

A Combined Effect of Local and Global Method for Contrast Image Enhancement

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Abstract— Image enhancement is used to improve the digital quality of image. It is used to improve the poor quality of image that is too used to improve bad quality of picture into good picture or image. This paper suggests a combination of local and global method for contrast image enhancement. Global contrast image enhancement improves low contrast of image in a global way. This type of global enhancement avoids noise and other ringing artifacts of a digital image. In global contrast image enhancement when high contrast occurs it causes under exposure on some part of image and over exposure on some other part of an image. Global contrast image enhancement has much advantage but it lack in local enhancement of image means it lacks the local detail of an image. When we use local detail of an image, the local detail of an image can be defined in better way. Local contrast image enhancement increases noise of an image when high contrast gain occurs. When we use global contrast image enhancement or local contrast image enhancement single handedly it is not beneficial but when we use combination of local and global method it gives us better results for certain images. In this paper we will going to use global contrast stretching method for global contrast image enhancement .In local contrast image enhancement method we are using unsharp masking technique to enhance the local detail of an image. The main aim of using this combination of local and global method is to preserve the brightness of an image when contrast image enhancement is done.

Keywords— *Contrast Stretching; Global Contrast Image Enhancement; Local Contrast Image Enhancement; Unsharp masking.*

I. INTRODUCTION

Image is a discrete space made up of small elements called pixel. Each pixel represents intensity value at each position [1]. A digital image can be captured with different devices such as a camera, an MRI machine and also with sensors that consume light intensity [1]. There are two types of an image gray scale image and color image [1].

Image enhancement is a process which changes the pixel's intensity of the input image so as to make the output image looks better [1].Image enhancement technique has been proposed in many application of image processing where subjective quality of image is most important and objective quality of image is depended on application circumstances[1].

The aim of image enhancement is to recover the interpretability or perception of information contained in the image for human viewers, or to deliver a “better” input for other automated image processing systems [1].

Contrast enhancement is acquiring clear image through brightness intensity value redistribution [2]. In other words, that is enhancing features as stretching interval between dark and brightness area [2]. Enhanced image which was result of contrast enhancement processing in preprocessing stage will provide clear image to eyes or assist feature extraction processing in computer vision system [2]. Contrast factor is one of the factors of low or good quality images [2]. An image cannot be said to be of good quality when it has very low contrast or too high contrast [2]. However, the quality of low contrast images can be improved by using global contrast enhancement or local contrast enhancement [2]. Low contrast image can be improved in its quality globally by using global contrast enhancement and the information is more defined globally as compared to the original image [2]. And the quality of low contrast image can be improved regionally by using local contrast enhancement and the local details are shown more distinctly as compared to the original image [2].

Contrast stretching is one of the image enhancement technique .It attempts to improve the contrast in an image by stretching the range of the intensity values it contains to span a desired range of values [4]. The full range of pixel values that the image type concerned allows Contrast Stretching changes the distribution and range of digital numbers assigned to each pixel in an image [4]. This is normally done to accent the details that are difficult for human viewer to observe [4]. Contrast stretching is the image enhancement technique that is commonly used for medical images [4]. Contrast stretching process plays an important role in enhancing the quality and contrast of images [10].

Unsharp masking (USM) is an image sharpening technique. The unsharp name derives from the fact that the technique will going to use unsharp or blurred image to create a mask of the original image[6]. The unsharp mask is then mix with the negative image that create an image that is less blurry than the original [6]. The resulting image will be clearer than original image. In the context of signal processing an unsharp

mask is generally a linear or nonlinear filter that amplifies the high-frequency components of a signal [6].

II. LITREATURE SURVEY

Gaurav Garg and Poonam Sharma *An Analysis of Contrast Enhancement using Activation function* [3]. This paper studies various activation functions such as sigmoid function, Ramp function, Hyperbolic Tangent Function and many function are used for contrast image enhancement. Activation function is mostly used in neural networks. These activation functions are successfully studied over bright and dark region.

Dr Vijay Dhir and Sanjeev kumar *Review of various Contrast Image Enhancement Technique* [7]. This paper studies various contrast image enhancement technique. This various technique will going improve the contrast of an image so that image will look good. There are so many contrast image enhancement technique that we will going to study in this paper they are Convolution Mask ,Linear Contrast Stretching , Histogram equalization, Adaptive Histogram Equalization and Enhancement by Point Processing. The main aim of this paper is preserve input mean brightness of an image when contrast image enhancement procedure is done on that image.

Jaspreet Kaur and Amita Choudhary *Comparision of Sevral Contrast Stretching method on Acute Leukemia Image* [4]. This paper focuses on various contrast stretching methods such as local ,global ,partial, bright and dark contrast stretching methods. The comparison of all this method studied in this paper to find out which one is best to enhance and study acute leukemia image in better way.

Archana Singh and Neeraj Kumar *A Comprehensive method for Contrast Image Enhancement based on Local and Global Contrast and Local standard Deviation* [8]. This paper studies global and local method for Contrast image Enhancement .This paper study this two method in which researcher found that this two are not sufficient to enhance an image when image has some contrast area and it is not possible to perform any type of transformation on it. This paper proposed and study a novel method to remove the divided by zero condition that arises due to local standard deviation of that contrast area to enhance the image in more suitable way.

Prasad Nagelli,Venkath Reddy, BTR Naresh Reddy *Blurred Image Enhancement using Contrast Stretching ,Local Edge Detection and blind decovolution* [9]. This paper is research work to avoid the problem which will occur in blurred image .Blurred image is a common problem observed in the situation when object is in motion or when we will going to shoot a video. Three method are presented here in this paper to avoid the problem of blurred image. Contrast stretching process is used to deblurred image. Local edge detection method is applied on original as well as blurred image. Both the image edges are fused to obtain sharp edges

of an image as an output. Fused image distortion is unknown so blind deconvolution technique is applied to obtain final output.

III. METHODOLOGY

A. Proposed Approach

The combination of local and global method is used on 2D histogram. 2D histogram consist of two or more than that channel. 2D histogram is made up of RGB values. The pixel intensity as well as statistics of color has to maintain when we work on combination of local and global method. In this work we combine local as well as global method for contrast image enhancement to preserve the brightness. The fact is that when contrast occurs image lose its brightness to avoid this we are trying to develop new method. We are using local Contrast Stretching method for local feature enhancement of an image. Local contrast stretching is used to sharpen the edges. It is used to enhance the local details of an image. In local contrast Stretching we will going to use unsharp masking technique.

We use global contrast stretching for global contrast image enhancement of an image. This two method are combined by using combination of local and global method. First on input image local contrast stretching process is applied. The output which we obtained from local contrast stretching is applied as input to global contrast stretching method. The output which we obtained from global contrast stretching is final output. The objective analysis is done on the whole system by calculating the brightness factor on every stage. The brightness factor of input image and output image is enhanced from that we conclude that system work properly. The aim of our work is fulfilled that when contrast increase image will not going to lose its brightness it will be preserved and it increase not decrease.

B. System Architecture(flowchart)

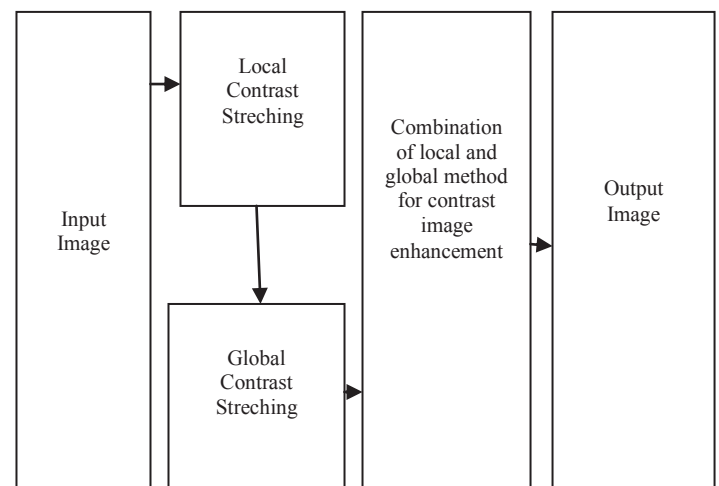


Fig.1. System Architecture

C. Implemented Part

- Global Contrast Image Enhancement

To perform global contrast image enhancement method we are using global contrast stretching method. Global Contrast stretching is a simple image enhancement technique that changes the range of pixel intensity values. This method enhances the pixel intensity into desired range. For global contrast stretching a new upper and lower pixel value is needed to be predicted so that image got normalized. The concept of maximum and minimum value is to be deciding the maximum pixel intensity value and minimum pixel intensity value that we will going to use while executing process. The Contrast of an image is a measure of its dynamic range, or the "spread" of its histogram. The dynamic range of an image is defined to be the entire range of intensity values contained within an image, or put a simpler way, the maximum pixel value minus the minimum pixel value.

- Input and output of Global contrast image enhancement method

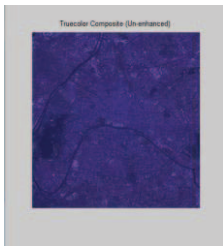


Fig. 2. Input Image

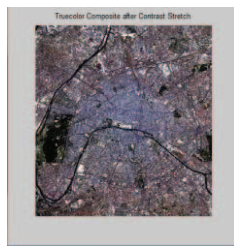


Fig.3. Global method

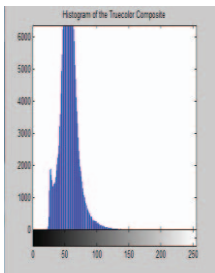


Fig.4.Histogram Of an Input Image

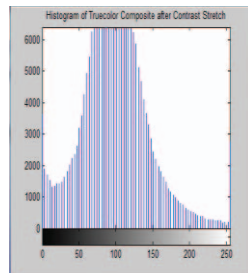


Fig.5. Histogram of a Global method

- Local Contrast Image Enhancement

For Local contrast image enhancement we will going to use local contrast stretching method. In local contrast stretching method we will going to target on local feature of an image. For this type of a local contrast stretching method we will going to focus on particular area of an image where we want to perform local contrast image enhancement. For Local contrast image enhancement method we will going to use unsharp masking technique. In unsharp masking, image is separated into two components, the low-frequency unsharp

mask obtained by low-pass filtering of the image, and the high-frequency component obtained by subtracting the unsharp mask from the original image itself. The high-frequency component is then amplified and added back to the unsharp mask to form an enhanced image. Local enhancement based algorithms only make level of pixels in the fixed region, but effectively reduce the impact of other regions, and greatly enhance the local details.

- Input and Output of local Contrast Image Enhancement method



Fig.6.
Input image

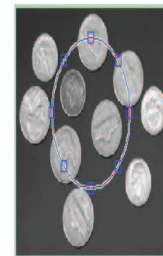


Fig.7.
Region of Interest



Fig.8.
Local method

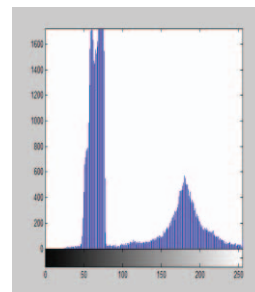


Fig.8.Histogram
of input image

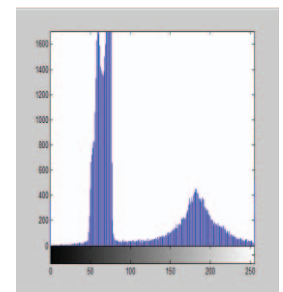


Fig.9. Histogram
of local method

- Combination of local method and global method

Combination we used is of local and global method for Contrast image enhancement to preserve the brightness. The main aim is to preserve the brightness of an image or if it increased it will be good when contrast image enhancement is done. Global contrast image enhancement methods are generally fast in the processing speed of the enhancement as compared to the local contrast enhancement. Global method lacks to enhance the local detail of an image. Global contrast enhancement methods which we frequently used are linear contrast stretching, histogram equalization etc. Global contrast enhancement method improves the quality of an image in better way. However, such a situation does not always occur. The image features or we can say characteristic vary considerably on different part of an image. This is one reason for using local contrast image enhancement. This local contrast feature enhancement method will enhance the local detail of an image which global contrast feature enhancement does not target on. The combination of this two method work like first we use local feature enhancement technique that is

local contrast stretching. The output which we obtained from local feature enhancement technique will give as input to global contrast enhancement method. The output which we got after global contrast image enhancement method is final output of our work. This combination is explained in detail with the help of GUI.

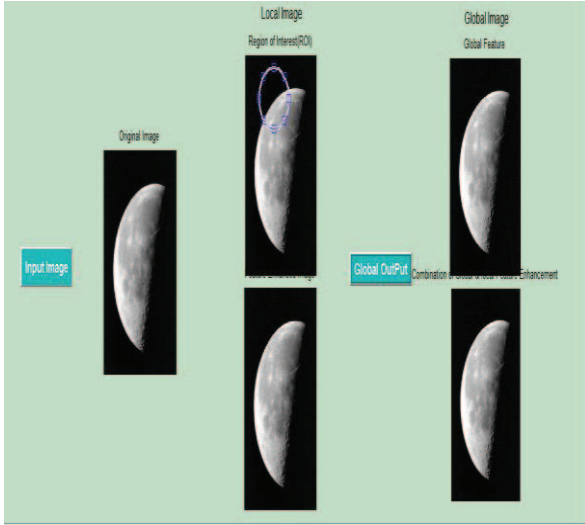


Fig.10. GUI of combination of local and global Contrast image enhancement method

The histogram we obtained after performing local and global method separately will be obtained at runtime in GUI that will be same.

In this work the suggested combination work properly or not for that we analyze the system on one factor that is brightness factor. We calculate brightness factor of input image, local image and the global image and then final output image. The comparison concludes that brightness factor enhances of output image as compare to input image.

TABLE.I COMPARISON OF INPUT AND OUTPUT IMAGE WITH THE HELP OF BRIGHTNESS FACTOR

S.no	Image name	Brightness factor of input image	Brightness factor of Output Image
(1)	Moon.tif	3.4723e+10	3.9413e+10
(2)	Coins.png	4.3420e+12	8.3229e+11
(3)	Glass.png	7.8133e+12	9.9499e+12
(4)	Mandi.tif	1.3342e+12	2.2931e+12

IV. CONCLUSION

Global contrast image enhancement method enhances the low contrast of an image in a global way. The output image obtained after global method does not have noise and other type of ringing artifacts in it. The exposure for contrast does not remain same in some part it is low. In some part of an image it is high where high contrast gain occurs. When we use global method we lack of local details. We cannot target on local details of an image when we perform global contrast enhancement. Hence we use local contrast image enhancement of an image to enhance the local detail of an image. When local contrast image enhancement occurs noise occurs in image. Both methods have certain disadvantages when used separately hence the suggested method is used as combination of local and global method which works in a better way. The output which we will go to obtain from this method will be far better than other methods.

The experiment which we are trying to perform by combining the global methods will also going to work well and this method can be used for any type of image. The qualitative analysis of the method is done by using factor like brightness factor. The comparison is done on input image and final output and from the obtained output we can state that system which we proposed work properly. From this experiment we conclude that when contrast of an image increase it preserves brightness of an image. The image will not going to lose its brightness but brightness will going to preserve and its will increase the brightness of an image.

V. FUTURE SCOPE

In the future scope of our paper the combination of local and global method is done by using weighted approach. Our work is small part of this combination of local and global method we will going to use many for combination for contrast image enhancement to see that image got enhance in better way The qualitative analysis should be done on various factor like PSNR, discrete entropy, Image enhancement factor, AMBE and many more .The analysis should also be done with existing method also. We are also trying to developed a new method which we will

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