

A Mixed Approach of Color Image Feature Enhancement

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Abstract— The process of image enhancement to improve image in form of brightness and contrast in different parameters. Many images suffer from poor contrast. Image enhancement improves an image appearance by increasing dominance of some parameters in image. Histogram equalization (HE) is that which is widely used for enhancing image due to its functionality which is simple. And another technique is Brightness preserving Bi-histogram equalization (BBHE) which is widely used for for enhancing brightness of the image. In this paper, hybrid approach by combining both these techniques to get more suitable result than original result is proposed.

Key words: Image enhancement, Cumulative density function, HE, Probability density function

I. INTRODUCTION

Image enhancement is the digital signal processing technique treating the image as two-dimensional signal and applying standard signal processing to it. Two broad categories of image enhancement are known as Spatial domain technique and Frequency domain technique. Spatial domain is to the image plane itself and in this image direct manipulation are also. And other is modification of the fourier- transform known as frequency domain technique. Spatial domain refers to pixels composing an image to the aggregate value. They operate on the pixels of the image. The most important image processing technology is digital image enhancement to improve the visual appearance of the image or to provide a better transform representation for various image processing such as image analysis, detection, segmentation and recognition. Many images due to insufficient illumination have low dynamic range of intensity value need to be processed before being displayed. There are large number of techniques which has focused on the enhancement of gray level images in the spatial domain. These are the techniques which include to equalize the image, high pass filtering, low pass filtering, homomorphism filtering, etc. In the field of digital image processing an important area is enhancement of image in contrast and brightness for human vision. In graphics, instead of being acquired (via imaging devices such as cameras) from natural scenes, as in most animated movies, images are manually made. On the other hand, it is often considered as that type of processing of image out of which a machine/computer/software propose to translate the physical contents of an image or a sequence of images. In the image enhancement processing contrast Enhancement is a specific characteristics enhancement. In which histogram equalization (HE) is the popular technique of contrasting the image, enhancement the histogram of the gray-level image represent the occurrence of all gray -levels in the image. Histogram equalization well divide the pixels over the full range.

II. RELATED ISSUES

Image enhancement is done in order to increase the quality of the image such that image that is enhanced is better than the normal image. Several image enhancement techniques have been proposed in both spatial and transform domains but the results obtained are not efficient. A very popular technique for contrast enhancement is to Equalize the histogram of an image that is Histogram equalization (HE), which is simple and has better performance compared to nearly all images, earlier local histogram equalization technique (LHE) was used it would over enhanced the image, but was not able to the preserve the brightness of the image and as a result the image is over enhanced, then came BBHE, though it was considered to be better than the LHE .As Bi-HE (BBHE) divides the input image into two parts based on the mean of histogram. This BBHE is that which preserve the brightness of the image only. Histogram equalization is performed on the image to drive cumulative density function [14] and intensity mapping is derived of each pixel to equalize image histogram. In the previous works, histogram equalization was used [5] to preserve image in form of Brightness with maximum entropy. To eliminate background noise from image to improve the quality of image for purpose of determining the focal areas such as nucleus, Auer rode and nucleoli in acute leukaemia [9] image. For preserving the Brightness of image to better level without losing [11] image features was also proposed. DSIHE method [4] uses entropy value for histogram separation. Though these are the methods which can perform good enhancement in case of contrast, but they also cause some more annoying side effects which are depending on the variation of gray level distribution in the histogram of images. Various techniques have been proposed for enhancing the image but all have some error of over-enhancing, noise etc. which we need to improve.

So there is need to proposed a new technique in which both the contrast and the brightness of the image is preserved , so that the quality of the image by enhancing is increased and the resultant is better than the original image.

III. PROPOSED WORK

To increase the quality of the image enhancement is performed. Many techniques of the image enhancement have been proposed earlier but they were not that much efficient to give the desired result, so by studying pervious approaches of image enhancement, a new technique is proposed. This technique is basically a hybrid technique in which the problem of the traditionally using techniques is solved to some extent. In this two techniques namely Histogram Equalization (HE) and Brightness Preserving Bi-Histogram Equalization (BHHE) are combined. Though LHE cannot modify to partial light information, it still over-enhances some portions depending on its window size but

the contrast of the image can be preserved by it and BBHE can preserve the brightness of the image. So in this approach both the brightness and the contrast of the image are preserved. Firstly the Histogram equalization is applied on the selected image and then the Brightness Preserving Bi-Histogram Equalization (BBHE) is applied that result in both contrast and brightness preservation of the image. The resultant enhanced image is better than the original image and its quality is increased. So this approach is considered to be better than the previous traditional approach of image enhancement.

IV. METHODOLOGY SECTION

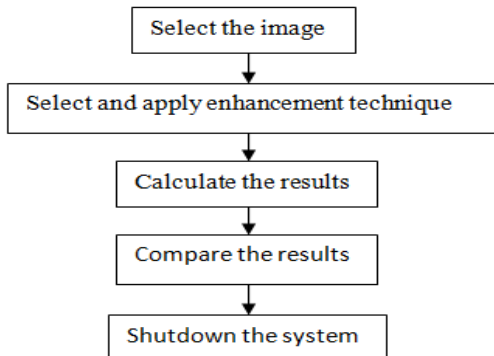


Fig. 1: Methodology Section

The Proposed method flow following steps:

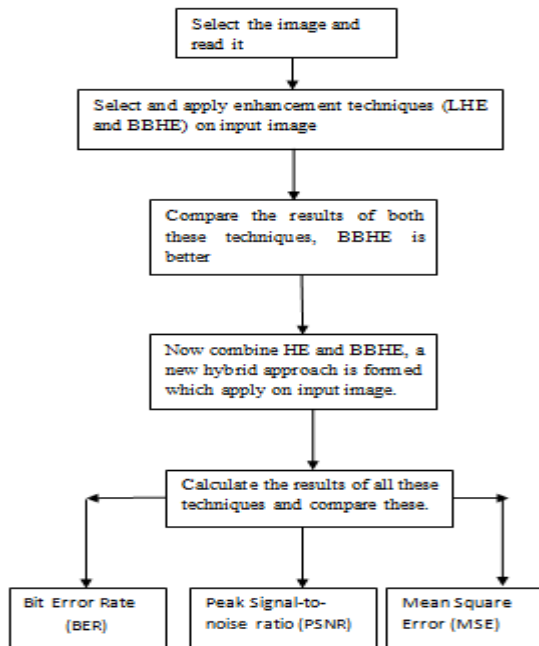


Fig. 2: Steps of proposed method

Firstly, select the image from the data set on which equalization is to be done. Then select local histogram equalization (LHE) and apply it on the input image by calculating cumulative density function (CDF), histogram of image is formed and calculates the result of this technique in parameters BER, PSNR and MSE. Secondly, select Brightness preserving bi-histogram equalization (BBHE) and apply on input image by using normalized function with lower and upper value image, histogram of image is formed and calculates results in all three parameters then compare results of both techniques, BBHE is much better. Now,

Hybrid approach by combining HE and BBHE is proposed, frequency counts the occurrence of each pixels and probability of each occurrence is calculated by probability function and cumulative density is calculated which apply on the input image to get better result from other techniques in different parameters, which shows Hybrid approach is better than traditional techniques to see objects clearly.

V. EXPERIMENTAL RESULT

To demonstrate the performance of proposed algorithm. In this we show original image and its histogram with red, green and blue layer

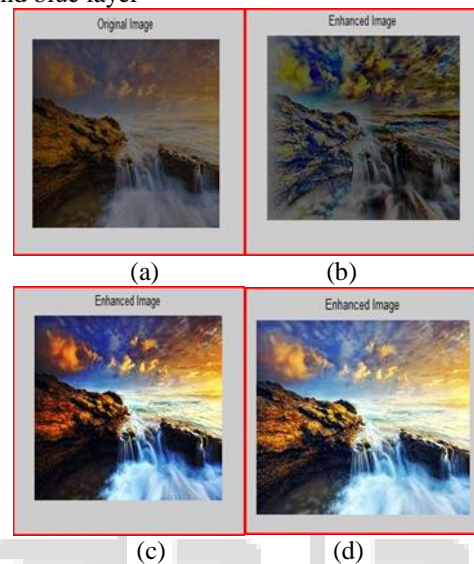


Fig. 2: a)Original image b) Enhanced by LHE c) Enhanced by BBHE d) Enhanced by HYBRID

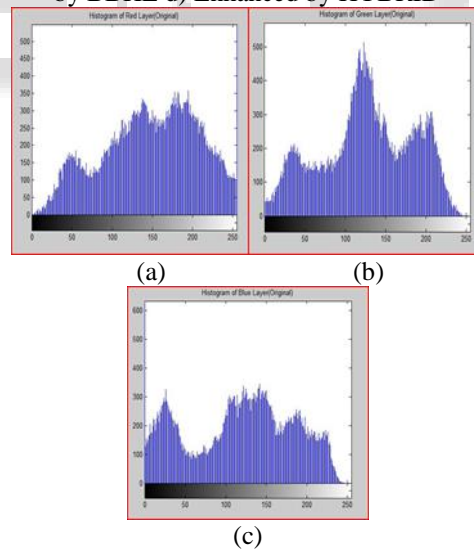


Fig. 2: Histogram of original image in(a) Red layer (b)Green layer(c)Blue layer

A. Local histogram equalization

Now we are applying local histogram technique in all three layers of original image for getting better results. Then we can see that by applying LHE on the image an enhanced image is formed with all three layers. In graphs it is showing that LHE enhances the image in form of contrast. Histogram equalization accomplishes this by effectively spreading out the most frequent intensity values. The pixels intensity over

the full intensity range well distributed by histogram equalization

The histogram of red, green and blue layer of enhanced image are shown below: -

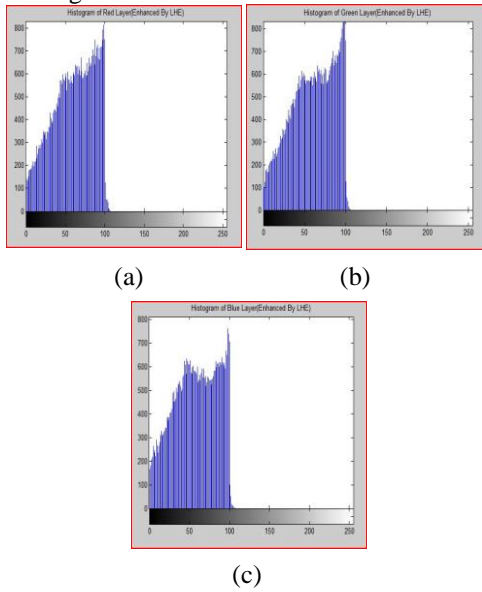


Fig. 3: Histogram of image Enhanced by LHE in (a) Red (b) Green and(c) blue layer

B. Brightness Preserving Bi-Histogram Equalization

Now we are applying brightness preserving bi-histogram in all three layers of original image for getting better results. Then we can see that by applying BBHE on the image an enhanced image is formed with all three layers. In graphs it is showing that BBHE enhances the image in form of brightness preserving for human vision. Advantage of BBHE is that it preserves mean brightness of the image while enhancing the contrast and, thus, provides much natural enhancement that can be utilized in electronic products.

The histogram of red, green and blue layer of enhanced image BBHE are shown below: -

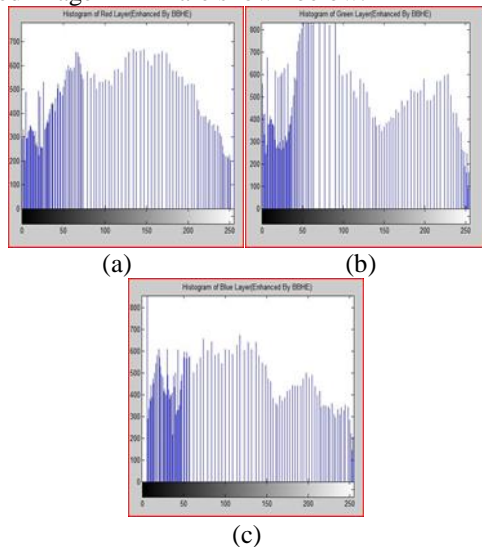


Fig. 4: Histogram of image Enhanced by BBHE in (a) Red (b) Green and(c) blue layer

C. Hybrid Technology

In this Hybrid approach we combine both the algorithm Bi-Histogram Brightness preserving Histogram Equalization

method (BBHE) and Histogram Equalization method (HE). One method is for the improvement of contrast enhancement and other method is for the improvement of brightness enhancement. By combining both, a result in image is formed which is better for human viewing. We can see the histogram for this image which is equalized by Hybrid Approach and with this image showing is very clear in case of contrast and brightness in Red, Green and blue layer.

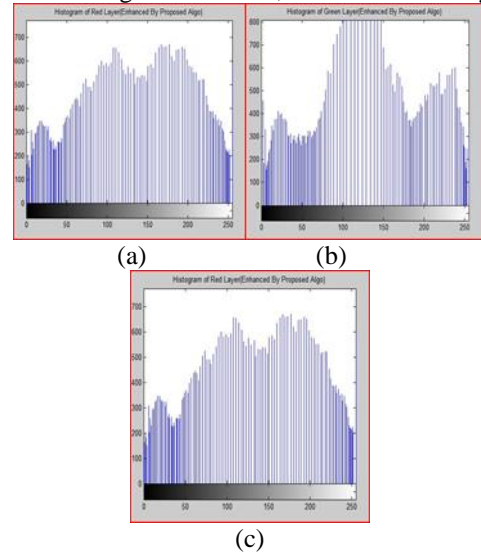


Fig. 5: Histogram of image Enhanced by HYBRID approach in (a)Red(b)Green and (c)Blue layer

Now we have different parameters for all these three technique which gives different values.

1) Bit Error Rate

Bit Error rate is defined as the inversely proportional of the Peak signal to noise ratio.

$$BER = \frac{1}{PSNR}$$

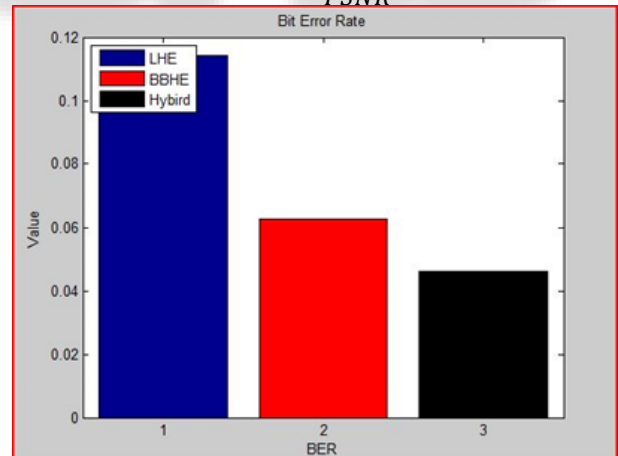


Fig. 6: Bit Error Rate

2) Peak Signal to Noise Ratio

PSNR is the evaluation standard of the reconstruction image quality, and is important measurement feature. PSNR is measured in decibels (db), and is given by:

$$PSNR = 10 \log(255^2 / MSE)$$

Where the value 255 is maximum possible value that can be attained by the image signal. Higher the PSNR value is, better the reconstructed image is.

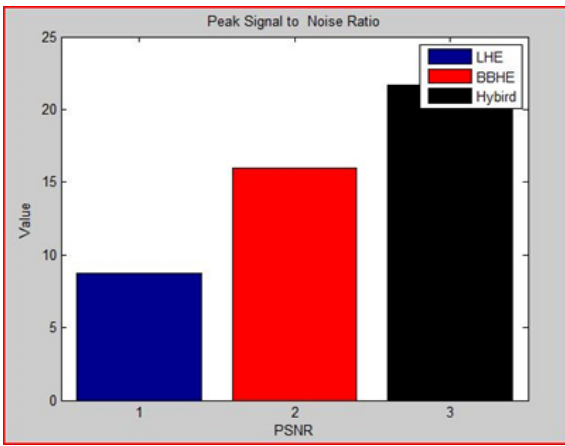


Fig. 7: Peak Signal Noise Ratio

3) Mean Square Error

MSE quantifies the global difference between an enhanced image and an original image. It is defined as follows:

$$MSE = \frac{1}{N} \sum_{i=0}^{N-1} (x_i - y_i)^2$$

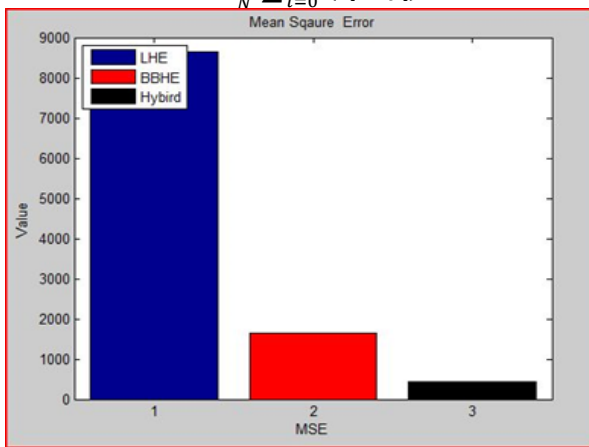


Fig. 8: Mean Square Error

S.no	METHOD	MSE	BER	PSNR
1	LHE	8654.6931	0.11417758	8.7582869
2	BBHE	1653.2638	0.062706217	15.947382
3	HYBRID	-445.0093	0.04619554	21.64711

Table 1:

VI. CONCLUSION

In this paper, a Hybrid approach is proposed for enhancing the image for better quality. The method is very simple and effective that makes it easy to implement and use in real time system. The proposed scheme is implemented with the help of GUI (Graphical User Interface) in MATLAB. After that, this process on the basis of PSNR (Peak signal to noise ratio), MSE (Mean square error), and BER (Bit error rate) is analysed. The ultimate goal of this proposed method is to preserve image brightness with contrast. Experimental result shows that the results are much better than the traditional approaches which can be further help in using the proposed work for the application development purpose.

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