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Health Care Analysis Based On Fuzzy Logic Control System

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ABSTRACT

An intelligent decision making system for approximate reasoning that can approximately handle the uncertainty of critical risk for human health using fuzzy logic control system implemented in tool for finding an analysis. In this paper involved to diagnosis the health risk which is related to Blood Pressure, Pulse rate and Kidney function. Level of blood pressure analysed with kidney function by Glomerular Filtration Rate (GFR). Under this concept, fuzzy logic control system proposed to represent the parameters which may cause the risk for human health and analysis by using rule base factor which was implemented in MAT Lab Tool.

Keywords:- *Fuzzy logic control system, measuring the range of Blood Pressure, Measuring the range of Kidney Function, Diagnosis Health risk, Fuzzy Inference System*

I. INTRODUCTION

Data mining is the central step in a process called knowledge discovery in database. Several research areas like artificial intelligence, soft computing, machine learning have contributed to an arsenal of methods. In this paper to provided fuzzy logic control system for analysing risk for health of patient with respective of the kidney function rate, blood pressure value and pulse rate. Fuzzy approaches can play an important role in data mining.

II. FUZZY IN DATA MINING

A. Fuzzy Logic

Fuzzy logic is an Artificial Intelligence technique which has the ability to mimic human mind in terms of approximate reasoning rather than being exact. A Fuzzy Set has values with partial membership along with the crisp values. Fuzzy Sets are useful in establishing conditions which are imprecise in definition through partial membership values. Elements in fuzzy set can overlap, so a given crisp value can belong to multiple fuzzy sets with different membership degrees in each set.

B. Fuzzy Control System

Fuzzy Inference System (FIS) is a process of mapping an Input data and a set of Fuzzy Rules using the Sugeno method. There are the several steps follows in Fuzzy Inference system such as Fuzzification, Rule Evaluation, Rule Aggregation and Defuzzification [1].

Fuzzification is the first step in Fuzzy Inference System. It is the process of mapping a crisp value of an input to membership degrees in different Fuzzy Linguistic variables.

In Rule Evaluation step the antecedent part of the If – Then rules are evaluated using the membership values obtained. Rule Aggregation is a process of unifying the output of the rules fired, for a given set of inputs. Defuzzification is inverse process of Fuzzification. It is the process of combining the fuzzy outputs of all the rules to give one crisp value.

Membership functions are defined for each input and output variable by identifying the degree to which it corresponds to each fuzzy set. Rule Base is a repository of If – Then rules where the antecedent belongs to fuzzy input variables and the consequent belongs to fuzzy output variables. It is also known as Knowledge Base since the expert knowledge is stored in those rules.

In this study, it present a Fuzzy control System for the diagnosis risk factor from the collection of Blood pressure value, pulse rate and kidney function are used as a several parameter to determine risk analysis by fuzzy rule respectively. A typical architecture of FLC is shown below, which comprises of four principal comprises such as a fuzzifier, a fuzzy rule base, inference engine, and defuzzifier.

III. METHODOLOGY FOR MEASURING THE HEALTH RISK

For measuring the health risk analysis based on the given parameter inputs. The inputs are kidney function which was measured by several classification of Glomerular Filtration Rate (GFR) such as Normal, problem started GFR, Below GFR, Moderate GFR, Below Moderate GFR, Damage GFR and Kidney failure. Blood pressure (BP) values also classified by different ranges such as Low normal, Low BP, Very Low

BP, Extreme Low BP, Danger Low BP, Very Danger Low BP, Danger too Low BP, Normal BP, High Normal BP, Border line BP, High BP, Very High BP, Extreme very High BP, Very danger High BP.

The pulse rate was analysed by given Systolic and Diastolic values. Finally risk factor was analysed by blood pressure, pulse rate and analysis by GFR rate of kidney functions.

A. Proposed Method

Fuzzy Logic Control describes the algorithm for process control as a fuzzy relation between information on the condition of the process to be controlled and the control action. The essence of fuzzy control algorithms is a conditional statement between a fuzzy input variable A and a fuzzy output variable B. This is expressed by a linguistic implication statement such as

A→B (condition A implies condition B)

Which is written as

IF A THEN B

There is an equivalency between this expression and the relation obtained by Cartesian multiplication such as

R= A X B ≡ IF A THEN B.

A fuzzy variable is expressed through a fuzzy set, which in turn is defined by a membership function μ. The fuzzy variable may be continuous or discrete.

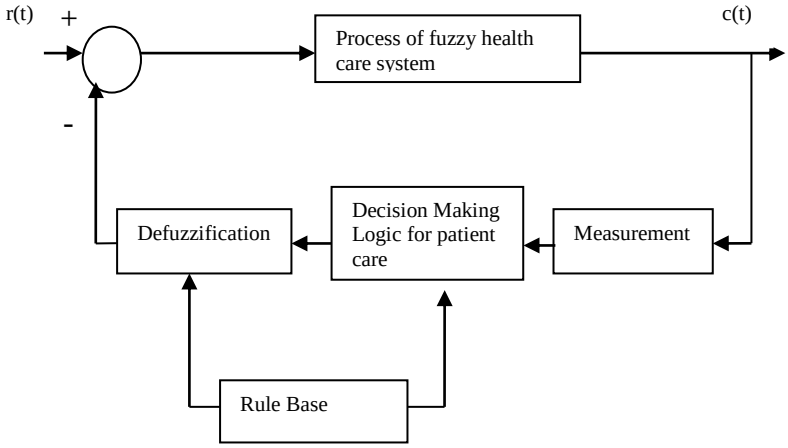

Fig. 2 Methodology for analyzing Kidney Function using Fuzzy Control System

From the figure2, the kidney function was analysed by using Fuzzy control system based on Fuzzy inference system. Under the process fuzzification was handle for first step a proper choice of process state variables and control variables is essential to characterization of the operation of a fuzzy logic control system[6]. In decision making logic, if...Then rule base follow for measuring the membership values obtained. Finally the defuzzification is processed for combining the fuzzy outputs of all the rules to give one crisp value.

IV. IMPLEMENTATION

In this study, the analysis focused on how to design an expert system to diagnosis the risk performed by range taken as Patients participants. Table I and Table II shows the ranges can be evolved to measure the BP, pulse rate and Kidney function as an input for analyse the risk for the patient.

TABLE I. MEASURE THE RANGE OF BLOOD PRESSURE

Comment	Systolic	Diastolic	Pulse
Low Normal	115	75	40
Low Blood Pressure	100	65	35
Very Low children and Athletes	90	60	30
Extreme Low Meds (Syntopes)	80	55	25
Danger Low BP	70	45	25
Very Danger Low BP	60	40	20
Danger too Low BP	50	30	20
Normal Blood Pressure	120	80	40
High Normal	130	85	45
Border Line	140	90	50
Stage 1 High Blood pressure	160	100	60
Stage 2 Very High Blood pressure	180	110	70
Stage 3 Extreme High Blood pressure	210	125	85
Stage 4 Very Danger High Blood pressure	240	140	100

TABLE II. MEASURE THE RANGE OF KIDNEY FUNCTION

Cases	Comment
KIDNEY FUNCTION GFR [Glomerular Filtration Rate]	Normal (> 90)
	Below GFR (80- 89)
	Moderate GFR (45-59)
	Below Moderate GFR (30-44)
	Damage GFR (15-29)
	Kidney Failure GFR<15

First, the linguistic values and corresponding membership functions have been determined. Samples of values and corresponding membership functions for the input Blood pressure are taken as a parameter range is divided into four fuzzy sets, namely, 'low', 'medium', 'high' and 'very high' etc, referred in Table I. The range of values and respective fuzzy sets of blood pressure is given in Table II. The membership functions of fuzzy sets of blood pressure are of triangular and trapezoidal types as shown in fig.3.

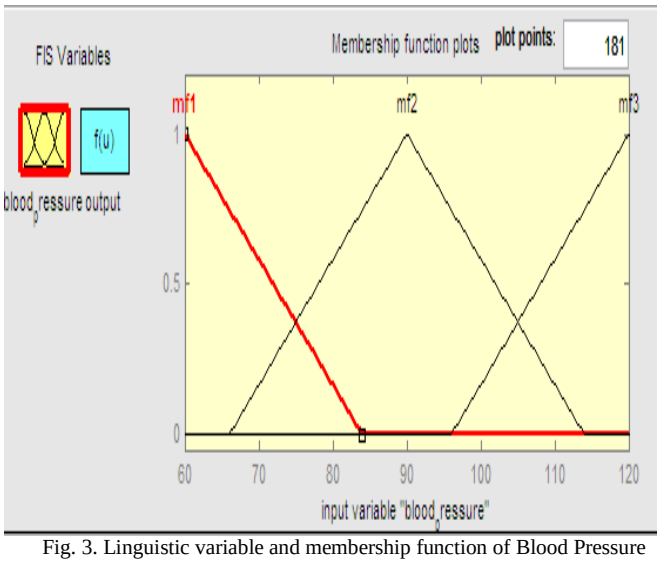

Fig. 3. Linguistic variable and membership function of Blood Pressure

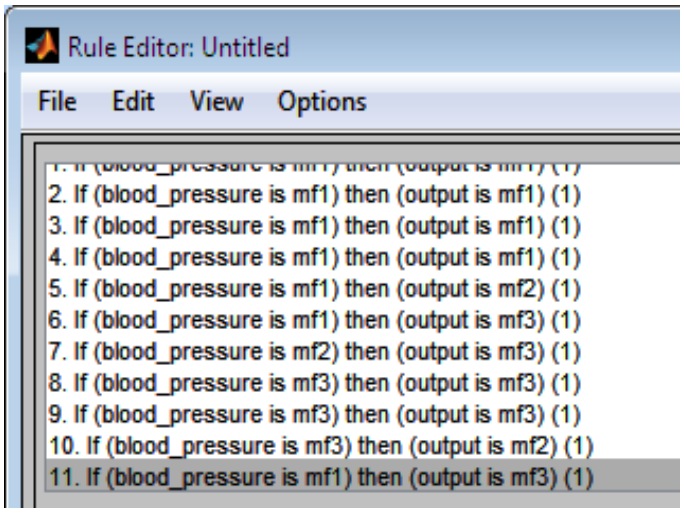

Fig.4. Build a Rule editor

Second, to assigned membership functions to a variables and refer the figure-4, build a rule base in a fuzzy system takes the form If… then rules firing with varied strengths leads to a crisp control action through the process of defuzzification [4] [6].

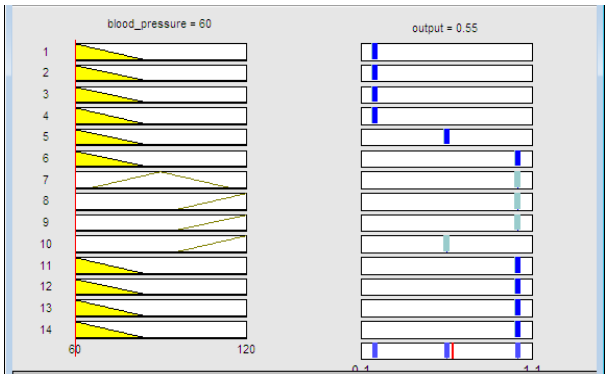

Fig. 5 FIS Rule viewer1

In MATLAB the rule viewer will be evolved, form figure 5, fig-6, fig-7 input of blood pressure is 60 then the output of depression risk will generate as 0.55, if BP is 75 then the risk is 0.591 and If BP is 120 the then risk is 0.833 respectively.

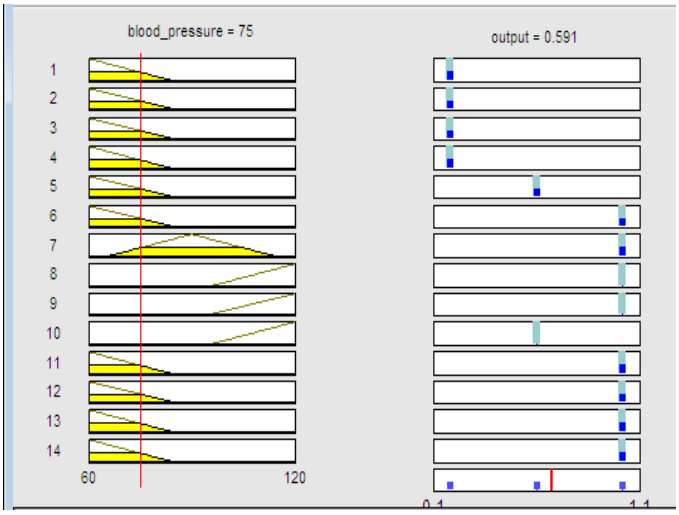

Fig. 5 FIS Rule viewer2

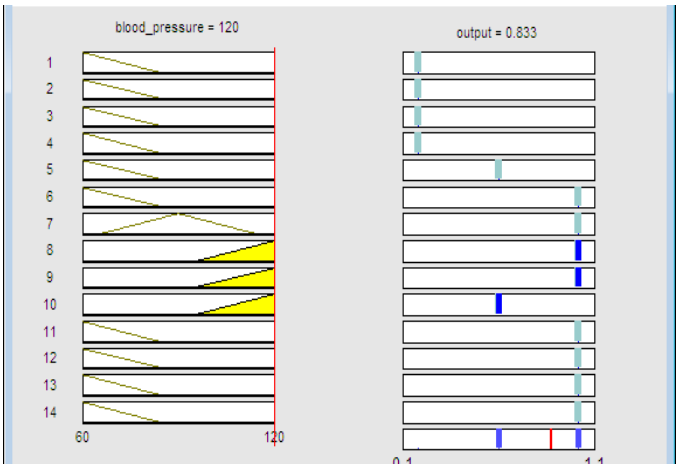

Fig. 6 FIS Rule viewer3

Fuzzy system is used to obtain the severity level which is the only output variable of the system. The risk determines the level of severity of risk given the input of BP values. The fuzzy system provides an objective process for obtaining the depression risk level.

V. RESULT AND DISCUSSION

Risk depression was observed from the given input of linguistic variable of Blood pressure, Pulse rate and kidney functions. The membership functions of fuzzy sets of blood pressure are plotted in MATLAB tool in triangular and trapezoidal type. Fuzzy system takes a whole set of data is loaded into the If ... Then rule and inference strategies are chosen for processing the rule base to determine the risk factor among the blood pressure, kidney function and pulse rate by logical decision making analysis. Through the rule viewer the risk was viewed in the MAT LAB Tool noted in fig 6.

VI. CONCLUSION

This fuzzy system captures all the variations of the symptoms knowledgeable and so, it will be useful to infer the exact stage of patient risk as per the expert's knowledge. This is essentially useful to take proper decision at the right time for giving treatment to the patients immediately. Such risk found to change the life style, food habits, have monitoring from the treatment in future.

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