induced oedema model; 55.1% versus 35.6% in formaldehyde induced arthritis model [27, 55-57].

Antipyretic activity

The alcoholic extract of *C. rotundus* showed highly significant ($P < 0.001$) antipyretic activity against pyrexia produced in albino rats by the subcutaneous injection of suspension of dried Brewer's yeast in gum acacia in normal saline. A specific fraction obtained by chromatographic method from the petroleum ether extract was found to possess a significant antipyretic effect similar to acetyl salicylic acid when used on the same animal model [58].

Analgesic activity

The petroleum ether extract and essential oil of *C. rotundus* are reported to possess analgesic activity [58-59].

Tranquilizing activity

The ethanolic extract of *C. rotundus* showed potent tranquilizing activity in various tests: reduced the spontaneous motor activity, potentiated the pentobarbital narcosis and deranged the motor coordination, abolished the conditioned avoidance response in animals [55]

Anticonvulsant activity

Pretreatment with ethanolic extract of *C.rotundus* caused significant protection against strychnine and leptazol-induced convulsions in mice [60].

The ethanol extract of rhizomes (100mg/kg, p.o.) reduced hind limb extension and duration of convulsion significantly, ($p<0.001$) which was comparable to standard drug Phenytoin (25mg/kg, i.p.) and Diazepam (4mg/kg, i.p.), respectively. These results suggest that the ethanol extract of its rhizomes is worthwhile to develop the potent phytoconstituent for treatment of epilepsy and the flavonoids present in ethanol extract could be attributed for anticonvulsant activity [61].

Anti-emetic activity

The ethanolic extract of *C. rotundus* in the dose of 128.1 ± 11.6 mg/kg was found to protect 50% dogs against apomorphine induced vomiting [55].

Antispasmodic activity

Ethanolic extract of *C. rotundus* produced relaxation of rabbit ileum and spasmolytic effect against contractions induced by acetylcholine, barium chloride and 5-hydroxytryptamine, showing a direct relaxant action on the smooth muscle [55].

Inhibition of gastric motility activity

The rhizome of *C.rotundus* Linn. was assessed for its cytoprotective effects against ethanol induced gastric damage. Decoctions of Rhizoma Cyperi were given orally to rats 30 min. before ethanol was administered. The findings in this study suggest that the protective action of *C. rotundus* Linn. is related to its inhibition of gastric motility and endogenous prostaglandins may play an important role [62]

Gastroprotective activity

C.rotundus extract protected against gastric mucosal injury induced by ischemia and reperfusion in rats. The mean ulcer index of rats treated with 200 and 100 mg/kg *C. rotundus* were significantly lower than that of control. The activities of glutathione-peroxidase and malondialdehyde were significantly affected by treatment of *C. rotundus* [64]. Cytoprotective effects of *C.rotundus* have been mentioned also in case of ethanol induced gastric damage in rats. Decoctions of Rhizoma Cyperi were given orally (1.25, 2.5, 4.0 g crude drug/kg) to rats 30 min before ethanol showed an ulcer inhibitory effect in a dose dependent manner. Pretreatment of rats with indomethacin (5 mg/kg) significantly reduced the gastric protective action of *C. rotundus*. The authors suggested that the gastroprotective action of *C.rotundus* is related to its inhibition of gastric motility and endogenous prostaglandins [62].

Antidiarrhoeal Activity

The methanol extract of *C. rotundus* rhizome, given orally at the doses of 250 and 500 mg/kg showed significant antidiarrhoeal activity in castor oil induced diarrhoea in mice. Among the fractions, tested at 250 mg/kg, the petroleum ether fraction and residual methanol fraction were found to retain the activity, the latter being more active as compared to the control. The ethyl acetate fraction did not show any antidiarrhoeal activity [2]

Haemodynamic (hypotensive) activity

The alcoholic extract of *C.rotundus* produced gradual and persistent fall in blood pressure and stimulated the respiration. The responses of epinephrine and acetylcholine on blood pressure were not altered by the extract, but that of histamine was partially blocked [55]

Hypolipidaemic Activity

Wistar rats weighing 250-300 g were selected for the study. Animals were divided into 7 groups, each group comprising of 6 rats. Rats in the group 1 received normal pellet diet and received 0.1% sodium CMC solution and served as vehicle control. The rats belonging to remaining 6 groups received high fat diet for the entire duration of the study that is for 25 days. High fat diet induced hyperlipidaemia is one of the common methods to induce hyperlipidaemia. Hence hyperlipidaemia was induced by oral feeding of high fat diet. The high fat diet was comprised of the chow enriched with high calorie and 1% cholesterol. After 10 days induction of hyperlipidaemia group 2 of animals was left untreated and served as high fat diet control. The rest of the groups received following treatment for 15 days. Group 3 and group 4 treated orally with the standard drugs Simvastatin (5 mg/kg/day) and Fenofibrate (20 mg/kg/day) respectively. Groups 5, 6, 7 treated orally with aqueous extract at dose level of 100 mg/kg/day, 200 mg/kg/day, 400 mg/kg/day respectively. All the drugs were suspended in 0.1% Na CMC (vehicle). Blood samples were withdrawn from retro orbital plexus after overnight fasting. Serum was separated from blood by centrifugation for ten minutes at three thousand rpm, subsequently analyzed for total cholesterol, triglycerides and HDL cholesterol using commercially available kits (Erba Diagnostics Germany). The serum LDL was calculated by Friedwald's formula [65]

In another study administration of *C. rotundus* extract restored the age associated change in serum lipids (total cholesterol, LDL cholesterol, DL cholesterol, triglycerides and VLDL triglyceride level) to the level of young control rats. In young rats, treatment of *C. rotundus* significantly increased HDL cholesterol level [66].

Hepatoprotective activity

Ethyl acetate extract and two crude fractions, solvent ether and ethyl acetate, of the rhizomes of *C. rotundus* (Cyperaceae) were evaluated for hepatoprotective activity in rats by inducing liver damage by carbon tetrachloride. The ethyl acetate extract at an oral dose of 100 mg/kg exhibited a significant protective effect by lowering serum levels of glutamic oxaloacetic transaminase, glutamic pyruvic transaminase, alkaline phosphatase and total bilirubin. These biochemical observations were supplemented by histopathological examination of liver sections. Silymarin was used as positive control [67].

Inhibitory activity on Brain Na⁺/K⁺-ATP-ase

Extract of *C. rotundus* showed high potent inhibitory activity on crude enzyme Na⁺/K⁺-ATP-ase from rat brain [68]

Anti-obesity activity

C. rotundus preparations (powder in fine suspension, aqueous and alcoholic extracts) exhibited a lipolytic action and mobilized

fat from the adipose tissues in rats, thus helping to reduce the obesity [69].

A pilot study carried out on 30 obese people who were administered the powdered tuber of *C. rotundus* for 90 days, showed reduction in weight along with a decrease in serum cholesterol and triglycerides [70].

Antiarthritic activity

Singh and his co-workers were first to discover anti-inflammatory, anti-pyretic and anti-rheumatic activity of *C. rotundus* [27,29,35]. A double blind trial of crude powder of *C. rotundus*, *Withania somnifera* and their combination (1:1) was carried out in 200 patients suffering from rheumatoid arthritis. Out of the 200 patients selected for the study 196 completed the trial of 3 months. Each group (including placebo group) consisted of 50 patients. Each patient received 500 mg capsule three times a day for three months. During this period biweekly general assessment based on global criteria (duration of morning stiffness, grip strength, articular index, consumption of escape analgesic, erythrocyte sedimentation rate, haemoglobin, rheumatoid factor titre, x-ray findings) was made. *C. rotundus* was more effective than *W. somnifera*, and when both drugs were combined, the response was better than the response of single drug. Also the patients' preference (against escape analgesic) was highest in the case of combined herbs [55-56,58, 71-72].

Wound healing activity

An alcoholic extract of tuber parts of *C. rotundus* was examined for wound healing activity in the form of ointment in three types of wound models on rats: the excision, the incision and dead space wound model. The extract ointments showed considerable difference in response in all the above said wound models as comparable to those of a standard drug nitrofurazone ointment (0.2 % w/w NFZ) in terms of wound contracting ability, wound closure time and tensile strength [73].

Antioxidant activity

A combination of spices (*Piper nigrum*, *Piper longum* and *Zingiber officinale*), herbs (*Cyperus rotundus* Linn. and *Plumbago zeylanica*) and salts make up Amrita Bindu. The study was focused to evaluate the antioxidant property of individual ingredients in Amrita Bindu against the free radical 2,2'-azinobis-(3-ethylbenzothiazoline-6-sulphonic acid) (ABTS). The analysis revealed the antioxidant potential of the ingredients in the following order: *Piper nigrum* > *Piper longum* > *Cyperus rotundus* > *Plumbago zeylanica* > *Zingiber officinale*. These results reveal that Amrita Bindu, a salt-spice-herbal mixture containing *C. rotundus* Linn. exerts a promising antioxidant potential against free radical induced oxidative damage [74].

Anticancer activity

Anticancer *C. rotundus* ethanolic extract was found to have only weak to moderate anticancer activity (LC50=2.528-4.939 mg/ml calculated from dose-dependent cell death) in a study which used neuro-2a cells for screening of plants with tumoricidal effects [75]. Another study showed that *C. rotundus* essential oil was very effective against L1210 leukaemia cells line. This result

correlated with significantly increased apoptotic DNA fragmentation [21].

Antidiabetic activity

Oral daily administration of 500 mg/kg of the extract (once a day for seven consecutive days) significantly lowered the blood glucose levels in rats with alloxan induced diabetes. The scientists concluded that this antihyperglycemic activity can be attributed to its antioxidant activity as *C. rotundus* showed a strong 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging action *in vitro*. These results are convergent with *C. rotundus* potential to suppress AGE formation and protein oxidation in a model of fructose-mediated protein glycoxidation. Scientists concluded that, since non-enzymatic glycation has been shown to correlate with severity of diabetes and its complications, *C. rotundus* could be a candidate for targeting diabetic complications [17, 76].

Antimicrobial activity

In-vitro antimicrobial activity by agar disc diffusion and agar well diffusion method was evaluated for aqueous and ethanolic extracts. The ethanolic extract was active against all the investigated bacterial strains, while aqueous extract was inactive. In another study acetone and ethanol extracts showed significant broad spectrum antibacterial activity in disc diffusion method [9, 77]. Antimicrobial activity tests were carried out on human pathogens bacteria (gram negative and gm positive) and fungi viz. *C. albicans* and *A. niger*. The highest percentage of inhibition was observed against *K. pneumoniae* (133.33%). Amoxicillin 20µg/ml and ethanol (as fungicide) 70% were used as positive control. Moderate inhibition was observed in case of *A. niger* and *S. aureus* (90 and 70% respectively). No zone of inhibition was observed in *Acinetobacter* and *Candida*.

Antibacterial Activity

The oil of *C. rotundus* showed a remarkable activity against gram-positive bacteria *Staphylococcus aureus* and *Enterococcus faecalis* [73,78]. Another study stated that a marked inhibitory effect of *C. rotundus* was observed against *Salmonella enteritidis*, *Staphylococcus aureus* and *Enterococcus faecalis* with total oligomers flavonoids (TOFs) and ethyl acetate extracts [79, 80].

Antimalarial Activity

Activity guided investigation of sesquiterpenes *C. rotundus* rhizomes showed *in-vitro* antimalarial activity against *Plasmodium falciparum* [81]. Some Tanzanian medicinal plants were extracted and tested for *in vitro* antimalarial activity, using the multidrug resistant K1 strain of *Plasmodium falciparum*. Of the forty-nine plants investigated, extracts of three plants were found to have an IC50 between 5-10 mg/ml; extracts of 18 other plants showed an IC50 between 10 and 50 mg/ml, all others were less active. The three most active extracts were obtained from the tubers of *C. rotundus* Linn. the root bark of *Hoslundia opposita* Vahl. and the root bark of *Lantana camara* L [6].

The underground parts of several weedy species contain essential oils, about 0.5-1% in the case of the fresh tubers of *C. rotundus*,

mainly consisting of terpenoids or sesquiterpenoids (e.g. cyperone, cyperol, cyperolone, cyperene, copadiene, epoxy-guaiane, rotundone, rotundol, patchoulone (cyperotundon), kobusone, sugeonolacetate, sugetriol, oxido-eudesmenol, *C. rotunduskone* and 'BETA'-selinene). When Tanzanian medicinal plants were screened, *C. rotundus* showed activity in a test for in vitro antimalarial activity [82].

Ovicidal and larvicidal activities

The ovicidal and larvicidal efficacy of essential oils extracted from the tubers of *Cyperus giganteus* and *Cyperus rotundus* Linn. was studied on eggs and fourth instar larvae of *Aedes albopictus*. The eggs and larvae were exposed to serial concentration of the oils ranging from 5-150 ppm and kept under observation for 24h. Both the oils showed remarkable ovicidal and larvicidal activities indicated by EC50 values of <5 ppm and LC50 and LC90 values of <20 ppm. The results obtained suggest that the essential oils of these *Cyperus* species can serve as a potential source of natural mosquitocidal agents [83]

Anti Candida activity,

Essential oils and alcoholic extracts from the leaves and/or roots of 35 medicinal plants commonly used in Brazil were screened for anti *Candida albicans* activity. Essential oils from 13 plants showed anti Candida activity, including *Aloysia triphylla*, *Anthemis nobilis*, *Cymbopogon martini*, *Cymbopogon winterianus*, *Cyperus articulatus*, ***Cyperus rotundus* Linn.**, *Lippia alba*, *Mentha arvensis*, *Mikania glomerata*, *Mentha piperita*, *Mentha sp.*, *Stachys byzantina*, and *Solidago chilensis*. The ethanol extract was not effective at any of the concentrations tested. Chemical analyses showed the presence of compounds with known antimicrobial activity, including 1,8-cineole, geraniol, germacrene-D, limonene, linalool, and menthol [84].

Cytoprotective effects

The rhizome of *C. rotundus* was assessed for its cytoprotective effects against ethanol induced gastric damage. Decoctions of Rhizoma Cyperi were given orally (1.25, 2.5, 4.0 g crude drug/kg) to rats 30 min before ethanol (40% v/v, 10mL/kg) was administered. The decoction showed an ulcer inhibitory effect in a dose dependent manner. Moreover, the activity was also observed when the decoction was given subcutaneously (0.3-0.6 g/kg), suggesting that the herb possessed systemic effects on protecting the stomach. Compared with controls, gastric motility of the ethanol-treated rats was delayed significantly by either oral (2.5-4.0 g/kg) or subcutaneous (0.3g/kg) administration of the decoction. Pretreatment of rats with indomethacin (5 mg/kg) significantly reduced the gastric protective action of *C. rotundus* [85].

Toxicological studies

Rats were divided into two groups of ten animals (five males, five females). The ethanol extract (2,500 mg/ml in 10% dimethylsulfoxide, DMSO) was orally administered to rats at a single dose of 5,000 mg/kg body weight, while the control group received only vehicle. The animals were monitored for the appearance of toxicity signs over 14 days. The animals that died within this period were necropsied. All rats were weighed and sacrificed on the 14th day following administration. Finally, the

vital organs including heart, lungs, livers, kidneys, spleen, adrenals, sex organs and brain were grossly examined.

In the acute toxicity test at the dose of 5,000 mg/kg, all rats did not exhibit signs of toxicity and mortality after a single oral administration of 95% ethanol extract from the rhizomes of *C. rotundus*. Results of the subacute toxicity showed that administration of the ethanol extract from the rhizomes of *C. rotundus* at a dose of 1,000 mg/kg daily over 14 days did not cause mortality or behavioral changes [86].

Another study for the purpose of the test, in bred wistar strain rats (250-300 g) of both sexes were selected. The animals were housed in polypropylene cages (6rats per cage) under good hygienic conditions natural light / dark cycle. The animals were given free access to standard pellet diet and water. The acute toxicity study was carried out as per OECD guideline (OECD/OCDE 423 OECD Guideline for testing of chemicals Acute Oral Toxicity –Acute Toxic Class Method Adopted: 17th December 2001). Thus the oral acute toxicity tests revealed that the extract of *C. rotundus* rhizomes was safe up to the administered dose 2000 mg/kg.

Another acute toxicological studies showed no mortality or morbidity up to 2000mg/kg body weight in Wistar rats. Sub chronic toxicity study revealed that, food, water consumption and body weight of animals didn't vary significantly. But the hematological parameters showed an increase in WBC count and Hemoglobin level. The kidney function and liver function didn't change even after long term exposure [87].

V. DISCUSSION

C. rotundus Linn., commonly known as nut grass and locally. It is said to possess antidiarrheal, anti-inflammatory and antipyretic activities. The tubers are used in Ayurvedic medicine and have been mentioned in ancient texts for various ailments. Some studies have reported antidiarrheal activity of ***C. rotundus***. Antidiarrheal action in castor oil-induced diarrhoea and in irritable bowel syndrome in animal models has been demonstrated. Previous studies with the essential oil of ***C. rotundus*** showed it to be more bactericidal against Gram-positive bacteria.

The major constituents present in ***C. rotundus*** are essential oil, triterpenes, polyphenol, alkaloids and flavonoids. However, none of these have been attributed with antidiarrheal activity.

The decoction used showed the presence of carbohydrates, reducing sugars, proteins, amino acids, tannins, flavonoids and saponins. Tannins and flavonoids, in general, have been reported to have antidiarrheal activity.

This study shows that ***C. rotundus*** has limited antimicrobial action and have. *C. rotundus* with a large number of biologically active phytochemicals has diverse variety of pharmacological properties, as described above, has been found effective in the

treatment of chronic disorders. Its therapeutic effects are excellent and no adverse reaction was observed.

VI. CONCLUSION

The above collected information suggest that *C. rotundus* has limited activity against different forms of infectious diarrhoea due to its selective activity against diarrheal pathogens. Traditional uses of natural compounds, especially of plant origin received much attention as they are well tested for their efficacy and generally believed to be safe for human use. Thorough screening of literature available on *C. rotundus* depicted the fact that it is a popular remedy among the various ethnic groups, Ayurvedic and traditional practitioners for treatment of ailments. Researchers are exploring the therapeutic potential of this plant as it has more therapeutic properties which are not known.

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Resource & Availability in Multi-cloud Using Services

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Abstract- Cloud computing reduces costs associated with computing with increase of flexibility and scalability for computer processes because of this cloud computing is counted as one of today's most exciting technologies. As we know that Turbo-c, Microsoft visual studio, Java is software package available in the windows operating system. But one important thing which we should note is there is operating system restriction with these software packages. We can't use some application in Linux operating system. Also another thing is we can't use this software over internet. So there are some OS restrictions and Hardware restrictions with existing system. The solution to this problem is to develop a soft-ware application which should avoid the OS restrictions and Hardware restrictions. It should be usable over the internet. Cloud benefits such as load balancing, better level of the security will help to increase the performance of this application. We are developing a technique thro-ugh cloud computing in which user will handle systems from far distances with the help of centralized server and can access applications as well insert them from client machines, and can store data on data storage area on proxy server.

Index Terms- cloud security, cloud storage, data security, service availability, Web application.

I. INTRODUCTION

Users can use cryptographic methods to protection of the stored data in the cloud. Hashing function is effective solution for data integrity. The loss of availability of service is limitations in cloud computing is done by storing the client data on different servers in cloud. If the data is processed from several clients, then privacy cant ensured by data encryption. Cloud can be attacked by the Third-party

This project is about developing an cloud based software that will provide the users the features similar to that of turbo c, Microsoft visual studio, java. The advantage of deploying it on cloud is that, the user can create, modify and access the documents from anywhere with no need of carrying the documents. The aim of this project is to deploy most commonly used modules of Application (turbo-c, Microsoft visual studio, and java) on Cloud and make it available to all people without any OS restriction or restrictions of Hard disks space and Hardware requirements and with 24*7 availability of application with the help of internet connection.

II. RELATED WORKS

Dealing with the cloud computing for a first time it is important to avoid potential pitfalls and confusion

- The notion of how cloud services are deployed is often used interchangeably with where they are provided, which may cause confusion. like private or public clouds may be described as internal or external cloud, which model may or may not be correct in all cloud model.
- The manner in which cloud services are consumed is often described relative to the location of an organization's management or security perimeter (usually presence of a firewall). It is important where security boundaries lie in terms of cloud computing.

A. Existing System

- Customers make use of methods like encryption and decryption for security of stored data in the cloud.[1]
- Data integrity is achieved by hash function.[1]
- Availability of cloud service is considered as the main limitations in cloud computing and it has been maintain by storing the data on several clouds.
- Different clients process different data, data encryption cannot ensure privacy in the cloud.
- Cloud can be attacked by the Third-party[1]
- Security of data in the cloud model is major concern but this is not achieved by this system, it will only used for data storing. [1]

B. Proposed System

- User guarantee data confidentiality, it does not need code execution in their servers.
- User's data does not affected by loss of availability, loss of corruption of data, loss of privacy, vendor lock-in problem.
- User is able to access application environment which is located on server side.
- Every user can access licensed version software for their work

III. GOAL

To develop a system for sharing of software and hardware in cloud from which user can access applications anytime, anywhere in secured environment.

IV. SYSTEM ARCHITECTURE

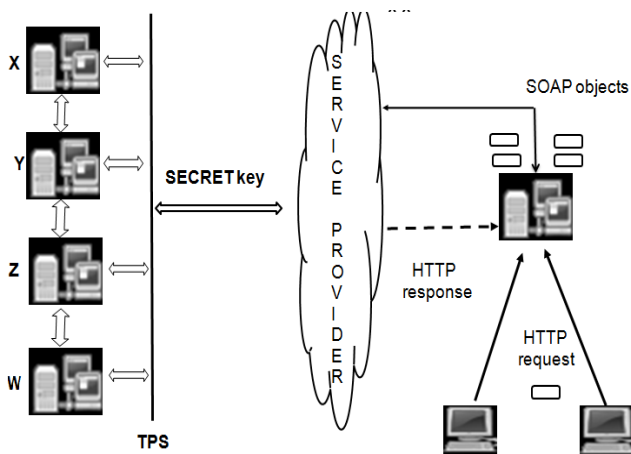


Figure .1: System architecture

Fig 1 describes system architecture .Client sends HTTP request to domain server. Domain accept request and send SOAP object to Service provider (Azure ,Amazon, Google etc).Web service which contains Secrete sharing algorithm divide key in no of shadows which are stored on different server via TPS (Transaction process System).X,Y,Z are cloud servers which contains applications. When client request any application after login first secret key is checked after authentication of user application is accessed via HTTP response.

V. ALGORITHM AVAILABLE FOR CLOUD SECURITY

To reduce the risk in cloud storage model , user can use encryption and decryption for security purpose of the stored data in the cloud [7]. Data integrity by for keeping a short hash use of hash function [9] is a preferred solution . by recalculating hash user will get required key [7].for large database hash tree [9]is used rather than hash function.

A. HAIL (High Availability and Integrity Layer) [6]

Distributed cryptographic system noting but a set of server which available for 24*7 and that the client's stored data is retrievable and integral.

B.RACS (Redundant array of cloud storage)[3]

This employs RAID like technique to implement high-available and storage –efficient data replication on diverse clouds. In cloud use of replication decreases the cost of providers and also gives better fault tolerance. This results into, amount of large database load will be divide among different providers as a result of the Redundant array of cloud storage proxy server .[3]

C. Depsky

Deals with this problem using Byzantine fault tolerance replication to store data on cloud services, allowing data to be retrieved correctly even if some of the clouds corrupt or lost data.

VI. SECRETE SHARING (SHAMIR'S SECRET SHARING)[5]

In cryptography, secret sharing refers to a method for distributing a secret amongst a group of participants. When shares are combined together then and then only secret can only be reconstructed. Individual key share holder cannot change/access the data.

Goal is to divide some data D (e.g., the safe combination) into n pieces D1, D2....Dn in such a Way that:

- Knowledge of any k or more D pieces which in turns makes D easily computable.
- Knowledge of any k -1 or less pieces will not be sufficient for determination of D.

This scheme is called (k,n) threshold scheme. In case if k=n then all participants are required together to reconstruct the secret. Suppose we want to use (k,n) threshold scheme to share our secret S where k<n.

Choose at random (k-1) coefficients a1, a2, a3ak-1, and let S be The a0

$$f(x)=a_0 + a_1x + a_2x^2 \dots + a_{k-1}x^{k-1}$$

Construct n points (i,f(i)) where i=1,2..n

Given any subset of k of these pairs, by interpolation user can find the coefficients of the polynomial to evaluate a0=S , which is the required secret.

VII. ADVANTAGES

- Number of services available by category wise
- It provide secured cloud.
- In system server side program can be access and can be modified as per as your need and teacher can able to comment on it.
- Load balancing will be provide to avoid any system clash and Dividing the traffic between servers, data can be sent and received without major delay Multi cloud computing service availability

- Http and SOAP protocol is used, for two way communication
- Minimum response time required when worker processor is busy i.e. proxy server can reply
- Secret sharing algorithm provide security

VIII. DISADVANTAGES

- The major disadvantage of our project is that any new user or any client will have to first authenticate by the server. It has limited access.
- It will always give access to the application then we are running .exe file in our client machine hence we require good internet connections with high speed.

IX. CONCLUSION

System allows user to access applications, use resources (printer) re-motley .System is available on internet so that user can access service anytime from anywhere,. When any user access any service server will get a notification. Service is available for 24*7.user need not to purchase license software. While developing any system with cloud security must taken in consideration first.System will be developing the cloud computing environment with the safety issues through analyzing a cloud computing framework security needs. Finally conclude a cloud computing model for data security from single to multi-cloud. Cloud computing, while still evolving in all its iterations, can offer IT a powerful alternative for efficient application, infrastructure, and platform delivery. If it is implemented on practical basis it will be very efficient for user.

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Minerals Composition (Ca, Na, Pb and Sn) Of Sudanese White Soft Cheese

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Abstract- Minerals composition (Ca, Na, Pb and Sn) of Sudanese white soft cheese purchased from White Nile state had been investigated, the cheese samples were packed in to 5 different packaging techniques, metal tin (lined with polyethylene bags and non-lined), plastic container (lined with polyethylene and non-lined) and petroleum gallon as a control. The Calcium and Sodium content decreased significantly ($P \leq 0.05$) throughout the storage period from 9.5 and 11.13 ppm at the beginning of the storage period to 7.0 and 2.47 ppm at the end of the storage (180 days) respectively, where there were no significant differences between samples kept in lined and non-lined metal tin packages. The significantly ($P \leq 0.05$), lowest value 0.026 ppm of Pb content was observed in samples stored in plastic container at 120 days storage. The Tin content in all samples was under the detected level.

I. INTRODUCTION

Goyer (1995) stated that minerals and trace elements occur in the body in a number of chemical forms, such as inorganic ions and salts or as constituents of organic molecules, for example protein, fat, carbohydrates and nucleic acid. The minerals that are considered essential in human diet are sodium, potassium, chloride, calcium, magnesium, phosphorous, iron, copper, zinc, manganese, selenium, iodine, cobalt, molybdenum, fluorine, arsenic, nickel, silicon and boron. A number of other chemical elements occur in food, e.g. aluminum, lead; tin, mercury, cadmium and many of them are toxic. Birghila, et al (2008) reported that many dangerous elements or compounds, such as metals and metalloids, accumulate along the food chain. Furthermore their concentrations in the environment grow with the increase of urban, agricultural, and industrial emissions. The almost ubiquitous presence of some metal pollutants, especially Cd and Pb, facilitates their entry into the food chain and thus increases the possibility of their having toxic effects on humans and animals. Although heavy metals have industrial uses, their potential toxicity for people and animals is the object of several studies. For some elements the effects are accumulative and it is necessary to control their level in consumed food. Increasing metal concentration in food over the limits can cause toxic effects for consumers of these products. The gravity of toxic effect depends on nature, quantity and chemicals form of metals from the food product and it depend on metal concentration. Milk and dairy products become contaminated with heavy metals either through food stuff and water or through manufacturing and packaging processes (Ayar et al., 2009). Guicherit (1972) stated that, the total lead intake from food and beverages has been

estimated for adults in various industrialized countries to be 250-300 $\mu\text{g/day}$. Cheese and dairy products may contain different amount of Pb between 0.3-5.49 ppm. The maximum limits allowed for lead content in dairy product are 0.1 ppm for milk, 0.4 ppm for processed cheese and 0.5 ppm lead for cheese. GEMS/food regional diets, (2003) stated that the maximum limits of lead for milk and secondary milk products were taken as 0.05 ppm each, the total exposure in the European diet (European diet provides maximum potential for weekly intake of lead through food) would be 4.631 g of lead per kg body weight According to Hartwell (1951), the tin is not considered as a poisonous metal but very long doses produces serious digestive disturbances. Most of the tin present in canned foods is insoluble in the gastric and intestinal juices, and it is not absorbed during the process of digestion.

In general, cheese supplies a great deal of calcium and phosphorous. El-Abd et al. (1982) mentioned that 50% of the calcium and less than 20% of the phosphorous passed in cheese serum at 14 days of storage

Tin plate is light gauge, steel sheet or strip, coated on both sides with commercially pure tin and has been used for well over a hundred years as a robust form of food packaging. The use of tin plate for food and beverage packaging will result in some dissolution into the food content, particularly when plain uncoated internal surfaces are used. The recommended maximum permissible levels of tin in food are typically 250 $\mu\text{g/kg}$. The highest levels being found in products packaged in un-lacquered or partially lacquered tin plate cans (Wallace and Blunden, 2003).

Dissolution of the tin plate depends on the food matrix, acidity, presence of oxidizing reagent (nitrogen, iron and copper), and presence of air (oxygen) in the headspace, time and storage temperature. To reduce corrosion and dissolution of tin now a day cans are usually lacquered (Dvorzak and Perring, 2002). There are many types of lacquer used for coating packaging materials used in food industry; the most commonly used type is the Golden lacquers, which resist the effect of Sulphur and acid in both salty and sweet stuff. In addition, they are taste free and odorless and don't affect the canned foods (Leonard, 1987).

Plastics and polymers have become a part of our life today. In fact they have become as essential to mankind as food and water. There is no sphere of human activity in which plastics have not made their entry ranging from agriculture, chemical industry, and packaging, etc. Singh (2001) reported that plastics we generally come across are not considered to be toxic or harmful in any way. They are even safe even if they come in contact with food. In fact, most of the polymers may be

consumed orally without any ill effects, as they are inert and do not react with the chemicals in our body

White cheese is the main and traditional form of cheese made and consumed in Sudan. The objective of this study is investigate the presence of Lead, Tin, Calcium and Sodium in the Sudanese white cheese packed in metal and plastic containers during the storage period.

II. MATERIALS

Food materials

The cheese used in this research was purchased from galaja 70 kilometers south Eldueim 350 kilometers southwest of Khartoum (Sudan). The purchased cheese was packaged into 5 different type of packing, metal tin (lined with polyethylene bags and non lined), plastic container (lined with polyethylene and non lined) and petroleum gallon. The tin containers were made from tinplate the inside were coated by golden lacquer and the outside was coated by white paint. The tin was square, with push-on-closures and 2 kg size. Plastic containers were white, square, the cover lined with adhesive tape, and 2 kg size. The Petroleum Gallon were 2kg size sealed by soldering.

III. METHODS

The sodium, calcium, lead and tin content were determined using the atomic absorption spectrophotometer. A 2 gm cheese were maintained in a muffle furnace at 550°C for 4 hrs, samples were cooled and 10 ml of 3 N HCl was added, covered with watch glass and boiled gently for 10 minules, then cooled,

filtered, diluted to volume (100 ml) with distilled water, and taken for determination of sodium, lead, and tin contents, for determination of calcium, 1 ml of 1% lanthanum chloride was added to final dilution (Perkin Elmer, 1994).

IV. RESULTS AND DISCUSSION

Calcium content

Table 1 shows the calcium content of the white soft cheese as affected by the storage period. The calcium content of the soft cheese significantly ($P \leq 0.05$) decreased throughout the storage period, the intial value of 9.5 p.p.m, then decreased gradually to be 7.0 p.p.m towards the end of the storage period (180 days). These findings agreed with those obtained by Abdel Razig (2000), who stated that the calcium content of the braided cheese significantly ($P \leq 0.05$) decreased as the storage time progressed, and mentioned that the higher the acidity the higher the calcium losses in whey. Amer et al. (1979) also reported a decrease in calcium of Kashkaval cheese during ripening. Wong et al. (1988) reported that the solubility of calcium and phosphorus salts in the acidic medium lead to the loss of both of them. At 30 days of storage there were no significant ($P \leq 0.05$) differences between sampels kept in metal tin and plastic containers on one side and between plastic lined with polyethylene and metal gallon on the other. The lowest calcium values were observed at the end of the storage period, in which there was no significant difference ($P \leq 0.05$) between lined metal tins and non lined. The loss in calcium content was attributed to the increase in acidity (E1 – Abd et al., 1982).

Table 1: Changes in calcium content (ppm) of Sudanese white soft cheese during storage period as affected by type of packaging*

Packaging Type	Storage period (days)					
	0	30	60	120	150	180
MT	19.50 ^a	8.750 ^{efg}	10.50 ^{bcd}	10.25 ^{bcd}	6.600 ^h	7.000 ^h
MTL	19.50 ^a	8.000 ^{fgh}	9.250 ^{def}	8.500 ^{efg}	6.875 ^h	7.125 ^h
P	19.50 ^a	8.750 ^{efg}	10.73 ^{bc}	9.375 ^{cdef}	6.740 ^h	7.065 ^h
PL	19.50 ^a	7.750 ^{gh}	11.27 ^b	9.375 ^{cdef}	6.740 ^h	7.065 ^h
MG	19.50 ^a	7.750 ^{gh}	9.625 ^{cde}	9.375 ^{def}	6.740 ^h	7.065 ^h

* Mean values having different superscript letters in columns and rows differ significantly ($P \leq 0.05$).

Where:

- MT = Metal tin
- MTL = Metal tin lined with polyethylene bags
- P = Plastic
- PL = Plastic lined with polyethylene bags
- MG = Metal gallon

Sodium content

Table 2 shows changes in sodium content of soft cheese content during the storage period. A significant decrease in sodium content of cheese was observed throughout the storage period. The initial value was 11.13% decreased gradually to 2.47% at the end of the storage (180 days), these results were different from values observed by Abdel Razig (2000) who stated that the sodium content of braided cheese increased

significantly ($P \leq 0.05$) with storage time. cheese sample kept in metal tin containers at 60 days were significantly ($P \leq 0.05$) higher (6.75) compared to the other containers. The lowest values obtained for samples kept in lined and non lined tin cans were 2.47 and 2.62, respectively, at the end of the storage period (120 days). The increase in sodium content correlated well with the decrease in moisture content. Abdel Razig (2000) attributed the high sodium content of braided cheese to the high loss in its moisture content

Table 2: Changes in sodium content (ppm) of Sudanese white soft cheese during storage period as affected by type of packaging*

Packaging Type	Storage period (days)					
	0	30	60	120	150	180
MT	11.130 ^a	3.000 ^{efg}	6.750 ^b	4.500 ^d	3.375 ^{ef}	2.475 ^g
MTL	11.130 ^a	3.100 ^{efg}	5.950 ^c	4.590 ^d	3.050 ^{efg}	2.625 ^{fg}
P	11.130 ^a	3.600 ^e	6.250 ^{bc}	4.600 ^d	3.215 ^{efg}	2.550 ^g
PL	11.130 ^a	3.075 ^{efg}	5.100 ^d	4.600 ^d	3.215 ^{efg}	2.550 ^g
MG	11.130 ^a	4.850 ^d	5.875 ^c	4.600 ^d	3.215 ^{efg}	2.550 ^g

* Mean values having different superscript letters in columns and rows differ significantly ($P \leq 0.05$).

Lead content

Table 3 shows changes in lead content of soft cheese during storage. The values of lead content in soft cheese kept in metal tin cans was 0.0480 ppm at the beginning of the storage and become 0.05 ppm after 180 days of storage, such results showed a non significant ($P \leq 0.05$) variation between the samples during the storage period. These values were lower than the general limit which is ranged between 1.0-2.0mg/Kg and 0.2 mg/Kg for foods specially prepared for infants (Egan et al., 1976). The maximum limit of lead content allowed for cheese was 0.5 ppm (Guicherit, 1972). Korfali and Abou Hamdan (2013) reported that the lead might exist in canned food stuff due the leaching from the soldering materials. The values showed that there were no significant ($P \leq 0.05$) differences in lead content among cheese samples kept in different types of containers at 30 days storage. The significantly ($P \leq 0.05$) lowest value 0.026 ppm of Pb content was found in samples stored in plastic container at 120 days storage. The Pb content of cheese samples packed in metallic gallon sealed by soldering was increased significantly ($P \leq 0.05$) at 60 days storage, which could be attributed to the fact that the cans were not food grade containers beside the use of solder in sealing them value, Birghila et,al (2008) attributed the presence of Pb in milk samples to various factors such as the transhumance along roads and/or motorways, fodder contamination, climatic factors, such as winds, and the use of pesticide compounds. One of the most important sources of lead contamination in milk is water, especially in more contaminated areas (Codex Alimentarius Commission, 2003)

The results show that the tin content of cheese samples was below detection limits (<1.0 ppm), the maximum permissible levels of tin in food (250 mg/kg), (Blunden and Wallace and, 2003, JEFAC, 2006).). The significantly lower tin values in the cheese sample because of the fact that the metal containers were lacquered beside the use of lining polyethylene bags. Korfali and Abou Hamdan (2013) attributed the high level of tin in Lebanese marketed canned food to the use unlacquered cans with high percentage of tin.

V. CONCLUSION

Occurrence of high level of trace metals such as lead is associated with storage of cheese in metallic gallons.

In this context, Sudanese white soft cheese must be packed in lined containers made either of plastic or metal.

Suitable lining material such as polyethylene can be used for such purpose. Singh (2001) reported that plastics we generally come across are not considered to be toxic or harmful in any way. They are even safe even if they come in contact with food.

Further studies are necessary to evaluate the contents of “essential” and “toxic” heavy metals on Sudanese white cheese collected from different areas. There is always a possibility that a small amount of monomer might be present in the plastic in an uncombined form. Therefore, the level of unreacted monomer has to be closely monitored in case of such plastics. Tin content

Table 3: Changes in lead content (ppm) of Sudanese white soft cheese during storage period as affected by type of packaging*

Packaging Type	Storage period (days)					
	0	30	60	120	150	180
MT	0.0480 ^l	0.0770 ^c	0.0665 ^h	0.0390 ^q	0.0460 ^m	0.0450 ⁿ
MTL	0.0480 ^l	0.0400 ^p	0.0970 ^a	0.0675 ^g	0.0740 ^f	0.0500 ^k
P	0.0480 ^l	0.0910 ^b	0.0760 ^d	0.0260 ^r	0.0600 ^j	0.0615 ⁱ
PL	0.0480 ^l	0.0615 ⁱ	0.0750 ^e	0.0440 ^o	0.0600 ^j	0.0615 ⁱ
MG	0.0480 ^l	0.0680 ^g	0.0970 ^a	0.0440 ^o	0.0600 ^j	0.0615 ⁱ

* Mean values having different superscript letters in columns and rows differ significantly ($P \leq 0.05$).

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PERFORMANCE ANALYSIS OF VARIOUS TRANSFORMS BASED METHODS FOR ECG DATA

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Abstract— Electrocardiogram (ECG) data compression algorithm is needed to reduce the amount of data to be transmitted, stored and analyzed, without losing the clinical information content. This work investigates a set of ECG data compression schemes to compare their performances in compressing ECG signals. These schemes are based on transform methods such as discrete cosine transform (DCT), fast fourier transform (FFT), discrete sine transform (DST), and their improvements. An improvement of a discrete cosine transform (DCT)-based method for electrocardiogram (ECG) compression is also presented as DCT-II. A comparative study of performance of different transforms is made in terms of Compression Ratio (CR) and Percent root mean square difference (PRD). The appropriate use of a block based DCT associated to a uniform scalar dead zone quantiser and arithmetic coding show very good results, confirming that the proposed strategy exhibits competitive performances compared with the most popular compressors used for ECG compression. Each specific transform is applied to a pre-selected data segment from the CSE database, France and then compression is performed.

Index Terms— ECG, Compression, Transform methods, Compression Ratio

I. INTRODUCTION

Compression connotes the process of starting with a source of data in digital form (usually either a data stream or a stored file) and creating a representation that uses fewer bits than the original [1]. The aim is to reduce storage requirements or transmission time when such information is communicated over a distance. Ideally one needs the compression process to be reversible. Suppose a discrete time signal $s(n)$ is

compressed and then reconstructed, that is, the inverse of the compression process is performed to yield $\hat{s}(n)$. The error signal is defined as in (1):

$$e(n) = s(n) - \hat{s}(n) \quad (1)$$

The reconstructed signal can be alternatively taken as an additive noise contaminated version of the original by rewriting the above equation as in (2):

$$\hat{s}(n) = s(n) + w(n) \quad (2)$$

where $w(n) = s(n) - \hat{s}(n)$ is the noise. For a loss less compression $e(n)$ is identically zero [1].

A typical computerized signal processing system acquires a large amount of data that is difficult to store and transmit. Data compression is nothing more-or-less than effective coding designed to correct the over representation that occurs in digital data handling systems. The main aim of data compression is (a) To increase the storage efficiency. (b) Transmission bandwidth conservation. (c) Reducing the transmission time. The main goal of any compression technique is to achieve maximum data volume reduction while preserving the significant features [2] and also detecting and eliminating redundancies in a given data set. ECG data compression algorithms have been mainly classified into three major categories [3]: 1) Direct time- domain techniques, e.g., turning point (TP), amplitude-zone- time epoch coding (AZTEC) [4], coordinate reduction time encoding system (CORTES) and Fan algorithm. 2) Transformational approaches [3], e.g., discrete cosines transformation (DCT), fast fourier transform (FFT), discrete sine transform (DST), wavelet transform (WT) etc. 3)

Parameter extraction techniques, e.g., Prediction and Vector Quantization (VQ) methods [2]. Direct data compression methods rely on prediction or interpolation algorithms, which try to diminish redundancy in a sequence of data by looking at successive neighboring samples. Prediction algorithms employ a prior knowledge of previous samples, whereas interpolation algorithms use a prior knowledge of both previous and future samples. The direct data compression methods base their detection of redundancies on direct analysis of actual sample. Direct signal compression methods are also known as time domain techniques dedicated to compression of signals. The mode of operation is to extract a subset of significant samples from the original sample set. Which samples are significant, depends on the underlying criterion for the sample selection process. These algorithms suffer from sensitiveness to sampling rate, quantization levels and high frequency interference. It fails to achieve high data rate along with preservation of clinical information [5]. In Transform based techniques [6] compressions are accomplished by applying an invertible orthogonal transform to the signal. Due to its de correlation and energy compaction properties the transform based methods achieve better compression ratios [7]. Various orthogonal transformations include DCT, DST, FFT and WAVELET transforms etc. The parameter extraction method includes extracting a particular parameter of the signal. The extracted parameters are subsequently utilized for classification based on a prior knowledge of the signal features. Direct and transformation methods are reversible, while parameter extraction method is irreversible. In this work, ECG signal is compressed using the Discrete Cosine Transform (DCT), Fast Fourier Transform.(FFT), Discrete Sine Transform(DST), and Type Discrete Cosine Transform (DCT-II).

II. NEED FOR ECG SIGNAL COMPRESSION

The need for ECG compression exists in many transmitting and storage applications. Transmitting the ECG signal through telephone lines, for example, may save a crucial time an unnecessary difficulty in emergency cases. Effective storage is required of large quantities of ECG information in the intensive coronary care unit, or in Long-term (24-48 hours) wearable monitoring tasks (Holter). Holter monitoring usually require continuous 12 or 24-hours ambulatory

recording. For good diagnostic quality, each ECG lead should be sampled at a rate of 250-500 Hz with 12 bits resolution. The information rate is thus 11-22 Mbits/hour/lead approximately. The monitoring device must have a memory capacity of about 100-200 Mbytes for a 3-lead recording. Memory costs may render such a solid state Holter device impractical. In practice, efficient data compression may be achieved only with lossy compression techniques (which allow reconstruction error). In ECG signal compression algorithms the goal is to achieve a minimum information rate, while retaining the relevant diagnostic information in the reconstructed signal. All ECG compression algorithms have used simple mathematical distortion measure such as the percentage rms difference (PRD) for evaluation the reconstructed signal. It is used to evaluate the compression result.

III. PERFORMANCE EVALUATION

Any performance criterion used to evaluate an ECG compression algorithm must include two factors Compression ratio, (CR) and Percent root mean square difference, (PRD). In present work we have tested the data on the basis of these two.

Compression Ratio (CR)

This is one of the most important parameters in data compression algorithms which specifies the amount of compression. All data compression algorithms minimizes data storage by reducing the redundancy wherever possible, thereby increasing the compression ratio [7]. The compression ratio (CR) is defined as the ratio of the number of bits representing the original signal to the number of bits required to store the compressed signal. A high compression ratio is typically desired [2]. A data compression algorithm must also represent the data with acceptable fidelity while achieving high CR, given by (3).

$$CR = \frac{\text{Total number of samples before compression}}{\text{total number of samples after compression}} \quad (3)$$

Error Criteria and Distortion Methods

One of the most difficult problems in ECG compression applications and reconstruction is defining the error criterion The purpose of the

compression system is to removed redundancy and irrelevant information. Consequently the error criterion has to be defined so that it will measure the ability of the reconstructed signal to preserve the relevant information. Since ECG signals generally are compressed with lossy compression algorithms, we have to have a way of quantifying the difference between the original and the reconstructed signal, often called distortion. Different objective error measures namely root mean square error(RMSE) percentage root mean difference (PRD), signal to noise ratio (SNR) are used for calculation of reconstruction error. The most prominently used distortion measure is the Percent Root mean square Difference (PRD) [8] that is given by (4) .

$$PRD = \frac{\sum_{n=1}^{L_b} [X(n) - X'(n)]^2}{\sum_{n=1}^{L_b} [X(n)]^2} \quad (4)$$

where $x(n)$ is the original signal and $x'(n)$ is the reconstructed signal. and L_b is the length of the block or sequence over which PRD is calculated. PRD provides a numerical measure of the residual root mean square (rms) error.

IV. TRANSFORMATION METHODS

In this work we have compared the performance of four different transformation methods for ECG compression and then their performance is evaluated. The various compression techniques have been discussed below:

Discrete Cosine Transform (DCT)

A discrete cosine transform (DCT) expresses a sequence of finitely many data points in terms of a sum of cosine functions oscillating at different frequencies [9]. DCTs are important to numerous applications in science and engineering, from lossy compression of audio (e.g. MP3) and images (e.g. JPEG) (where small high-frequency components can be discarded), to spectral methods for the numerical solution of partial differential equations. The use of cosine rather than sine functions is critical in these applications. For compression, it turns out that cosine functions are much more efficient whereas for

differential equations the cosines express a particular choice of boundary conditions[10].

In particular, a DCT is a Fourier-related transform similar to the discrete Fourier transform (DFT), but using only real numbers. DCTs are equivalent to DFTs of roughly twice the length, operating on real data with even symmetry (since the Fourier transform of a real and even function is real and even), where in some variants the input and/or output data are shifted by half a sample.

Discrete Cosine Transform is a basis for many signal and image compression algorithms due to its high de-correlation and energy compaction property [7]. A discrete Cosine Transform of N sample is defined as in (5):

$$F(u) = \sqrt{2/NC} c(u) \sum_{x=0}^{N-1} f(x) \cos\left[\frac{\pi(2x+1)U}{2N}\right] \quad (5)$$

$$C(u) = \begin{cases} \sqrt{2} & \text{for } u=0 \\ 1 & \text{otherwise} \end{cases}$$

The function $f(x)$ represents the value of xth samples of input signals [7]. $F(u)$ represents a DCT coefficients. The inverse DCT is defined in similar fashion as in (6):

$$F(x) = \sqrt{2/NC} \cos[\pi(2x+1)U/2N] \quad (6)$$

$$\sum_{U=0}^{N-1} C(U)F(U)$$

$$X=0,1,\dots,N-1.$$

Fast Fourier Transform (FFT)

A fast Fourier transform (FFT) is an efficient algorithm to compute the discrete Fourier transform (DFT) and it's inverse. There are many distinct FFT algorithms involving a wide range of mathematics, from simple complex- number arithmetic to group theory and number theory. An FFT is a way to

compute the same result more quickly. Computing a DFT of $2N$ points in the naive way, using the definition, takes $O(N^2)$ arithmetical operations, while an FFT can compute the same result in only $O(N \log N)$ operations. The difference in speed can be substantial, especially for long data sets where N may be in the thousands or millions—in practice, the computation time can be reduced by several orders of magnitude in such cases, and the improvement is roughly proportional to $N / \log(N)$. This huge improvement made many DFT-based algorithms practical; FFTs are of great importance to a wide variety of applications, from digital signal processing and solving partial differential equations to algorithms for quick multiplication of large integers. The most well known FFT algorithms depend upon the factorization of N , but there are FFTs with $O(N \log N)$ complexity for all N , even for prime N . Many FFT algorithms only depend on the fact that is an N th primitive root of unity, and thus can be applied to analogous transforms over any finite field, such as number-theoretic transforms. Fast Fourier Transform is a fundamental transform in digital signal processing with applications in frequency analysis, signal processing etc [7]. The periodicity and symmetry properties of DFT are useful for compression. The u th FFT coefficient of length N sequence $\{f(x)\}$ is defined as in (7):

$F(U)=$

$$\sum_{X=0}^{N-1} f(X) \exp(-j2\pi UX/N)$$

(7)

Where $U=0,1,\dots,(N-1)$

And its inverse transform is calculated from (8):

$f(x)=1/N$

$$\sum_{X=0}^{N-1} f(X) \exp(-j2\pi UX/N)$$

(8)

$X=0,1,\dots,N-1$

Discrete Sine Transform (DST)

Discrete sine transform (DST) is a Fourier-related transform similar to the discrete Fourier transform (DFT), but using a purely real matrix. It is equivalent to the imaginary parts of a DFT of roughly twice the length, operating on real data with odd symmetry (since the Fourier transform of a real and odd function is imaginary and odd), where in some variants the input and/or output data are shifted by half a sample. Like any Fourier-related transform, discrete sine transforms (DSTs) express a function or a signal in terms of a sum of sinusoids with different frequencies and amplitudes. Like the discrete Fourier transform (DFT), a DST operates on a function at a finite number of discrete data points. The obvious distinction between a DST and a DFT is that the former uses only sine functions, while the latter uses both cosines and sines (in the form of complex exponentials). However, this visible difference is merely a consequence of a deeper distinction: a DST implies different boundary conditions than the DFT or other related transforms. Formally, the discrete sine transform is a linear, invertible function $F: \mathbb{R}^N \rightarrow \mathbb{R}^N$ (where \mathbb{R} denotes the set of real numbers), or equivalently an $N \times N$ square matrix. There are several variants of the DST with slightly modified definitions. The N real numbers x_0, \dots, x_{N-1} are transformed into the N real numbers X_0, \dots, X_{N-1} according to (9):

$$X_k = \sum_{u=0}^{N-1} [X_u \sin\{\frac{n}{N} + 1(n+1)(K+1)\}]$$

(9)

Where $k=0,1,\dots,N-1$

Discrete Cosine Transform-II (DCT-II)

The most common variant of discrete cosine transform is the type-II DCT. The DCT-II is typically defined as a real, orthogonal (unitary), linear transformation by the formula in (10):

$$C_k = \sqrt{2 - \delta_{k/N}} \sum_{n=0}^{N-1} X_n \cos\left[\frac{\pi}{n(n + \frac{1}{2})K}\right]$$

(10)

for N inputs x_n and N outputs

DCT-II can be viewed as special case of the discrete fourier transform (DFT) with real inputs of certain symmetry . This viewpoint is fruitful because it means that any FFT algorithm for the DFT leads immediately to a corresponding fast algorithm for the DCT-II simply by discarding the redundant operations.

The discrete Fourier transform of size N is defined by (11):

$$X_k = \sum_{n=0}^{N-1} X_n \exp(-j2\pi n k / N) \quad (11)$$

$X_n = \exp(-j2\pi n k / N)$ where is an Nth primitive root of unity. In order to relate this to the DCT-II, it is convenient to choose a different normalization for the latter transform [11] as in (12):

$$C_k = 2 \sum_{n=0}^{N-1} X_n \cos\left[\frac{\pi}{N\left(n + \frac{1}{2}\right)K}\right] \quad (12)$$

This normalization is not unitary, but it is more directly related to the DFT and therefore more convenient for the development of algorithms. Of course, any fast algorithm for C_k trivially yields a fast algorithm for although the exact count of required multiplications depends on the normalization. In order to derive from the DFT formula, we can use the identity to write (13).

$$C_k = 2 \sum_{n=0}^{N-1} X_n \cos\left[\frac{\pi}{n\left(n + \frac{1}{2}\right)K}\right] \quad (13)$$

Where C_k is a real-even sequence of length $4N$, defined as follows for $n > N$.

$$X_{2n} = X_{4N-(2N+1)} = X_n \quad (14)$$

Thus, the DCT- II of size N is precisely a DFT of size $4N$, of real-even input, where the even-indexed inputs are zero.

V. THE PROPOSED ALGORITHMS

The various compression techniques DCT, FFT, DST and DCT- II algorithms are compared with PRD and

Compression ratio CR and best suitable is considered. The algorithms are performed on CSE database shown in Fig. 1.

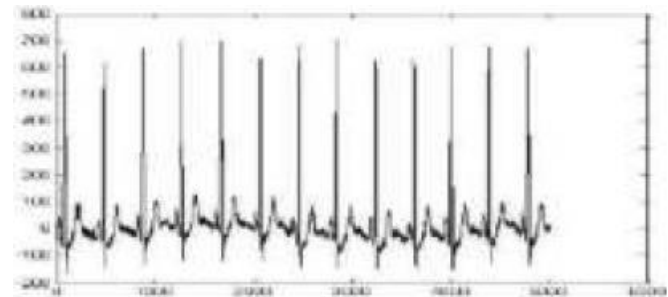


Figure 1. The ECG signal before compression.

A. DCT Compression Algorithm

- Separate the ECG components into three components x,y,z
- Find the frequency and time between two samples.
- Find the DCT of ECG signal and check for DCT coefficients (before compression) =0, increment the counter A if it is between +0.22 to -0.22 and assign to Index=0.

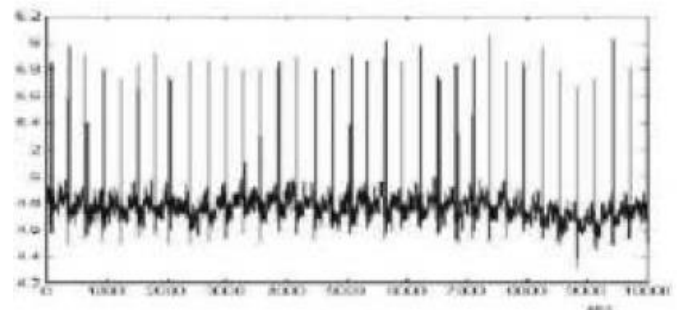


Figure 2 (a). The ECG signal after DCT compression.

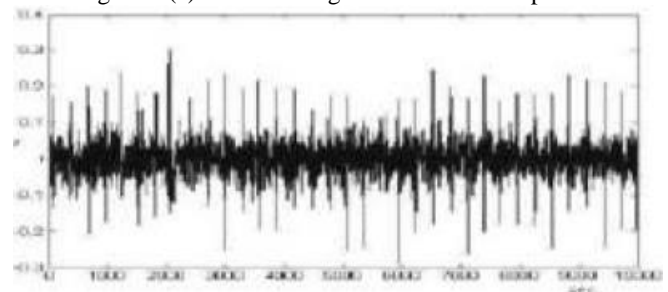


Figure 2(b). The Error signal after DCT compression.

Figure 2. DCT compression analysis.

- Check for DCT coefficients (after compression) =0,
- increment the Counter B.
- Calculate inverse DCT and plot decompression, error.
- Calculate the compression ratio CR and PRD.

The plot is shown in Fig. 2.

B. The FFT compression algorithm

- Separate the ECG components into three components x, y, z.
- Find the frequency and time between two samples.
- Find the FFT of ECG signal and check for FFT coefficients (before compression) =0, increment the counter A if it is between +25 to-25 and assign to Index=0.
- Check for FFT coefficients (after compression) =0, increment the Counter B.
- Calculate inverse FFT and plot decompression, error.
- Calculate the compression ratio CR and PRD.

The plot is shown in Figure 3.

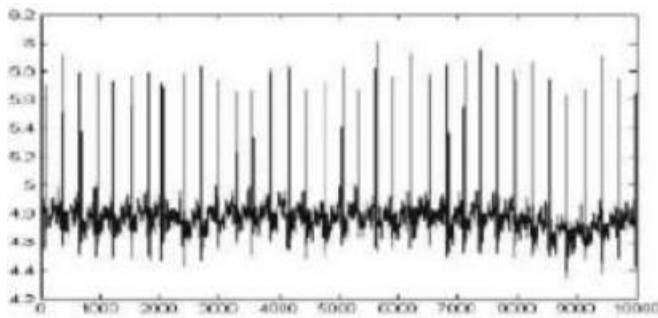


Figure 3(a). The ECG signal after FFT compression.

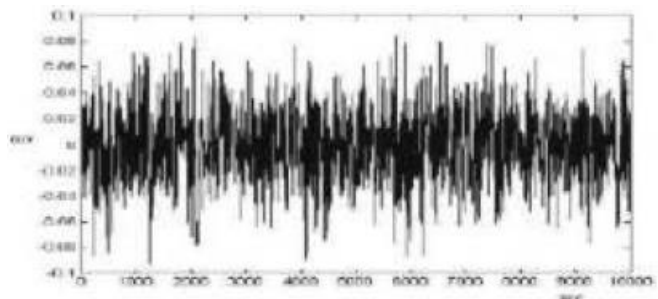


Figure 3(b). The Error signal after FFT compression.

Figure 3. FFT compression analysis.

C. The DST compression algorithm

- Separate the ECG components into three components x, y, z.
- Find the frequency and time between two samples.
- Find the DST of ECG signal and check for DST Coefficients (before compression) =0, increment the counter A if it is between +15 to-15 and assign to Index=0.
- Check for DST coefficients (after compression) = 0, increment the Counter B.

- Calculate inverse DST and plot decompression, error.
- Calculate the compression ratio CR and PRD.

The plot is shown in Figure 4.

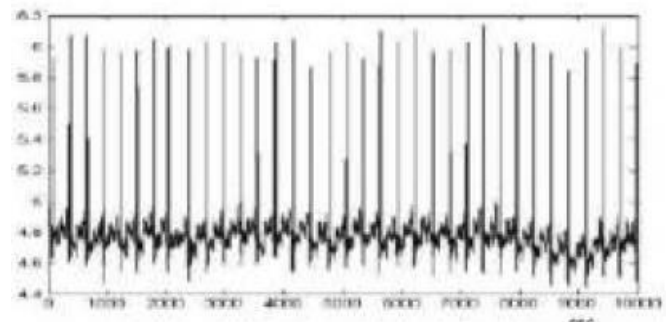


Figure 4(a). The ECG signal after DST compression.

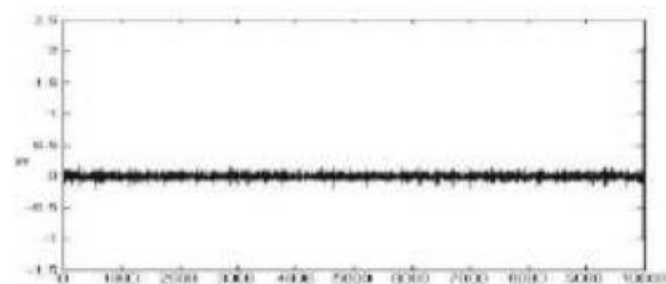


Figure 4(b). The Error signal after DST compression.

Figure 4. DST compression analysis.

D. The DCT-II compression algorithm

- Partition of data sequence x in Nb consecutive blocks b_i , $i = 0, 1, \dots, Nb-1$, each one with L_b samples.
- DCT computation for each block.
- Quantization of the DCT coefficients.
- Lossless encoding of the quantized DCT coefficients.

Increasing the block size increases the CR and the DC computing time. Various results show that increasing the block size above a certain point results in a very modest CR gain while the processing time increases. The type II DCT is commonly used for data compression due to its greater capacity to concentrate the signal energy in few transform coefficients.

The algorithm is explained in details as :

- Let $b_i[n]$, $n=0,1,\dots, L_b-1$, represent the L_b values in block b_i .
- The one-dimensional DCT-II of this block generates a transformed block B_i constituted by a

sequence of Lb coefficients $Bi[m]$, $m=0,1,\dots,Lb-1$, given by(15): where $cm=1$ for $1 \leq m \leq Lb-1$ and $co=(1/2)(1/2)$. The DCT can be seen as a one-to-one mapping for N point vectors between the time and the frequency domains. The coefficient $Bi[0]$, which is directly related to the average value of the time-domain block is called DC coefficient and the remaining coefficients of a block are called AC coefficients. Given Bi , bi can be recovered by applying the inverse DCT-II:

$$Bi[n]=\sqrt{\frac{2}{LB} \sum_{m=0}^{Lb-1} CmBi[m] \cos\left[\frac{(2n+1)m\pi}{2LB}\right]} \quad (15)$$

To quantize B we use quantization vector q . Each element $q(n)$, $n=0,1,\dots,Lb-1$, of q is a positive integer. In a specified interval and represents the quantization step size for the coefficient $B[n]$. The elements of the quantized DCT block obtained by the following operation:

$$Bi[n]=\text{round}(Bi[n]/q[n]) \quad (16)$$

where $//$ represents division followed by rounding to the nearest integer. Lossless encoding of the quantized DCT coefficients involves run length encoding, because the quantization normally generates many null values followed by an entropy encoder.

The plot is shown in Figure 5.

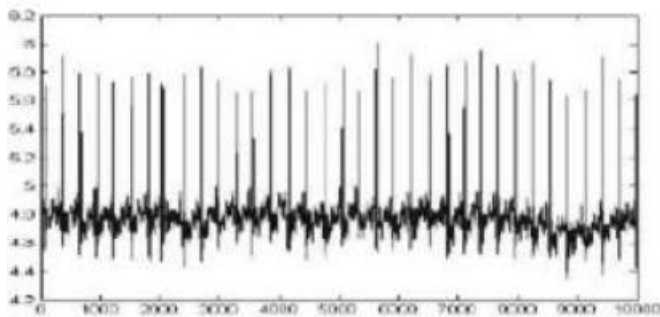


Figure 5(a). The ECG signal after DCT-II compression.

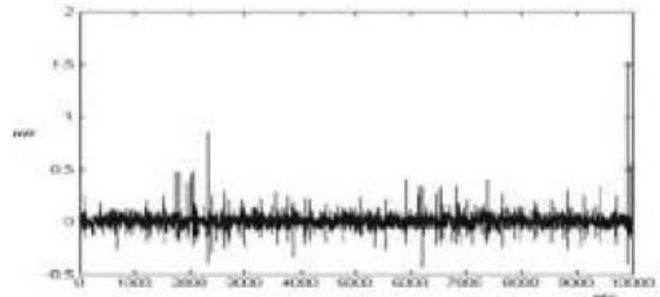


Figure 5(b). The Error signal after DCT-II compression.
 Figure 5. DCT-II compression analysis

VI. RESULTS AND DISCUSSION

We used data in the CSE database to test the performance of the four coding techniques. The ECG data is sampled at 333 Hz. The amount of compression is measured by CR and the distortion between the original and reconstructed signal is measured by PRD. The comparison table shown in Table 1, details the resultant compression techniques. This gives the choice to select the best suitable compression method. A data compression algorithm must represent the data with acceptable fidelity while achieving high CR. As the PRD indicates reconstruction fidelity; the increase in its value is actually undesirable. Although DCT-II provides maximum CR, but distortion is more. So a compromise is made between CR and PRD.

Method	Compression Ratio	PRD
DCT	80.89	0.93
FFT	89.57	0.01
DST	70.40	1.18
DCT-II	95.77	1.33

VII. CONCLUSION

Among the four techniques presented, DST provides lowest CR and distortion is also high. DCT improves CR and lowers PRD. Next is FFT which gives higher CR 89.5767 with PRD as 0.0123. But DCT-II provides an improvement in terms of CR of 95.77 but PRD increases up to 1.3319. Thus an improvement of a discrete cosine transform (DCT)-based method for electrocardiogram (ECG) compression is presented as DCT-II in terms of amount of compression. The appropriate use of a block based DCT-II associated to a uniform scalar dead zone quantiser and arithmetic coding show very good results, confirming that the proposed strategy exhibits competitive performances compared with the most popular compressors used for ECG compression.

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Using Genetic Algorithm to Optimize Machining Parameters in Turning Operation: A review

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Abstract- The determination of optimal cutting parameters have significant importance for economic machining in minimizing of particular operating mistakes like tool fraction, wear, and chatter. The evolutionary algorithm GA is used to improve many solutions of optimization complex problems in many applications. This paper reviewed the ideal selection of cutting parameters in turning operation using GA and its variants. This study deals with GA algorithm in different machining aspects in turning operation like surface roughness, production rate, tool life, production cost, machining time and cutting temperature. The survey showed that there are many papers in the field of turning parameters optimization using GA, but there is a lack in studies in the field of cutting temperature optimization in turning operation which is very important problem in machining operation. In addition, there are rare papers that studied dry turning operations.

Index Terms- Genetic algorithm, machining aspects in turning, optimal cutting parameters in turning, temperature optimization

I. INTRODUCTION

The evolutionary computing algorithms such as GA, PSO, and ABC etcetera are more robust and active approach for solving complex real-world problems compared with traditional optimization methods [1]. The difficulties in optimization operations made the determination of ideal cutting parameters an important and complex case [2], [3]. Also, the determination of optimum cutting parameters plays an important role in reducing machining problems as tool destroy and wear [4]. Paper [5] studied many optimization algorithms such as Genetic Algorithm, Simulated Annealing, Particle Swarm Optimization, Artificial Bee Colony and Ant Colony Optimization. It posits that use of ABC algorithm began at the latest years of this decade and concentrated on optimization the parameters of new cutting operations such as electrical discharge and electrochemical operations. However, no much papers in the field of using ACO optimization at the latest years. Also when use GA and PSO algorithms, the most machining operation that is using it was multipass turning, while SA algorithm used in end milling and AJW. On the other hand, most machining performances used surface roughness, machining / production costs and material removal rate as shown in Figure 1 which shows that the papers in the field of temperature measurement and dry turning are very rare.

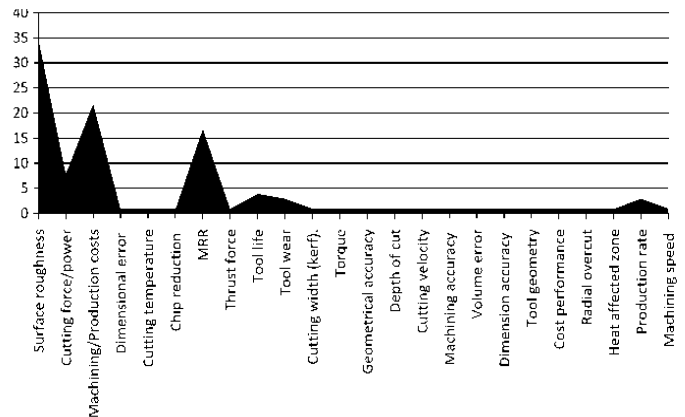


Figure 1: Machining performance considered in GA, SA, PSO, ABC and ACO [5].

Finally, we can say that the fineness of the parts, precise, and temperature estimation still challenging because of the difficulties that accompany the cutting operation. So, this study aims to survey GA-based optimization for turning processes as below:-

II. USING GA IN TURNING PARAMETERS OPTIMIZATION

The optimal machining parameters can be finding using GA evolutionary techniques widely [5]. Three main parts in GA can be used; reproduction, crossover and mutation. The binary encoding process used to encode the parameters as genes. Using of GA in turning operation improvement is studied as below:-

A. surface roughness optimization

Coarseness of the machined part is depending on several parameters such as feed rate, depth of cut, cutting speed, tool wear [6]. Srikanth and Kamala [7] studied the surface roughness optimization in turning operation by finding the optimum parameters (speed, feed and depth of cut) that minimize surface roughness. A real coded genetic algorithm (RCGA) also called floating-point representation is used as optimization method for this purpose. The conventional genetic algorithm uses binary code which needs more time to code and decode the values. In contrast, (RCGA) used real-parameters which enable the use of large variables to improve the operation of finding the optimal value, decrease the time and increasing the precision. The fitness function used to calculate the surface roughness is as:-

$$R_a = \frac{1.0632 \cdot f^{1.0198} \cdot d^{0.0119} \cdot H^{0.5234} \cdot r^{0.1388}}{V^{0.229}} \quad \text{Eq. (1)}$$

Whereas:-

- Ra:- Surface roughness (µm).
- f :- Feed rate (mm/rev).
- d :- Depth of cut (mm).
- H :- Material hardness.
- r :- Tool radius (mm).
- V :- Cutting speed (mm/min).

Feed rate, depth of cut, tool radius and cutting speed are taken as limitations of the operator and judgment variables. The authors observed that high speed, low feed, modest cutting depths and nose radius led to better surface quality.

Savadamuthu et al. [8] using Taguchi-genetic algorithm for studying the quality improvement in turning operations. The objective function is to reduce the defect rate in a very short period of time. This method finds the ideal domination parameters for an adaptive Neuro Fuzzy interface system (ANFIS). It consists of predictor and fuzzy logic controller and able to keep a cutting force turning process at stable value under different conditions. Computer simulations to verify the effectiveness of this method was used.

Sanjeev et al. [9] showed the effect of cutting conditions on the surface quality in CNC turning operations when turning poly tetra fluoro ethylene using genetic algorithm. The fitness function used to minimize the surface roughness is shown as:-

$$R_a = -0.309 + 0.675V + 0.870f + 0.175d - 0.234V \cdot f - 0.002f \cdot d - 0.143V \cdot d \quad \text{Eq. (2)}$$

Whereas:-

- Ra:- Surface roughness.
- V :- Cutting speed.
- F :- Feed rate.
- d :- Depth of cut.

The constraints used are V, f, and d. The crossover type used is single point with probability of 0.08 and the mutation probability type is 0.1 to prevent local convergence.

Raj et al. [10] developed a new type called improved genetic algorithm (IGA) to calculate the ideal parameters for estimating the surface quality. Cutting parameters used are nose radius speed, feed, and depth of cut. In this work, Taguchi's orthogonal array method is used to achieve the experiment of dry turning of SS 420 work piece. This method combines stochastic crossover technique and an artificial initial population to provide faster search mechanism to avoid the local optimal trap. The author concluded that this algorithm is more effective than conventional genetic algorithm (CGA).

Singh et al. [11] used a genetic algorithm to estimate and optimize the work piece roughness values during operating the

bearing steel by hard turning. The cutting parameters were aimed to show the cutting tool rake angle and nose radius and cutting conditions (feed and speed) on the surface quality. Lower values of surface roughness and ideal conditions can be achieved by GA program.

Sahoo [12] studied the machining parameters optimization to improve the roughness characteristics of AISI 1040 mild steel in CNC turning using genetic algorithm. The cutting tool used is CVD carbide coated tools with titanium nitride. The mild steel mechanical properties used are hardness 201 BHN, density 7.85 g/cc and tensile strength 620 Mpa. The cutting parameters such as depth of cut, spindle speed and feed rate are used to study its effect on the surface quality aspects such as centre line average roughness, root mean square roughness and mean line peak spacing using response surface methodology. The author concluded that the increasing cutting parameters lead to decrease the surface roughness parameters.

B. Optimization of production rate and tool life

Quiza et al. [13] used two dissonant objective functions to find the optimal value of depth, feed and speed simultaneously. Micro genetic algorithm is used for this purpose. The first fitness function is production rate (Z) which can be calculated as:-

$$Z = Z_s + V/M \cdot (1 + ZTC/C) + Z_o \quad \text{Eq. (3)}$$

Whereas:-

- Z_s:- Set-up time.
- ZTC:- Tool change time.
- Z_o:- Time during which the tool does not cut.
- V:- Volume of the removal metal.
- M:- Material removal rate.

The second objective function is tool life (ε) which can be calculated as:-

$$\epsilon = (V/M \cdot T) \cdot 100 \% \quad \text{Eq. (4)}$$

Whereas:-

- V:- Volume of the removal metal.
- T:- Tool life.
- M:- Material removal rate.

The parameters (T) and (M) depend upon variables feed, speed and depth of cut. Many constraints affect on the optimal cutting conditions taken in account like (cutting force, cutting power and surface roughness). This system gives greatest amount of information to select cutting parameters in turning with low computational cost. The future work is including other constraints such as work piece surface temperature.

Wang et al. [14] studied the single and multi-pass turning operations using two ways; with and without the effects of tool wear. A hybrid models such as nonlinear programming methods and a genetic algorithms for four machining performance are considered. Cutting force, tool wear, tool life, chip form, chip breakability, and surface roughness are used as machining aspects. This method enables to obtain the ideal cutting conditions and select suitable tools for turning operations.

Yusoff et al. [15] showed the application of non dominated sorting genetic algorithm (NSGA-II) for optimizing machining parameters such as feed rate, cutting speed and rotational speed. This method is used for quick classification of multi objective optimization problems. This system optimizes each objective without control of any other solution simultaneously. It can find a group of optimal solutions based on combination of suitable variables.

C. Optimization of production cost

In recent machining operations, the aims are for getting high quality products with as possible as minimum cost [16].

Xie and Guo [16] minimized the production cost in multi-pass turnings using GA combines with a pass repeating method. This operation is very complicated because many constraints should be considered. Cutting speed, feed rate and depth of cut for both rough and finish machining are used for this purpose. The fitness function used computed as:-

$$U_C = C_M + C_I + C_R + C_T \quad \text{Eq. (5)}$$

Whereas:-

U_C :- Production cost for multi-pass turning.

C_M :- Cutting cost by actual time in cut.

C_I :- Machine idle cost for loading and unloading operations and idling tool motion.

C_R :- Tool replacement cost.

C_T :- Tool cost.

The constraints used are tool-life, surface quality, force, power, roughing and finishing parameters relations, chip-tool interface temperature and fixed cutting area. The numbers of possible value of rough cuts are calculated as:-

$$m = (n_u - n_l + 1) \quad \text{Eq. (6)}$$

Whereas:-

m :- Number of rough cuts.

n_u :- Upper limit

n_l :- Lower limit.

The authors proposed bound adjustment of optimized variants (BAOV) method to minimize the number of impractical individuals in the iteration process and eliminate surface finish constraint.

Yildiz et al. [2] proposed GA algorithm for solving the turning optimization problems. The machining cost used related with machining variables (speed, feed and depth of cut) as shown below:-

$$C_i = c_i \cdot v^{a_{i1}} \cdot f^{a_{i2}} \cdot d^{a_{i3}} \quad \text{Eq. (7)}$$

Whereas:-

C_i :- Machining cost.

c_i :- Cost component coefficients.

v :- The speed.

f :- The feed.

d :- Depth of cut.

$i=1 \dots n$ and a_{i1}, a_{i2}, a_{i3} are machining variable exponents.

The constraints B_n in this research can be expressed as:-

$$B_n = b_n \cdot Vn^{am1} \cdot fn^{am2} \cdot dn^{am3} \quad \text{Eq. (8)}$$

Whereas:-

b_n :- Term coefficient of constraints.

$n = 1 \dots N$.

$m = 1 \dots M$.

Han et al. [17] studied the cost minimization operation in multi-pass turning operations. The boundaries used are maximum and minimum allowable cutting speeds, feed rates depths of cut, tool life, surface roughness, cutting force and cutting power consumption. The ideal values of cutting parameters using three ways: integer programming, nonlinear programming, and genetic algorithms. The author concluded that the system generates minimum production costs in comparison with the results obtained from the previous and data collected from the handbooks.

Al-Aomar and Al-Okaily [18] developed a simple genetic algorithm (SGA) to a CNC turning machine for determination the optimal machining and production parameters so as minimize the production cost. This method has active convergence with minimum number of search generations. The system produces best productivity but needs to higher cost. The effectiveness of system research show by results obtained full factorial designs.

D. Optimization of machining time

Ahmad and Anwarul [19] studied the optimization process planning parameters for machining rotational component using a genetic algorithm optimization Matlab toolbox. The objective function used to decrease the operating time T_m which is calculated as:

$$T_m = L_f \cdot n_{pass} / f \cdot N_w \quad \text{Eq. (9)}$$

Whereas:-

T_m :- Machining time.

L_f :- Length of surface.

n_{pass} :- Number of passes.

f :- feed rate.

N_w :- Rotational speed of work piece.

The constraints used are cutting velocity, feed rate, depth of cut, rotational velocity of spindle and the power of machine. The results showed that at the low the depths of cut and cutting speed

and high feed rate, the optimum total machining time can be obtained.

Car et al. [20] proposed a hybrid genetic algorithm and linear programming optimization for turning process optimization. The objective function used to minimize production time (t_1) is expressed as:

$$t_1 = t_g + t_a + t_p \quad \text{Eq. (10)}$$

Whereas:-

t_g :- Main machining time.

t_a :- Time for tool changing.

t_p :- Time during which the tool do not cut.

The author concluded that this system is efficacious and proper to optimize machine parameters.

Chauhan et al. [4] suggested a new methods , the first is "LXPM" and second is Differential Evolution (DE) for determination of optimal machining conditions for turning process on CNC machines. The author showed that these methods used as real coded genetic algorithm. The fitness function is based on total production time that affects the production rate as shown below:-

$$Tu = tm + tcs + (tm/T) + tr + thz \quad \text{Eq. (11)}$$

Whereas:-

Tu = Total production time.

tcs = Tool changing time (min/edge).

tr = Quick return time(min/pass).

thz = Loading and unloading time (min/pass).

T = Tool life.

The parameters to be optimized are cutting speed, feed rate and depth of cut while the nonlinear constraints such as cutting force, power, tool-chip interface temperature and surface are considered. The results of this method were satisfactory, reliable and computational.

Saravanan and Janakiraman [21] studied the optimization the turning operation using facing and undercutting operations by genetic algorithm. The objective function to reduce the time of machining with many restrictions such as power, force, tool life, surface quality of the final part and the range of the operating parameters is used. The optimization problem was solved very efficiently using the above methodology.

E. Optimization of cutting temperature

- Cutting temperature measurement in turning

Determination of the ultimate cutting temperature and its allocation values along the rake face of the cutting tool is very important due to its influence on cutting tool properties. The measuring temperature in the cutting zone and the assessment of heat distribution in cutting operations and determination of internal temperatures on the cutting tool is very difficult action due to a straiten shear limit, chip formation, and the touch phenomena where the movement between the tool and chip are

continuous with respect to each other [22]. The temperature in the primary and secondary shear zones are usually very high, therefore it affects the shear deformation and tool wear. During the cutting operation, the total energy of the yielding distortion at the primary shear plane and at the chip-tool interface is converted into heat.

Maximum heat occurs on chip-tool interface temperature is one of the critical factors during machining because its effect on the formation of chip , cutting forces, tool life, surface quality, total tool wear rate and crater wear on the rake face and product surface quality [22],[23],[24],[25].

Abhang and Hameedullah [23] studied the turning operation of EN-31 steel alloy with tungsten carbide inserts. A tool-chip interface temperature is measured using a tool-work thermocouple technique and response surface methodology. The cutting parameters considered are cutting speed, feed rate, depth of cut and tool nose radius. The increment in cutting speed, feed rate and depth of cut leads to increase the cutting temperature, on the other hand increasing nose radius leads to reduce the cutting temperature.

Carvalho et al. [24] posits the complexity of the immediate temperature measurements at the chip-tool interface. The authors proposed the valuation of the temperature from heat flow at the chip-tool interface. The inverse heat conduction problem technique was used. Many cutting tests using cemented carbide tools were performed for examination the model and to confirm the influence of the cutting parameters on the temperature field.

Jurković [25] used Taguchi's method for minimizing the tool-chip interface temperature when cutting Č1730 (EN C60) steel work piece by cemented carbide inserts in turning process using a tool-work thermocouple technique. The author concluded that the main cause affects on the cutting tool and work piece properties is the cutting temperature. Also the cutting speed is the most worthy parameter on cutting temperature.

Salihu et al. [26] measured the temperature using the thermocouple method during the CNC turning on steel C45 work piece and ceramic cutting plates MC2 cutting tool. The cutting parameters used: cutting velocity (v), feed (s), depth of cut (a) and nose radius (r). There are three zones of cutting temperature: primary shear zone, secondary shear zone (chip-tool interface) and shear zone due to scrub between the tool and work piece. The authors concluded that cutting speed and feed have a great influence on temperature , on the other hand, when the cutting angle increases, the cutting forces also increase and then the temperature increase.

Zuperl and Cus [27] used the feed forward and radial basis neural networks to study a complex optimization of cutting parameters. The method produces accurate and reliable results, but requires more time for training and testing also the precision of results is worse. The authors suggested application of this method to experimental problems and stretching it to adaptive control of machining operations or on-line adjustment of cutting parameters based on information from sensors.

Dolinšek [28] posists that the tool wear is generally considered to be a result of mechanical thermo dynamic wear such as abrasion and chemical thermo chemical wear such as diffusion interactions between the cutting tool and work piece. At high temperature reaches to 1000C or more , the appearance of the

chemical wear becomes visible and clear which enhances the diffusion and oxidation processes.

Ueda et al. [29] proposed a new type of pyrometer, in which two optical fibers are used to accept and transmit the infrared energy. The two fibers are connected using a non-contact fiber coupler. In turning, the incidence face of one optical fiber which is embedded in a rotating work piece accepts the infrared rays radiated from the cutting tool and emits it at the other face. The infrared energy is accepted by the other optical fiber which is fixed at the pyrometer and led to the two-color detectors.

- Cutting temperature optimization in turning using GA

Dry and high speed machining produce significant heat dissipation in the chip formation zone. Hence, thermal phenomenon plays a key role in tool wear and machinability of the materials. The increasing in the temperature of the work piece material in the primary deformation zone softens the material, on the other hand, minimum cutting forces and energy values is desired.

Sultana et al. [30] studied the optimization of cutting speed (V_c), feed rate (f), pressure (P) and flow rate (Q) of high pressure coolant to improved machining performances in turning AISI-4320 steel by uncoated carbide insert. An experimental study has been carried out using response surface methodology. The predictive models of cutting temperature (θ), chip reduction coefficient (ξ) and surface roughness (R_a) were considered. Multi-objective optimization has been carried out based on genetic algorithm (GA) using two conflicting objectives, minimizing cutting temperature and cutting force simultaneously. The constraint of surface roughness less than 3 μm is considered. The results showed that θ , ξ and R_a can be well estimated through the models.

III. DISCUSSIONS AND CONCLUSIONS

Optimization operation is one of the important goals of manufacturing systems, also it simple to use and are increasingly used to solve inherently intractable problems quickly. From previous studies and papers, it is clearly that the genetic algorithm is one of the best population searches and its variants have been extensively used. However, many studies are concentrated on optimization of surface roughness, machining / production costs and material removal rate, but only a few done in other fields like cutting temperature, torque, geometrical accuracy, heat affected zone tool geometry.

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Determinants of Dividends in Indian Pharmaceutical Companies

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Abstract- Dividend is the portion of corporate profits paid out to stockholders. Dividend policy is influenced by various determinants of dividend. The payment of dividend is associated with profitability position of the firm and is influenced by internal and external factors. The Indian pharmaceutical industry currently tops the chart amongst India's science-based industries with wide ranging capabilities in the complex field of drug manufacture technology. The current study focuses on the determinants of dividends and its performance of select pharmaceutical companies in India. This study evaluates the performance of various pharmaceutical companies and their annual compound growth rate.

Index Terms- Dividend, Determinants, DPS, Growth rate

I. INTRODUCTION

Dividends are payments made by a corporation to its shareholder members. When a corporation earns profit or surplus, that money can be put to two uses: it can either be re-invested in the business (called retained earnings), or it can be distributed to shareholders in the form of dividends. Investors seeking high current income and limited capital growth prefer companies with high Dividend payout ratio. However investors seeking capital growth may prefer lower payout ratio because capital gains are taxed at a lower rate. High growth firms in early life generally have low or zero payout ratios. As they mature, they tend to return more of the earnings back to investors. Determinants of dividends play a key role in the dividend policy and at dividend payout ratio. The main determinants of dividend policy of a firm can be classified into:

- a. Dividend payout ratio
- b. Stability of dividends
- c. Legal, contractual and internal constraints and restrictions
- d. Owner's considerations
- e. Capital market considerations and
- f. Inflation.

Dividend policy is concerned with taking a decision regarding paying cash dividend in the present or paying an increased dividend at a later stage. Annual compound growth rate (CAGR) is often used to describe the growth over a period of time of some element of the business. It is used to compare the growth rates of two investments.

Review Literature

Muhammad Aamir and Syed Zullfiqar Ali Shah (2011) published an article "*Dividend Announcements and the Abnormal Stock Returns for the Event Firm and Its Rivals*" detailed the analysis of dividend announcement impact on stock prices. Benjamin M. Blau and Kathleen P. Fuller (2008) published an article "*Flexibility and dividends*" focused on model of corporate dividend policy based on the idea that management values Operating flexibility. Farzad Farsio, Amanda Geary, and Justin Moser (2004) published an article "*The relationship between dividends and earnings*" hypothesize that no significant relationship between earnings and dividend holds in the long run. Feldstein, Martin, and Jerry Green. (1983) published an article "Why do companies pay dividends" which mainly focuses on the reasons for issue of dividends. Ahmad H. Juma'h and Carlos J. Olivares Pacheco (2008) published an article "*The financial factors influencing cash dividend policy*" focuses on Internal and external factors that influence the decision of pay cash dividends. Merton H. Miller and Kevin Rock (2008) has published an article "*Dividend Policy under Asymmetric Information*" has concluded the model for dividend policy in case of asymmetric information.

II. RESEARCH METHODOLOGY

The Present study is a study on selected companies to meet the specified objectives. The dividend can be determined by the internal and external factors. The independent variables like current year sales, current year interest, current year depreciation, current year provision for tax, current year net profit previous year net profit previous year dividend per share previous year retained earnings per share and current year liquidity ratio and dividend per share.

III. NEED FOR THE STUDY

The major motive of corporations is the shareholders wealth maximization by issuing the dividends for their investments. Many factors influence dividend payment decision in corporations. The dividend determinants play a vital for issuing the dividends and for the reinvestment. The current approach is about the concept of determinants of dividends and its performance analysis through the annual compound growth rate method of various determinants of demand of select pharmaceutical companies.

IV. OBJECTIVE

The current study main objective is to analyze the profitability, and the growth rate of Select Pharmaceutical companies.

V. SOURCES OF DATA

For the current analysis data is secondary data and were collected from the financial reports of the selected pharmaceutical companies from the year 2002-2011. From internet (www.moneycontrol.com).

Tools for Analysis

Annual Compound Growth Rate:

The year-over-year growth rate of an investment over a specified period of time .The compound annual growth rate is calculated by taking the nth root of the total percentage growth rate, where the number of years in the period is being considered

$$ACGR = \left(\frac{\text{Ending Value}}{\text{Beginning Value}} \right)^{\left(\frac{1}{\# \text{ of years}} \right)} - 1$$

ACGR is not the actual return in reality. It's an imaginary number that describes the rate at which an investment would have grown if it grew at a steady rate.

Profit before interest and taxes (PBIT)

Profit before interest and taxes (PBIT) or operating income is a investment formula to measure of a corporation's profitability by subtracting operating expenses from revenue excluding tax and interest.

PBIT = revenue --- Operating expenses

PBIT (or) operating income = Net profit + Interest + Taxes

Profit after Tax

Profit after Tax (PAT) is the net profit earned by the company after deducting all expenses like interest, depreciation and tax.

PAT= PBIT- Interest- Tax

Earnings per Share (EPS)

EPS is the indicator that shows how much a share earns in a financial period. It is the amount of earnings per each outstanding share of a company's stock.

EPS = $\frac{\text{Net Profit available to equity shareholders}}{\text{Number of ordinary Shares out standing}}$

Dividend per Share

The sum of declared dividends for every ordinary share issued. Dividend per share (DPS) is the total dividends paid out over an entire year (including interim dividends but not including special dividends) divided by the number of outstanding ordinary shares issued.

EPS = $\frac{\text{Dividend paid to equity shareholders}}{\text{Number of ordinary Shares out standing}}$

VI. DATA ANALYSIS AND INTERPRETATION

TABLE NO:1 Annual Compound Growth Rate of PBIT (in %)

S.No	Company Name	PBIT (in crs)		ACGR of PBIT (in %)
		Beginning year (2002)	Ending year (2011)	
1	Hetero Drugs	20.25	78.4	14.49
2	Dr.Reddy Labs	579.22	1088.6	6.51
3	Cipla	285.2	1162.26	15.08
4	Sun Pharma	188.25	1454.61	22.68
5	Lupin Labs	161.74	897.01	18.6
6	Aurobindo Pharma	131.49	860.27	20.66
7	GSK	161.19	732.4	16.34
8	Cadila Healthcare	90.46	676.7	22.29
9	Aventis Pharma	90.8	279.59	11.9

10	IPCA Pharma	59.08	367.24	20.04
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Source: Annual Reports of select Pharma companies

INTERPRETATION:

From the above table 7.1 the annual compound growth rate of PBIT ranges from 6.21 % to 22.68 % for the selected Pharmaceutical companies. The Hetero Drugs had a growth rate of 14.49% from 2002 to 2011. Dr.Reddys is having least growth rate (6.51 %) in PBIT among the selected companies where as the Sun Pharma has the highest growth rate of 22.68 % among the companies selected.

Dr.Reddy’s laboratories is having less operating profit compared to other companies where as the Sun Pharma has

more operating profit and has a superior in annual growth of PBIT. PBIT of Cipla increased from 285.2 crs to 1162.26 crs from the year 2002 to 2011 and it has annual co pound growth rate of 15.08%. Lupin Pharma has a moderate annual compound growth rate of 18.6 % and the PBIT ranges from 161.74 crs to 897.01 crs. Aurobindo Pharma and IPCA Pharma had a similar annual compound growth rate with a variation of 0.62 % and their growth rates of PBIT are 20.66% and 20.04 % respectively

TABLE NO 2 : Annual Compound Growth Rate of PAT (in %)

S.No	Company Name	PAT (in crs)		ACGR of PAT (in %)
		Beginning year (2002)	Ending year (2011)	
1	Hetero Drugs Ltd.,	4.31	52.34	28.36
2	Dr.Reddy Labs	553.96	920.2	5.2
3	Cipla	207.00	920.39	16.5
4	Sun Pharma	168.69	1383.8	23.42
5	Lupin Pharma	72.67	809.87	27.26
6	Aurobindo Labs	69.93	594.75	23.92
7	GSK	98.08	434.74	15.97
8	Cadila Healthcare	65.35	599.8	24.81
9	Aventis Pharma	60.8	186.37	11.9
10	IPCA Pharma	35.44	261.43	22.11

Source: Annual Reports of select Pharma companies

INTERPRETATION:

From the above table 7.2 the annual compound growth rate of Profit after tax (PAT) from the year 2002 to 2011 ranges from 5.2 % to 28.36 % for the selected Pharmaceutical companies. The Hetero Drugs has highest annual compound growth rate of 28.36% and its PAT ranges from 4.31crs to 52.34crs from the year 2002 to 2011. Dr.Reddy’s is having least PAT growth rate of 5.2% of PAT and it has a PAT of 553.96 crs in the year 2002 and 920.2 crs during the year 2011. Sun Pharma and Aurobindo have a similar growth rate with a minor variation of 0.5 %. Their ACGR of PAT is 23.42 % to 23.92 % respectively. GSK and Cipla had a moderate growth rate of 15.97 % and 16.5 %

respectively. Lupin Pharma and Cadilla Health care has a annual compound growth rate of 27.26 % and 24.81 % and are next to Hetero drugs ltd., in their PAT growth rates. Aventis Pharma is having a PAT growth rate of 11.9 % and its PAT increased from 60.8% to 186.37 % from the year 2002 to 2011. GSK profit after tax increased from 98.08 crs to 434.74 crs and it has a annual compound growth rate of 15.97 %. The annual compound growth rate of profit after tax for IPCA Pharma is 22.11 % and for the years 2002 to 2011 its PAT increased from 35.44 crs to 261.43 crs

TABLE NO -3 : Annual Compound Growth Rate of EPS (in %)

S.No	Company Name	EPS (in rs)		ACGR Of EPS (in %)
		Beginning year (2002)	Ending year (2011)	
1	Hetero Drugs Ltd.,	0.26	18.52	0.532
2	Dr.Reddy Labs	60.07	52.78	-0.0128
3	Cipla	39.2	11.96	0.111
4	Sun Pharma	36.33	13.36	-0.0951
5	Lupin Pharma	17.71	18.15	0.245
6	Aurobindo Labs	33.14	20.4	-0.047
7	GSK	13.17	50.84	0.144
8	Cadila Healthcare	11.26	29.81	0.102
9	Aventis Pharma	26.53	83.01	0.221
10	IPCA Pharma	27	21.11	-0.024

INTERPRETATION:

From the above table 7.3 there is a negative compound growth rate of EPS for the companies like Dr. Reddy's, Cipla, Sun Pharma, IPCA are -0.0128 %, -0.0951%, -0.047%, and -0.024% respectively. Cipla and GSK had similar growth rates with a variation of 0.033 % and their EPS of two companies are not similar. Lupin Pharma has a growth rate of 0.245 % and its EPS increased from 17.71rs to 18.15rs from the year 2002 to 2011. Aventis Pharma EPS increased from 26.53 rs to 83.01 rs and it has a annual compound growth rate of 0.221 % which is of

moderate growth rate. Cadila Helath care has a growth rate of 0.102 % and its EPS is increased from 11.26 rs to 29.81 rs from the year 2002 to 2011

- The negative EPS indicates that there is a loss in their Earnings per share in their compound growth rate. The negative compound growth rate doesn't mean that there is loss at per share earnings for every year it only represents the annual compound growth rate from 2002 to 2011.

TABLE NO 4: Annual Compound Growth Rate of DPS (in %)

S.No	Company Name	DPS (Rs in crs)		ACGR Of DPS (in %)
		Beginning year (2002)	Ending year (2011)	
1	Hetero Drugs Ltd.,	0.0124	0.0200	0.0489
2	Dr.Reddy Labs	0.0760	0.1124	0.0412
3	Cipla	0.0699	0.0279	0.087
4	Sun Pharma	0.0500	0.0349	0.035
5	Lupin Pharma	0.0500	0.0300	0.049
6	Aurobindo Labs	0.0293	0.0201	0.0 313
7	GSK	0.0699	0.499	0.204
8	Cadila Healthcare	0.03500	0.0625	0.0596

9	Aventis Pharma	0.1600	0.3299	0.0750
10	IPCA Pharma	0.032	0.055	0.0527

INTERPRETATION:

From the above table the annual compound growth rate of dividend per share for the selected pharmaceutical companies varies from 0.035 % to 0.20%.GSK has the highest annual compound growth rate of 0.204 % and its dividend per share increased from 0.0699 crs to 0.499 crs from the year 2002 to 2011.Sun Pharma has a growth rate of 0.035 % which is the least growth rate among select pharmaceutical companies. Dr. Reddy’s Labs and with Lupin Pharma have a similar growth rates with a minor variation of 0.008 % and their growth rates are 0.041% and 0.049 % respectively. IPCA Pharma had a annual compound growth rate of 0.0527 % and its DPS increased from 0.032 crs to 0.055 crs from the year 2002 to 2011. Aurobindo Pharma and Sun Pharma had a similar growth rate with a variation of 0.004 % and their growth rates are 0.031 % and 0.035 % respectively. Cadilla Pharma has annual compound growth rate of 0.059 % where its dividend per share becomes twice that of its beginning year 2002 to 2011.The highest DPS doesn’t mean that the companies are performing well in all the areas. It depends on board decision, dividend payout ratio and several other factors.

VII. FINDINGS

The annual compound growth rate of select pharmaceutical companies was increased from the year 2002 to 2011 in their PBIT. Sun Pharma has the highest growth rate and. Sun Pharma and Aurobindo have a similar growth rate with a minor variation of 0.5 %. The Hetero Drugs have annual compound growth rate of 12.36%.which is an average growth rate compared to other select pharmaceutical companies. The annual compound growth rate of Profit after tax (PAT) from the year 2002 to 2011 ranges from 5.2 % to 22.68 % for the selected Pharmaceutical companies. The Hetero Drugs had a annual compound growth rate of 12.36% and Dr.Reddy’s is having least growth rate (5.2 %) of PAT among the selected companies where as the Lupin Pharma has the highest growth rate of 27.26 %. Hetero drugs DPS is positively correlated with sales. Cipla DPS is negatively correlated with sales. The sales of Glaxo SmithKline are highly positively correlated 0.9079.Except the Aventis all the companies Interest is negatively correlated with DPS. Cipla and Glaxo Smith Kline DPS are negatively correlated with depreciation and Hetero drugs sales are highly correlated with DPS. The interest shows a high affect on the net profit of the companies. The interest rates are negatively correlated with DPS. The dividend decision is taken to based on the previous year’s Dividend per share Earnings per share.

VIII. CONCLUSION

Determinants of dividend will affect the profitability of different pharmaceutical companies. Annual compound growth rates of the dividend determinants give the profitability and the growth rate of select pharmaceutical companies. The negative

annual compound growth rate doesn’t mean that there is loss at per share earnings for every year it only represents the annual compound growth rate. The highest DPS doesn’t mean that the companies are performing well in all the areas. It depends on board decision ,dividend payout ratio and several other factors.

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A Statistical Language Modelling Approach for Question Answering System

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Abstract- This paper concerns about Question Answering system in which a statistical language modeling approach is used. The main objective is to build a simple system for question answering without the need for highly tuned linguistic modules which need more human work and is very difficult to find any bugs if any. A mathematical model for answer retrieval and answer extraction is derived, which does not use any linguistic information or annotated data. It makes use of word tokens and web data. We take a statistical, noisy-channel approach and treat QA as a whole as a classification problem. We present a fully data-driven mathematical model for estimating the probability of a candidate answer given a question. In doing so we largely remove the need for ad-hoc weights and parameters that were a feature of many TREC systems.

Index Terms- Question Answering, Linguistic Modules.

I. INTRODUCTION

Information retrieval is the activity of obtaining information resources relevant to an information need from a collection of information resources. Searches can be based on metadata or on full-text indexing. An information retrieval process begins when a user enters a query into the system. In information retrieval a query does not uniquely identify a single object in the collection. Instead, several objects may match the query, perhaps with different degrees of relevancy.

An object is an entity that is represented by information in a database. Most IR systems compute a numeric score on how well each object in the database matches the query, and rank the objects according to this value. Question Answering (QA) concerns itself with the development of systems that can automatically and accurately answer questions posed in natural language, and draws upon fields such as information retrieval (IR), natural language processing (NLP) and machine learning. Natural language processing (NLP) is a field of computer science, artificial intelligence, and linguistics concerned with the interactions between computers and human (natural) languages. Many challenges in NLP involve natural language understanding that is, enabling computers to derive meaning from human or natural language input.

Modern NLP algorithms are based on machine learning, especially statistical machine learning. An early example is Murax an open-domain QA system which combined robust linguistic methods with an IR system in order to find answers in an online encyclopedia.

II. METHODOLOGY

NLP techniques employed by QA systems typically include part-of-speech (POS) tagging, named entity (NE) extraction, parsing and query expansion. The best performing systems in TREC evaluations have become increasingly complex, relying on a number of modules using highly-tuned, sophisticated NLP techniques, usually with great manual effort. There have also been many attempts to diverge from the complex linguistic approaches towards more robust, data-driven approaches, exploiting the huge domain coverage and redundancy inherent in web data. Redundancy in web data may be seen as effecting data expansion, as opposed to query expansion techniques and complex linguistic analysis often necessary in answering questions using a small corpus, such as the AQUAINT corpus, containing around 1 million documents.

III. LITERATURE SURVEY

As the symbolic approaches to NLP gave way to more empirically driven research in the 1990s, open-domain QA systems were developed, which relied on more shallow linguistic processing and IR on unstructured data corpora. The availability of large amounts of data, both for system training and answer extraction, logically leads to examining statistical approaches to QA. Several non-linguistic, statistical methods were investigated for what was termed bridging the lexical gap between questions and answers, such as maximum-entropy based query expansion, as well as statistical translation models where the question is considered the source language and the answer the target language.

A statistical translation model is also used in [4] to bridge the lexical gap, but extends the previous mentioned work by formulating the answer extraction problem in terms of a noisy channel model. In [4] a maximum-entropy based classifier using several different features was used to classify answers as correct or incorrect. A statistical noisy-channel model was used in [6] in which the distance computation between the query and the candidate answer sentences is performed in the space of parse trees.

In this paper we present a QA approach which, of the mentioned works, is most similar to [4] and the re-ranker. We take a statistical, noisy-channel approach and treat QA as a whole as a classification problem. We present a fully data-driven mathematical model for estimating the probability of a candidate answer given a question. In doing so we largely remove the need

for ad-hoc weights and parameters that were a feature of many TREC systems. Our motivation is the rapid development of data-driven QA systems in new languages where the need for highly tuned linguistic modules is removed. Apart from our mathematical model for QA, the main difference between our approach and many contemporary approaches to QA is that we only use word tokens in our system and do not employ NE extraction or any other linguistic information, e.g. from semantic analysis or question parsing; nor do we use hand-crafted or annotated lexical resources such as WordNet.

IV. SYSTEM ARCHITECTURE

A typical state-of-the-art QA system architecture has a question analysis module which processes a question posed by the user. It constructs a query that is used by an IR module, as well as answer type information that is used by an AE module. The IR module retrieves documents or passages from a corpus, e.g. a newspaper corpus or the World Wide Web, and passes them to the AE module. Ideally the retrieved question and answer type information, answer hypotheses are extracted and presented to the user as a ranked list. The architecture of our QA

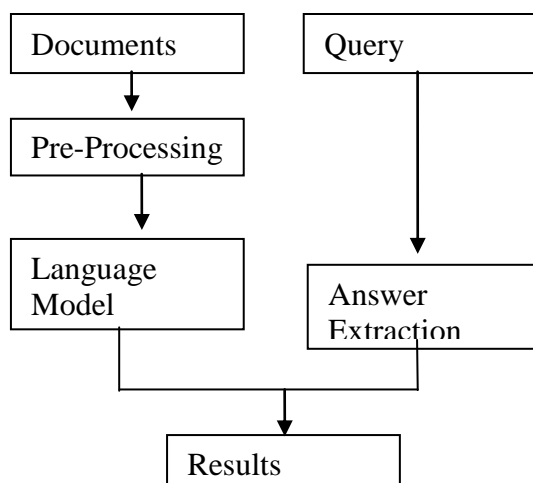


Fig.1 Architecture of our QA system

System is shown in Fig. 1 follows this pattern closely, although it doesn't have a separate question analysis module. Question processing is an integral part of the IR and AE modules and only involves tokenization and removal of stop-words. Moreover, answer type analysis is not explicitly performed, but implicitly done in the AE module.

In the AE module candidate answers are extracted from the retrieved text. These candidate answers are then ranked according to the probability of the candidate answer A given the question Q . The next section explains in detail how this probability is estimated.

V. PREPROCESSING

In this phase of the Project, document collections are pre-processed in order to remove stopwords and to store other words

in dictionary. This process is repeated for queries also. A stop list which contains a minimum of 500 words is used for pre-processing the document collections and queries. A dictionary is maintained for storing and updating the number of words which are not stopwords, for further processing.

VI. LANGUAGE MODEL GENERATION

The Statistical Language Model mainly concerns on a probabilistic distribution over a word sequences. It provides a principled way to quantify the uncertainties associated with the natural language. After the pre-processing process language model is generated for each and every document. That is for every words present in a document a probabilistic value is assigned.

$$P(t|D) = P(t|\theta_D) = \frac{t_{f,t,D}}{N_D} \quad (1)$$

VII. ANSWER EXTRACTION

It is the most important phase of the project in which the documents which are relevant to the given query will be extracted from the document collections. This process is done by generating language model for both query and document collections and the value of query is compared against every document. The document whose value is higher than any other document will be ranked as one and other documents are ranked vice versa..

We consider the dependence of an answer A on the question Q , where each is considered to be a string of $|A|$ words $A = (a_1, \dots, a_{|A|})$ and $|Q|$ words $Q = (q_1, \dots, q_{|Q|})$, respectively. In particular, we hypothesize that the answer A depends on two sets of features $W = W(Q)$ and $X = X(Q)$ as follows:

$$P(A|Q) = P(A|W, X),$$

where $W = \{w_1, \dots, w_{|W|}\}$ can be thought of as a set of $|W|$ features describing the "question-type" part of Q such as *when*, *why*, *how*, etc. and $X = \{x_1, \dots, x_{|X|}\}$ is a set of $|X|$ features comprising the "information-bearing" part of Q , i.e. what the question is actually about and what it refers to.

$$Score(Q, D) = P(Q, \theta_D) = \prod_{i=1}^n P(q_i|\theta_D)$$

VIII. EXPERIMENT

For our experiments we use the factoid questions from the TREC QA tracks. Text processing of corpus, web data, questions and answers is intentionally minimal; it involves only removing unnecessary mark-up and CACM datasets for searching documents. By using the query sets documents are ranked and listed. In our experiment, ranked documents are listed. The precision and recall values are calculated for the listed documents and a graph is drawn based on these values.

	D1	D2	D3	..	D10
Precision	0.0065	0.004	0.0023		0.0001
Recall	0.04	0.06	0.08		1

IX. CONCLUSION

In this paper we have presented a statistical, fully data-driven Question Answering system. A mathematical model for Answer Extraction was derived, which estimates $P(A|Q)$, the probability of an answer candidate A given a question Q, and is decoupled into two independent models: a retrieval model and a filter model.

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Aspect Oriented Business Process Model For Exceptional Flows in Business Processes

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Abstract- The increasing transparency and accountability of all organisations, including public service and government, together with the modern complexity, penetration and importance of ITC (information and communications technology), for even very small organisations nowadays, has tended to heighten demand for process improvement everywhere. This means that Business Process Modelling is arguably more widely relevant than say Time and Motion Study or Total Quality Management (to name two earlier 'efficiency methodologies') were in times gone by. Put simply Business Process modelling aims to improve business performance by optimising the efficiency of connecting activities in the provision of a product or service. Business Process Modelling techniques are concerned with 'mapping' and 'workflow' to enable understanding, analysis and positive change. Diagrams - essentially 'flow diagrams' - are a central feature of the methodology.

Index Terms- Business process modelling (BPM), exception handling, ontology, semantic annotation.

I. INTRODUCTION

SEMANTIC business process management [1], aims to improve the level of automation in the specification, implementation, execution, and monitoring of business processes by extending business process management tools with the most significant results from the area of the Semantic Web. When the focus is on process modelling, i.e., the activity of specification of business processes at an abstract level (descriptive and non executable), annotating process descriptions with labels taken from a set of domain ontology's provides additional support to the business analysis.

A crucial step in process modelling [2] is the creation of valid and robust diagrams that not only comply with the basic requirements of the process semantics but also satisfy the properties that are related to the domain-specific semantics and are able to care about exceptional behaviours as well as verify their correct management. Exceptional behaviours [3] and verifying their correct management, in fact, is one of the key factors that contribute to the process robustness [4].

II. METHODOLOGY

The aspect-oriented programming (AOP) literature [5] has widely investigated this problem for general-purpose language

by proposing a solution that is based on the separation of exception-handling concerns by means of their modularization into aspects [6]. An *aspect* is a module that encapsulates a secondary behaviour of a main view.

Taking advantage of the separation of concerns, designers can deal with aspects (which specify, for example, exceptional behaviours) separately and independently from the main view (e.g., the "happy" path). If needed, aspects can be added to the principal perspective in a weaving phase, thus generating the "woven" (integrated) process.

The weaving is performed by exploiting the information about the concern location that is specified in the aspect itself by using both the process and the domain-specific semantic information. The main purpose of this paper is to support designers in the modelling phase by proposing the "aspectization" of requirements, which crosscut a business process modelling notation (BPMN) [7] annotated process, with particular emphasis on exception handling.

III. EXAMPLE USED

Here the aspect-oriented programming (AOP) literature [6] has widely investigated this problem for general-purpose languages by proposing a solution that is based on the separation of exception-handling concerns by means of their modularization into aspects [7]. Taking advantage of the separation of concerns, designers can deal with aspects (which specify, for example, exceptional behaviours) separately and independently from the main view.

If needed, aspects can be added to the principal perspective in a weaving phase, thus generating the "woven" (integrated) process. The weaving is performed by exploiting the information about the concern location that is specified in the aspect itself by using both the process and the domain-specific semantic information.

The main purpose of this paper is to support designers in the modelling phase by proposing the "aspectization" of requirements, which crosscut a business process modelling notation (BPMN) annotated process, with particular emphasis on exception handling. 1) The server side, which is represented by the online Shop pool and describes the online buying process from the point of view of the shop, and 2) the client side, which is represented by the Customer pool and describes the process from the point of view of the buyers.

IV. SPECIFICATION OF PROCESS REQUIREMENTS

To ensure that relevant process requirements are satisfied, we make use of constraints. In our previous study, we have introduced two kinds of constraints: merging axioms and structural constraints. Merging axioms, whose formalization is denoted by MA (BPMNO, BDO), are not directly relevant to the purpose of this paper, and their description is, therefore, omitted. Structural constraints are the expressions used to state specific properties that relate to the structure of the process under construction.

In business processes, exception handling represents a typical example of crosscutting concern. The exception handler can be tangled in different scattered points of the process, thus increasing the process complexity, when explicitly managed. Hence, though processes meeting exception-handling requirements have higher robustness (see [4]); Aspects provide a possibility to take out the complexity that is added to the the exception handling. Aspects can then be woven only when needed, e.g., for the constraint verification of the whole process.

V. EXPERIMENTAL EVALUATION

We performed some experiments in order to provide a first evaluation of the performance of semantic reasoning techniques That is used to support the management of exception handling over annotated BPD. In particular, the goal of the evaluation was to provide an estimate of the impact on the BPM activities of 1) checking the consistency of the BPKB; 2) transforming an annotated BPD into an OWL Abox; 3) checking constraints verification over the BPKB; and 4) weaving the aspects in the BPKB. This extends the preliminary evaluation that we presented In [16], in which only the time for computing the consistency (and classification) of the BPKB was considered.

The first experiment consisted of five phases, which are organized as follows. First, we checked the consistency of the Tbox of the BPKB (*consistency phase*). Second, we ran the population tool to transform an annotated BPD into an OWL Abox (*Population Phase*). Third, we validated the BPKB against the constraint considered, to check whether the given process satisfied the requirement or not (*validation phase I*).

Fourth, once the appropriated aspect handlers have been selected for the process concerns violating the requirements, we ran the aspectization tool to weave the aspect parts into the main process

In the BPKB (*aspectisation phase*). Finally, we validated again theBPKB against the constraint considered to check whether the process, which is integrated with the woven parts, satisfied the exception-handling requirement imposed on the process (*validation phase II*). The reasoning tasks required in each phase have been performed with the support of the Pellet reasoned (v2.0.2), which is integrated with the Pellet IC Validator (v0.4) for the constraint validation tasks.

VI. CONCLUSION

We have presented an ontology-based aspect oriented approach to manage exceptional flows and exception handling in business process models. Our approach includes both the

specification of exception-handling mechanisms as separate aspects (that can be woven, if needed, into the main process) and the automated verification of specific constraints, thus describing the desired exception management.

For the aspect definition, we have proposed a visual language to support designers in separating exceptional behaviours from about the domain (e.g., policies for the management of exceptional flows), and the process structure and semantics, are formalized in DL and verified via DL reasoners. In our future research, we will investigate in more detail the generic and reusable classes of constraints for exception handling patterns and their formalization. We will also study how to simplify the tasks of requirement specification and checking by means of user-friendly notations and tools. Finally, we intend to validate our approach further on additional case

Our study represents an extension of the existing literature in which we provide an ontology-based approach that supports automated verification of semantic constraints about BPMN process entities And structure, their relations with domain-specific concepts, as well as the way exceptions are handled.

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Sensor Based Smart Home System

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Abstract- In the first instance it aims to provide an overview addressing the state-of-the-art in the area of activity recognition in Smart homes. Smart homes are augmented residential environments equipped with sensors, actuators and devices. In early method, they used data-driven approaches only for sensor data in this paper introduces a knowledge-driven approach to real-time, continuous activity recognition and describe the underlying ontology-based recognition process. We analyze the characteristics of smart homes and Activities of Daily Living (ADL) upon which we built both context and ADL ontologies. We will concern ourselves with one type of stochastic signal model is hidden markov model for recognition process.

Index Terms- Smart homes, ADL, activity recognition, ontology

I. INTRODUCTION

A convergence of technologies in machine learning and pervasive computing as well as the increased accessibility of robust sensors and actuators has caused interest in the development of smart environments to emerge. Furthermore, researchers are recognizing that smart environments can assist with valuable functions such as remote health monitoring and intervention.

The need for the development of such technologies is underscored by the aging of the population, the cost of formal health care, and the importance that individuals place on remaining independent in their own homes.

To function independently at home, individuals need to be able to complete Activities of Daily Living (ADLs) such as eating, dressing, cooking, drinking, and taking medicine.

Automating the recognition of activities is an important step toward monitoring the functional health of a smart home resident. When surveyed about assistive technologies, family caregivers of Alzheimer's patients ranked activity identification and tracking at the top of their list of needs.

In response to this recognized need, researchers have designed a variety of approaches to model and recognize activities. The generally accepted approach is to model and recognize those activities that are frequently used to measure the functional health of an individual.

However, a number of difficulties arise with this approach. First, there is an assumption that each

Third, to track a predefined list of activities, a significant amount of training data must be labeled and made available to the machine learning algorithm.

Because individuals perform activities differently due to physical, mental, cultural, and lifestyle differences, sample data need to be collected and labeled for each individual before the

learned model can be used reliably to track the individual's activities and functional well-being.

Unfortunately, collecting and labeling such sensor data collected in a smart environment is an extremely time-consuming task. If the individual is asked to participate by keeping track of their own activities over a period of time, the process is additionally obtrusive, laborious, and prone to self-report error.

II. METHODOLOGY

In this paper, we introduce an unsupervised method of discovering activities in a smart environment that addresses the above issues. We implement our approach in the context of the CASAS Smart Home project by using sensor data that are collected in the CASAS smart apartment testbed.

The unsupervised nature of our model provides a more automated approach for activity recognition than is offered by previous approaches, which take a supervised approach and annotate the available data for training. Compared to traditional methods for activity recognition which solely utilize HMM or other models for recognizing labeled activities, our approach first "discovers" interesting patterns of activity, and then, recognizes these discovered activities to provide a more automated approach.

We introduce a unique mining method for discovering activity patterns, along with a clustering step to group discovered patterns into activity definitions.

For the recognition step, we create a boosted version of a hidden Markov model (HMM) to represent the activities and their variations, and to recognize those activities when they occur in the smart environment.

III. RESULTS

A. Figure

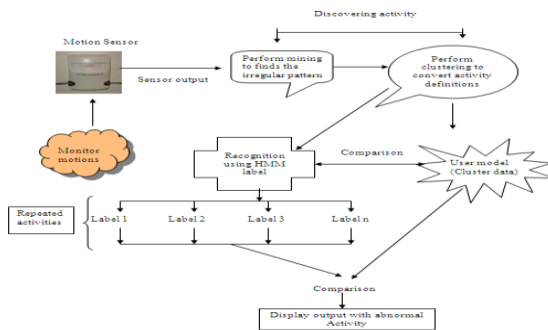


Fig. 1. Recognition activities in a smart environment

References

Activity recognition approaches can be generally classified into two categories. The first is based on the use of visual sensing facilities, [1]. Camera-based surveillance systems, to monitor an actor's behavior and environmental changes. The approaches in this category exploit computer vision techniques to analyze visual observations for pattern recognition. [2].

The second category is based on the use of emerging sensor network technologies for activity monitoring. The sensor data are analyzed using data mining and machine learning techniques to build activity models, which are then used as the basis of activity recognition. In these approaches, sensors can be attached to an actor under observation—namely wearable sensors, or objects that constitute the activity environment—namely dense sensing. [3]. Wearable sensors often use inertial measurement units and RFID tags to gather an actor's behavioral information. This approach is effective for recognizing physical movements such as physical exercises. In contrast, dense sensing infers activities by monitoring human-object interactions through the usage of low power and low-cost sensors.

Abbreviations and Acronyms

- ADL - Activities of Daily Living
- HMM - Hidden Markov model
- RFID - Radio-Frequency Identification

E. Algorithm and techniques

Activity discovery method performs **frequent sequence mining** using DVSM to discover frequent patterns, and then, groups the similar discovered patterns into clusters. We use DVSM to find sequence patterns from discontinuous instances that might also exhibit varied-order events. As an example, DVSM can extract the pattern ha; bi from instances fb; x; c; ag;

fa; b; qg, and fa; u; bg, despite the fact that the events are discontinuous and have varied orders.

It should be noted that our algorithm is also able to find continuous patterns by considering them as patterns with no discontinuity. Our approach is different from frequent item set mining because we consider the order of items as they occur in the data. Unlike many other sequence mining algorithms, we report a general pattern that comprises all frequent variations of a single pattern that occur in the input data set D. For general pattern a, we denote the variation of the pattern as ai, and we call the variation that occurs most often among all variations of the prevalent variation, ap. We also refer to each single component of a pattern as an event (such as a in the pattern ha; bi).

CHAMELEON uses k-nearest neighbor graph approach to represent its objects. This graph captures the concept of neighborhood dynamically and results in more natural clusters. The neighborhood is defined narrowly in a dense region, whereas it is defined more widely in a sparse region.

IV. CONCLUSION

Activity recognition is becoming an increasingly important determinant to the success of context-aware personalized pervasive applications. Synergistic research efforts in various scientific disciplines, e.g., computer vision, artificial intelligence, sensor networks and wireless communication. To this end, we introduced an ontology-based approach to activity recognition in this paper. The approach makes use of ontologies for modeling, representation and inference in the lifecycle of activity recognition, ranging from sensor, objects and activities to reasoning and recognition.

We have described the algorithms of activity recognition making full use of the reasoning power of semantic modeling and representation. Compared with traditional approaches, ontological ADL models are flexible and can be easily created, customized, deployed and scaled up. Description reasoning can provide advanced features such as exploitation of domain knowledge, progressive activity recognition and multiple levels of recognition.

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A Comparative Analysis of Association Rules Mining Algorithms

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Abstract- Association rule mining is the one of the most important technique of the data mining. Its aim is to extract interesting correlations, frequent patterns and association among set of items in the transaction database. This paper presents a comparison between different association mining algorithms. All these algorithms are compared according to various factors like type of data set, support counting, rule generation, candidate generation and some other factor .The compared algorithms are presented together with some examples that lead to the final conclusions. Association rules are widely used in various areas such as telecommunication, market and risk management, inventory control etc.

Index Terms- Data Mining, Association rule mining, AIS, Apriori, SETM, AprioriTid, Apriori hybrid.

I. INTRODUCTION

Association rule mining is to find out association rules that satisfy the predefined minimum support and confidence from a given database. The problem is usually decomposed into two sub problems. One is to find those itemsets whose occurrences exceed a predefined threshold in the database; those itemsets are called frequent or large itemsets. The second problem is to generate association rules from those large itemsets with the constraints of minimal confidence. Support and confidence are important measures for association rules. The purpose of Association rule is to find correlation between the different processes, it helps to take decisions and to use the process method effectively.

Generally, an association rules mining algorithm contains the following steps:

- i. The set of candidate k-itemsets is generated by 1-extensions of the large (k -1) itemsets generated in the previous iteration.
- ii. Supports for the candidate k-itemsets are generated by a pass over the database.
- iii. Itemsets that do not have the minimum support are discarded and the remaining itemsets are called large k-itemset.

There are dozens of algorithms used to mine frequent itemsets. Some of them, very well known, started a whole new era in data mining. They made the concept of mining frequent itemsets and association rules possible. Others are variations that bring improvements mainly in terms of processing time. The algorithms vary mainly in how the candidate itemsets are generated and how the supports for the candidate itemsets are counted.

II. ASSOCIATION RULE MINING ALGORITHMS

The problem of discovering association rules was first introduced and an algorithm called AIS was proposed for mining association rules. For last few years many algorithms for rule mining have been proposed. Most of them follow the representative approach of Apriori algorithm. Various researches were done to improve the performance and scalability of Apriori.

III. AIS ALGORITHM

The AIS algorithm was the first algorithm proposed for mining Association rules. AIS algorithm consists of two phases. The first phase constitutes the generation of the frequent itemsets. This is followed by the generation of the confident and frequent association rules in the second phase. The drawback of the AIS algorithm is that it makes multiple passes over the database. Further more, it generate and counts too many candidate itemsets that turn out to be small, which requires more space and waste much efforts that turned out to be useless

k-itemset	An itemset having k items
L_K	Set of large k-itemsets (those with minimum support) Each member of this set has two fields: 1.itemset 2. Support count
C_K	Set of candidate k-itemsets (potentially large itemset) Each member of this set has two fields: 1.itemset 2. Support count
\bar{C}_K	Set of candidate k-itemsets when the TIDS of the generating transactions are kept associated with the candidates

Figure: Notation Table

Consider the database in the fig. and assume that the minimum support is 2 database

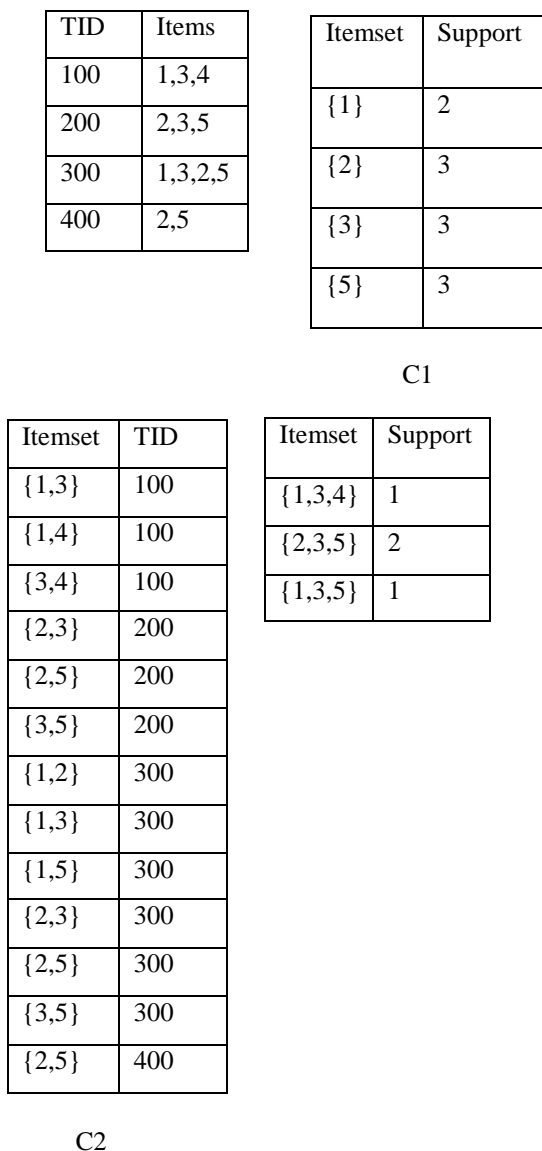


Figure 2: Example OF AIS

IV. SETM ALGORITHM

The SETM algorithm was motivated by the desire to use SQL to compute large itemsets. Like AIS, In SETM algorithm candidate itemsets are generated on the fly as the database is scanned but counted at the end of the pass. It thus generates and counts every candidate itemset that the AIS algorithm generates. However, to use the standard SQL join operation for candidate generation, SETM separates candidate generation from counting. It saves a copy of the candidate itemset together with the TID of the generating transaction in a sequential structure. At the end of the pass, the support count of candidate itemsets is determined by sorting and aggregating this sequential structure.

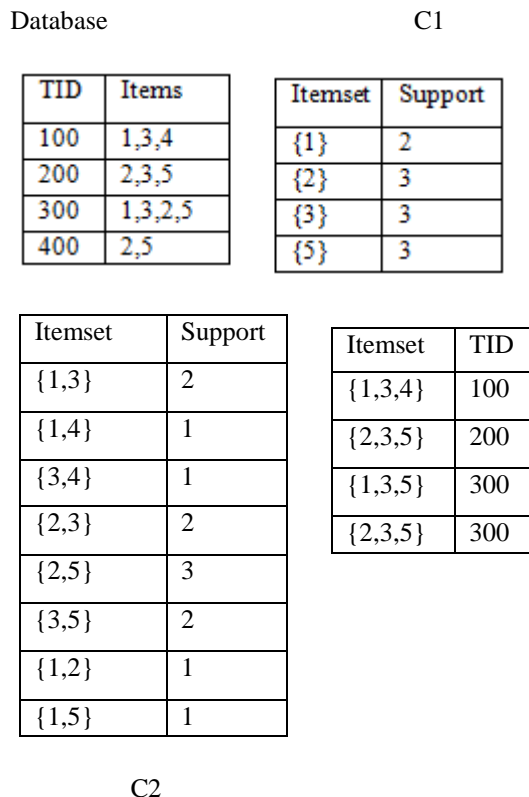


Figure 3: Example of SETM

V. APRIORI ALGORITHM

This pioneering work appeared first in 1994 and remained the standard reference of all algorithms for finding the association rules. It outperformed the previous algorithm by a great margin. The major difference in Apriori was the much less candidate set of itemsets it generates for testing in every database pass. The search for association rules is guided by two parameters: support and confidence. Apriori returns an association rule if its support and confidence values are above user defined threshold values. The output is ordered by confidence. If several rules have the same confidence then they are ordered by support. Thus apriori favors more confident rules and characterises these rules as more interesting. The apriori Mining process is composed of two major steps. The first one (generating frequent item sets) of the apriori algorithm simply counts item occurrences to determine the large 1-itemsets. This step can be seen as supportbased pruning, because only item sets with at least minimum support were considered. The second step is the generation of rules out of the frequent item sets. In this step confidencebased pruning is applied. Rule discovery is straightforward. Consider the database in fig. and assume that minimum support count is 2

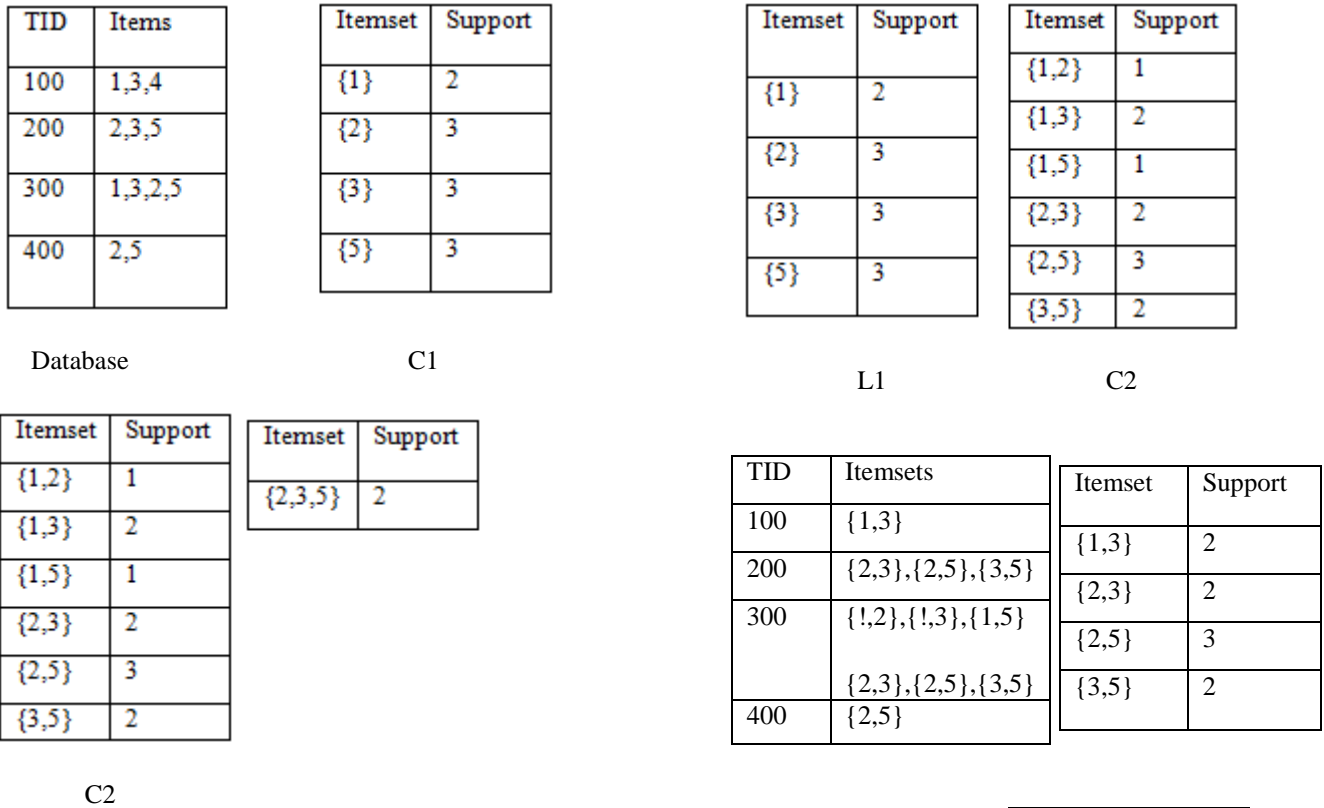


Figure 4: Example of Apriori

VI. APRIORITID ALGORITHM

The AprioriTid algorithm also uses the apriori-gen function to determine the candidate itemsets before the pass begins. The interesting feature of this algorithm is that the database D is not used for counting support after the first pass. It is not necessary to use the same algorithm in all the passes over the data. Apriori still examines every transaction in the database. On the other hand, rather than scanning the database, AprioriTid scans Ck for obtaining support counts, and the size of Ck has become smaller than the size of the database. Based on these observations AprioriHybrid algorithm has been designed. This uses Apriori in the initial passes and switches to AprioriTid Consider the minimum support count is 2

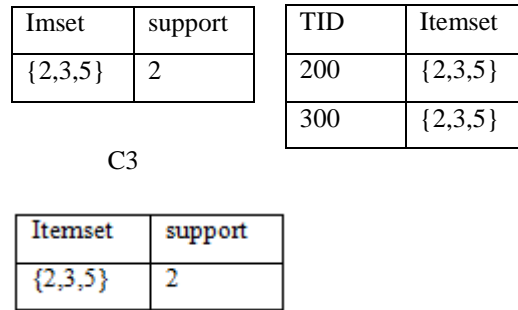
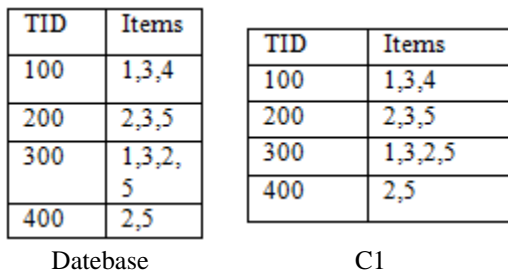


Figure 5: Example of AprioriTid

VII. APRIORIHYBRID ALGORITHM

It is not necessary to use the same algorithm in all the passes over the data. Apriori still examines every transaction in the database. On the other hand, rather than scanning the database, AprioriTid scans Ck for obtaining support counts, and the size of Ck has become smaller than the size of the database. Based on these observations AprioriHybrid algorithm has been designed Figure 7 shows the execution times for Apriori and AprioriTid for different passes. In the earlier passes, Apriori does better than AprioriTid. However, AprioriTid beats Apriori in later passes, the reason for which is as follows. Apriori and AprioriTid use the same candidate generation procedure and therefore count the same itemsets. In the later passes, the number of candidate itemsets reduces However; uses Apriori in the initial passes and switches to AprioriTid in the later passes.

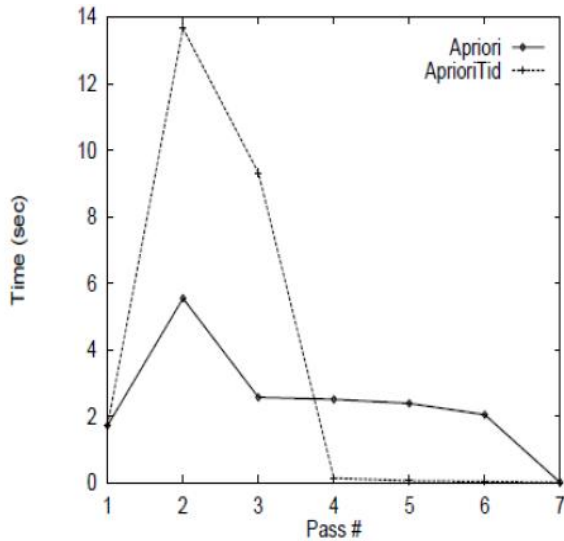


Figure 7: Per pass execution times of Apriori and AprioriTid (min. support=0.75 sec)

VIII. CONCLUSION

This paper represents comparison of five association rule mining algorithms: AIS, SETM, Apriori, AprioriTid and AprioriHybrid. The AprioriTid and AprioriHybrid have been proposed to solve the problem of apriori algorithm. From the comparison we conclude that the AprioriHybrid is better than Apriori and AprioriTid, because it reduced overall speed and improve the accuracy.

Characteristic	AIS	SETM	Apriori	Apriori-Tid	Apriori hybrid
Data support	Less	Less	Limited	Often suppose large	Very large
Speed in initial phase	Slow	Slow	High	Slow	High
Speed in later phase	Slow	Slow	Slow	High	High
Accuracy	Very less	Less	Less	More accurate than apriori	More accurate than apriori-tid

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