Image Enhancement of Aerial Images Using Adaptive Gamma Correction: A Review

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***Abstract*- Image processing plays a vital role in phantasm application. It improves the visibility of poor images. Different techniques have been anticipated so far to get better image quality. Image enhancement can selectively enhance and restrain some information about image. It is a method which decreases image noise, eliminate artifacts, and maintain details. Its purpose is to amplify certain image features for analysis, diagnosis and display. The overall objective of this paper is to propose an integrated technique which will integrate the nonlinear enhancement technique with the gamma correction technique. The proposed algorithm is implemented in MATLAB.**

***Keywords*- Image enhancement, human visual perception, Visibility, gamma correction**

I.INTRODUCTION

Image enhancement techniques acting as an important part in image processing. Somebody click image from common environment with elevated dynamic range include both dark and bright regions (aerial images). Due to go outside in dynamic range of human eyes sensing, those image are not easy to differentiate by human eyes. Image enhancement is a general approach to get enhanced quality of those images in terms of human visual observation. There are two techniques for image enhancement one is spatial domain and second is transform domain methods. In spatial domain method an image is enhance by straight dealing with the intensity value in an image. In transform domain enhancement method it transforms the image intensity data into a specific domain by using different techniques like DFT, DCT, etc. Image enhancement is applied in every field where images are ought to be understood and analyzed. For example, medical image analysis, study of images from satellites etc. Image enrichment simply means, transforming an image f into image g using T. (Where T is the transformation). The values of pixels in images f and g are denoted by r and s, respectively. As said, the pixel values r and s are related by the expression,

$$s = T(r)$$

Where T is a transformation that maps a pixel value r into a pixel value s. The outcome of this transformation are mapped into the grey scale range as we are dealing here only with grey scale digital images. So, the outcomes are mapped back into the range [0, L-1], where $L=2^k$, k being the number of bits in the image being considered. The figures below shows an example of image enhancement.

Figure 1 is showing the poor visible input image.

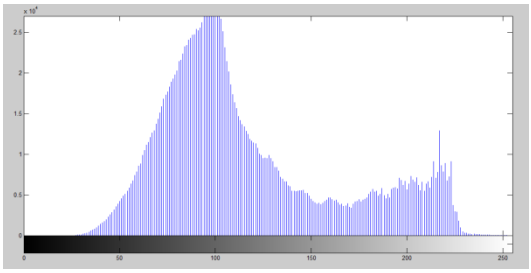

Figure 1(a) is showing the histogram of figure 1.

It is clearly shown in the image that it will not give much information to observers and, it may contain poor results for further processing.

Figure 2 is showing the enhanced image.

It is clearly shown in the figure that all the objects are enhanced and image is now providing quite more information to the observers.

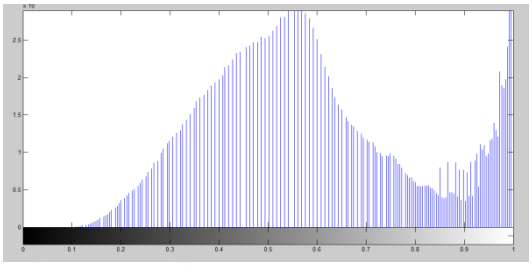

Figure 2(a) is showing the histogram of figure 2.

II.RELATED WORK

Gian Luca Foresti and Carlo Regazzoni presented the problem of extracting and grouping image features from complex scenes is solved by a hierarchical approach based on two main processes: voting and clustering.

Nancy and Sumandeep focuses on spatial domain techniques for image enhancement, with particular reference to point processing methods and on spatial filtering. This paper presents a short description of various image enhancement techniques in order to make familiar with the enhancement of a blurred image, noise removal, setting the brightness, contrast of images. The point processing methods are used primarily for contrast enhancement.

Tanzila Saba, Amjad Rehman and Ghazali Sulong have presented an intelligent approach based on cellular neural network for adaptive noise denoising. Experimental results of proposed intelligent denoising algorithm exhibit high performance in PSNR and visual effect in color images even in presence of high ratio of noise.

Nikesh T. Gadare, Dr. S. A. Ladhake used various methodologies to detect background image with poor lighting condition and to enhance the contrast in grey level images with bad lighting based on Weber's law notion.

III.GAMMA CORRECTION

Aerial images captured from aircrafts, spacecrafts, or satellites usually undergo from lack of clarity, since the atmosphere enclosing Earth has effects upon the images such as turbidity caused by haze, fog, clouds or heavy rain or night effects. The visibility of such aerial images may decrease drastically and sometimes the conditions at which the images are taken may only lead to near zero visibility even for the human eyes. Even though human observers may not see much than smoke, there may exist helpful information in those images taken under such poor conditions. Captured images are usually not the same as what we see in a real world scene, and are generally a poor interpretation of it. High vibrant range of the real life scenes and the limited dynamic range of imaging devices results in images with locally poor contrast.

Human Visual System (HVS) deals with the high dynamic range scenes by compressing the dynamic range and adapting locally to each part of the scene. There are some exceptions such as turbid or night imaging conditions under which acquired images and the direct observation possess a close parity . To deal with the problems caused by the limited dynamic range of the imaging devices, many image processing techniques like gamma correction have been developed.

Gamma correction is nothing but a function that compress the dynamic range of images so that we can view the image more nicely or properly. But why do we need to compress vibrant range?

A best day to day example is during day time when we cannot see the stars, the reason is because the intensity of sun is so large as compared to the intensity of stars that we cannot see the stars in the daytime.Similarly when dynamic range is high in an image then that of the display device we cannot see the image properly. Therefore we can use gamma correction to compress the dynamic range of image.

Gamma correction can be written as $g(x,y) = c * f(x,y)$ and $f(x,y)$ is original image with high vibrant range, $g(x,y)$ is enhanced image. C is a positive constant images. Power-law transformations are useful for general purpose contrast manipulation and for a dark image; an expansion of gray levels is accomplished using this transformation with a fractional exponent. Log Transformation is useful for enhancing details in the darker regions of the image at the expense of detail in the brighter regions the higher-level values.

IV.CONCLUSION AND FUTURE SCOPE

Most of the techniques are useful for altering the gray level values of individual pixels and hence the overall contrast of the entire image. But they usually enhance the whole image in a uniform manner which in many cases produces undesirable results.

There are various techniques available which produce highly balanced and visually appealing results for a diversity of images with different qualities of contrast and edge information and it will produce satisfactory result. The captured images of aerial image always lead to an ambiguity which is the main concern of research. The same concern we have taken in our proposed work to enhance the aerial images with the help of adaptive gamma correction method to improve the quality of the images so that the information contained in them could be extracted in a meaningful sense. The image enhancement quality can be assessed by the Absolute Mean Brightness Error (AMBE), the Discrete Entropy (H) and PSNR to assess the enhancement quality between the dimmed input image and the enhanced image.

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