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CONTRAST LIMITED ADAPTIVE HISTOGRAM EQUALIZATION FOR RETINAL IMAGE

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Abstract

In the field of the medical science, Engineering plays the major role in the part of diagnose the diseases and rectify the problem occur in human body. Mostly affected part in the human eye is Retina and many of the diseases acquired there. May it leads to blindness in eye. Now a days many of techniques used to diagnosis the problem especially fundus photography used for taking photographs the rear of an eye. But it has some of shortcomings such as blurring image, very low contrast and uneven luminescence. To overcome this problem by using Enhancement technique and colour images learned theoretically through generalized setup. Whenever RGB colour space changed to other colour spaces such as LHS, HSI, YIQ, etc., At this stage the gamut problem is arises. To rectify the gamut problem using enhancement technique subsequently followed by adaptive gamma correction. Through this process we can achieve the equalized enhancement of all range of pixels in a colour Image.

Index Terms – fundus photography, Adaptive Gamma Correction, luminescence

I. Introduction

Images which are taken from retina for early stage diagnosis of retinal infection, diseases and the age related eye problems. The visual image is essential for the retinal diagnosis and treatment by improving the accuracy in the interceding procedure. For example visual image are majorly helpful for the doctors to diagnose the eye related problems such as hypertension and cardio disease, it is mostly driven by the fundus camera device it has low luminance, less intensity and does not achieve the clear image.

Blurry image may hide the useful information for diagnosis along the uneven pixel by using the enhancement technique we can easily and rapidly achieve the clear report on images that why they use enhancement technique. By this method doctor diagnose the exact issues and rectify it through their medicines. Many of person and inventors proposed many technique to improve the quality of retinal images. Strickland says about the saturation of retinal colour images with low illumination variation. Later slightly changed that and manipulate component which having spherical frequency and it helps to show the original illumination of output image taken from retina. enhancement it based on stretching decorrelation. RGB colour space are helpful viewing and storing the retinal colour image. In particularly the image processing is essential for eye problem diagnose. Many types of technique available for the eye diagnose such as Image enhancement, Luminosity adjustment, Histogram equalization and our project is based on Adaptive gamma correction with Brightness[11]. Diabetes, Hypertension and vascular disorders are the different kinds of diseases affected the retinal vessels. In the early stage of diabetic retinopathy creates the abnormal in the blood vessels and the radius of vessels are also charges. The different works on vessels classified according to the proposed theory[12] and[18] they proposed the graph based method for the adaptive gamma correction. Three different data base are the results through the testing.

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II.Related works

Here we discuss about the related works of existing algorithm for retinal enhancement. Many of retinal image enhancement had proposed for past many years[1]. They are classified into many groups. Histogram based method[10], retina and wave let transform and others methods. Generally the image edge and detail must be increased for diagnose. So related references said for image edge enhancement. He construct the famous masking technique for the image edge but it has noise is reduced. So then they proposed[18] it performs cubic unsharp using mask in the AUM method [20] but it has the shortcomings to achieve the natural it looks artificially, so they go for the rescaling process to get the best result, [18]therefore we concluded that the many exiting methods about the retinal enhancement methods have the failures in the different issues.

III.Materials and Methods

Our proposed methods consists following steps are Adaptive gamma correction and brightness adjustment. The flow diagram of proposed method in the shown **Fig.1**.

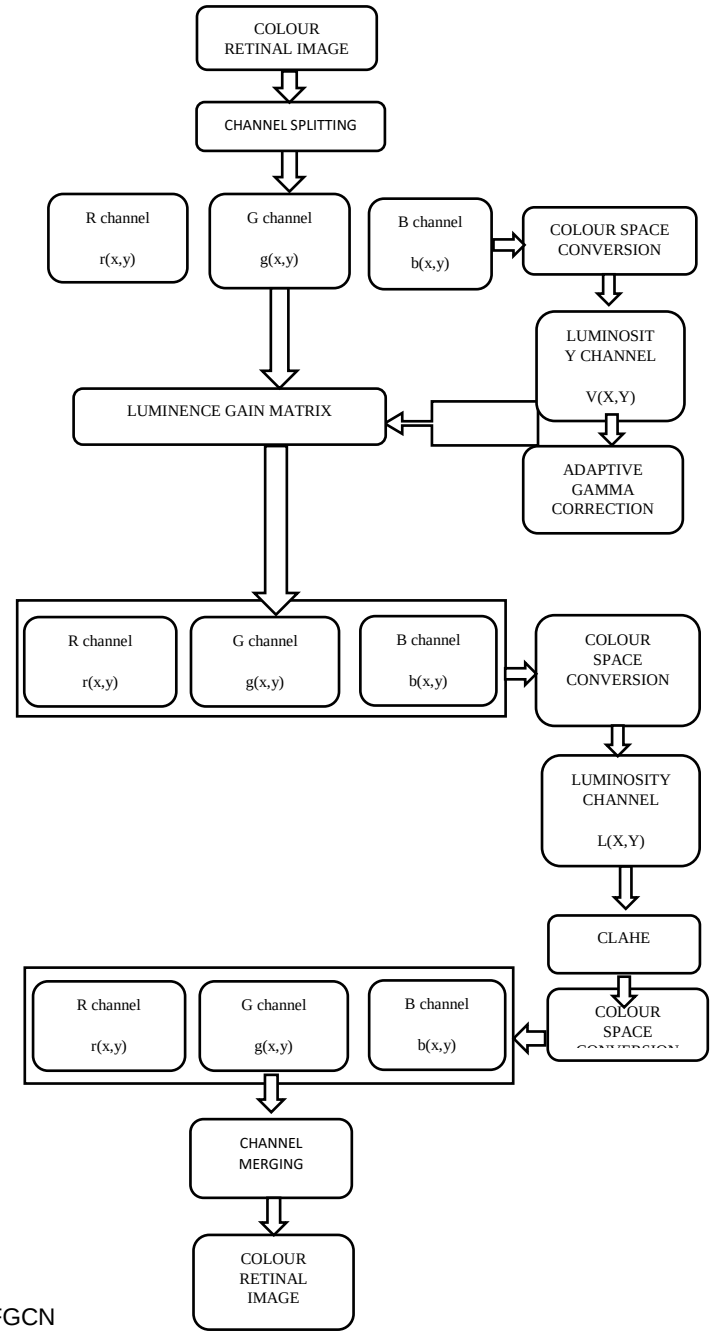

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Fig.1 Flow diagram of colour Retinal image Enhancement

a) ADAPTIVE GAMMA CORRECTION

The mainly to proposed appropriately to enhance the contrast of the retinal image and the limitation of getting the image through devices and mostly the digital images quality may degraded even though many advancement or development in imaging science it does not satisfies depend upon the nature of the image. **Fig.1** The different methods or techniques is used for the different degraded images.

By getting general observation shows the single technique never used for the different image. The different techniques is needed. The image is enhance by two different techniques such Histogram equalization[13] and Adaptive gamma correction[14]. They propose about histogram specification and it increases the contrast and reduced errors significantly. In the EHS used the Gaussian model which is not suitable for the natural image. In the APLT causes the excessive enhancement and ;more details of the image may loss in the different cases. When an image have same background. here are the image showing three types of channels namely RED,GREEN & BLUE.

size max=Lr

size of the image=lr

g-correction : TLr(i,j) = Lr*(lr(i,j)/Lr).^0.5;

Mostly the green channel enhancement achieved the best result when compared to the other two channel our propose idea about the adaptive gamma correction that enhance the image of retinal looks with the highest contrast image for better diagnosis. In the existing system they use all the three channels for the enhancement but we are using the green channel for the better enhancement in the image can achieved through peak signal to noise ratio shown in **Fig. 2**.

psnr1=10*log10(256*256/mse);

MSE = Mean Squared Error

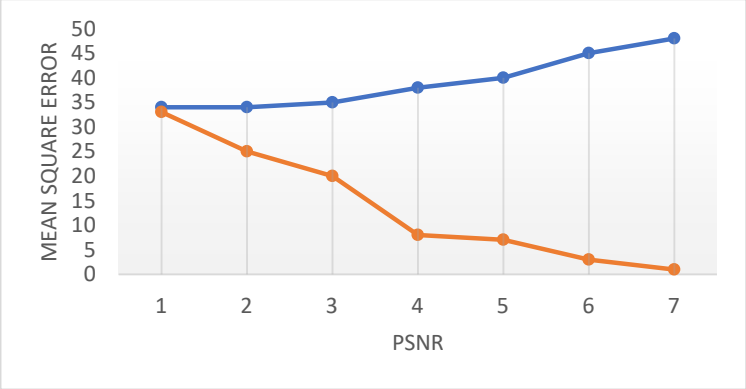

Fig. 2 Graphical Representation of PSNR vs MSE

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b) Contrast Enhancement

The illumination can balance the entire the retinal images with low illumination. Whenever the retinal images has the moderate illumination and image blurry, there will not achieve exact improvement in the image is shown in **Fig.3**.

Fig.3 Differentiation of Original and Contrast Image

c) **Luminosity Enhancement**

The obscure visual perception of retinal Images are the cause of lack and unequal. Luminance lead an undetectable diagnosis to do that we have to enhance the luminance effect. In this process we have prevent the image distortion not the changing the colour in pixel**. Eq.1** We use RGB colour space pixel for view and store the colour retinal Image. The .R,G and B channel contain both the Information of colour and Luminosity. They are linked with each other. We have to adjust the some proportion on R,G and B channels for preserving the colour and to Improve the luminosity. The Luminance Gain Matrix G(x,y) are follow as

$$G(x,y) = \frac{r\prime(x,y)}{r(x,y)} = \frac{g\prime(x,y)}{g(x,y)} = \frac{b\prime(x,y)}{b(x,y)} \text{.....(1)}$$

The enhanced value of the r(x,y), g(x,y), b(x,y) is the r'(x,y), g'(x,y), b'(x,y). Hue and saturation are the two colour components that are developed from luminosity the HSV colour space is transformed from the colour Image to get colour Invariant luminance gain matrix. The luminance gain matrix is

$$G(x,y) = \frac{v\prime(x,y)}{v(x,y)} = \frac{v\prime(x,y)}{\max(r(x,y),g(x,y),b(x,y))} \quad \text{.....(2)}$$

V'(x,y) = Luminance Intensity of pixel of xy plane

1. **Qualitative Assessment**

For this process, initially we take the samples of the image taken from eye or anything but having the problem in the low illumination and other problem such unblur in that **Fig.4** These images are already in other method[10] retinal images having the low contrast having the darkness and having the ore darken pixels. Here the our issues with the low brightness we want to enhance the brightness of the image but we have the problem with creating of the artificial look to images. Whenever the artificial look happens in the particular method. It looks like rubbish only. We it creates a real look to the image it said to a good or efficient method. When the histogram used in the images in create the effects look alike abnormal. Because it has the high intensity changes occurs in the different region. 161 to 255 range of intensity in the histogram effects.

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In the method like histogram equalization the our enhancement occur in the Images but the adaptive gamma correction changes the intensity to the range by this process we getting the better visual for imaging and researching. It are used in image for getting the same result. It creates the perfect images and having minute detail through we examine the problems in the image then we come to the AGC along with weighing distribution it can't create the efficient detail to the image it results the same image getting through the previous method does not have the perfect brightness increment but different image needs the different intensity and range. Histogram equalization is majorly failed in the increasingly the image brightness.

2.Quantitative Measurements

When the rms value is higher in the image it might have better contrast.

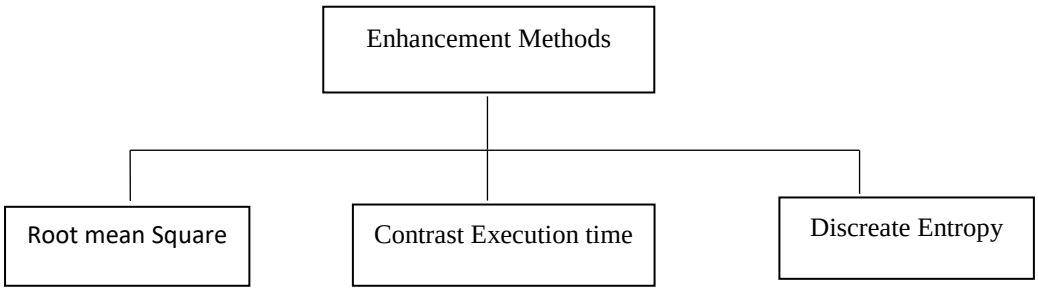

Fig.4 Quantitative Measurement

$$\text{Rms} = \sqrt{\frac{1}{sv}} \sum_{m=0}^{S-1} \sum_{n=0}^{V-1} (\mu - Imn) \quad ...(3)$$

The test images of the input are both dimmed and bright Contrast distorted Images. They can be direct or simulated camera outputs when applying Gamma corrections without the loss generally to the bright and dimmed input images are simulated with the images from kodak[4] and BSD500 standard database. They also conduct the fest for performance comparison. This includes HE[1], HM[4], AGCWD[11], IMADJ(MATLAB function IM adjust)[10] and SECE[6].

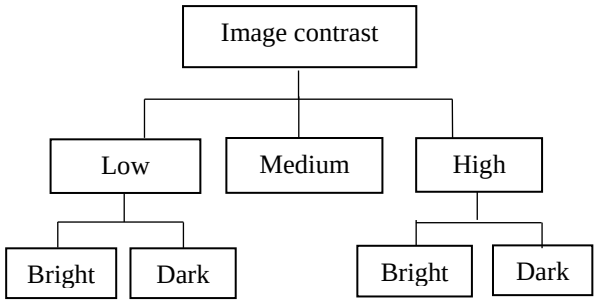

Fig.5 Improving Techniques the Contrast Image

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3. Discrete Entropy

Random variable can measured through the entropy with uncertainty The pixel intensity must be increased naturally or randomly. When the image have the high entropy or low contrast or low entropy of the image can get through the various methods. Mostly create the entropy higher.

IV. Results and Discussion

In our paper proposed that the are classified as the three types we can have the classification in the image appropriate and also having the perfect contrast adjustment in the image and we get the project chanced image. Without doing any of the complicated process. Mostly many of other methods have the more amount of complexity in nature. We just compare the adaptive technique to the other method such as histogram equalization and EHS HMF it having quality of imaging and output.

The assessment of CE algorithms as objective used as the metrics EMEG(Expected Measurement of Enhancement by gradient) it is defined as

$$\text{EMEG(I)} = \frac{1}{v1v2}\sum_{i=1}^{v1}\sum_{j=1}^{v2} \quad \frac{1}{255}\max\left(\frac{I_{i,j}^{dx,h}}{I_{i,j}^{dx,l}}, \frac{I_{i,j}^{dy,h}}{I_{i,j}^{dy,l}}\right) \quad \ldots..(4)$$

Above equations explains here through Input image I is classified into k1,k2 overlapping sub blocks $I_{i,j}$ of size 8x8 pixels,

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = \begin{pmatrix} 0.4124 & 0.3575 & 0.1804 \\ 0.2126 & 0.7151 & 0.0721 \\ 0.0193 & 0.1191 & 0.9502 \end{pmatrix} \begin{pmatrix} r(x,y) \\ g(x,y) \\ b(x,y) \end{pmatrix} \quad \ldots.(5)$$

The absolute row based block derivate of highest and lowest values are $I_{i,j}^{dx,h}$, $I_{i,j}^{dx,l}$ while column based ones are $I_{i,j}^{dx,h}$, $I_{i,j}^{dx,l}$.

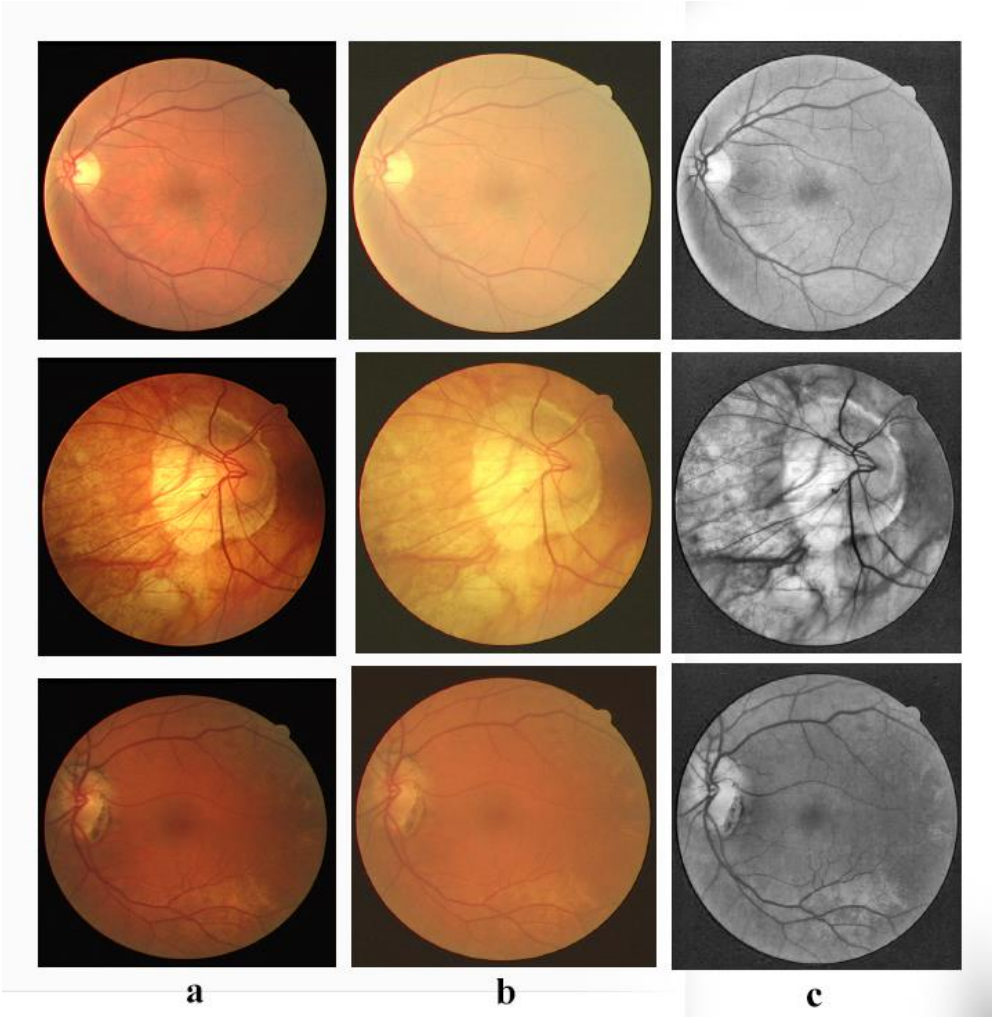

Fig.6 Procedure for Colour retinal Image for Proposed method (a) Original Image Data Sets (b) Adaptive Gamma Corrected Image c) Enhancement of Green Channel

V.Conclusion

Here our paper proposing a very simple and special technique for contrast enhancement for the image taken from retina using the adaptive gamma correction. In **Fig.5** we explains the output through this method consists of the pleasant enhancement for the retinal image. Compare the other methods Adaptive continuously change the parameters of the above methods. But Adaptive Gamma Correction have more Efficient in the contrast enhancement in many luminance condition. Additionally we using the brightness along with contrast enhancement is used for retinal image results in the images. It is achieve by the contrast and brightness increment though our proposing method. To done this proposal is based on the adaptive gamma correction with brightness increment. It change the characteristics of the given input by transform on intensity of that. We go through the all other method we find something in new and interesting to enhance the image through our method or tool of AGC mostly it act the smart in the darken areas with local regions. They concluded two classification of brightness in he earth in our real life. The over exposure and another one is under exposure mostly those over exposure is mostly might change to the bleach. But through our method we can reduced the over exposure and under exposure simultaneously. If we eliminated the brightness from proposed system it failed for global system of images and under exposed image. So finally our proposed system satisfies the both region of the images. By our proposed system we got the good results.

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