International Journal of Advanced Technology in Engineering and Science
Vol. No.5, Issue No. 03, March 2017
www.ijates.com
ijates
ISSN 2348 - 7550

AUTOMATIC IMAGE EQUALIZATION AND CONTRAST ENHANCEMENT USING GAUSSIAN MIXTURE MODELING

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ABSTRACT

In this paper, we propose an adaptive image equaliza- tion algorithm that automatically enhances the contrast in an input image. The algorithm uses the Gaussian mixture model to model the image gray-level distribution, and the intersection points of the Gaussian components in the model are used to partition the dy- namic range of the image into input gray-level intervals. The con- trast equalized image is generated by transforming the pixels' gray levels in each input interval to the appropriate output gray-level interval according to the dominant Gaussian component and the cumulative distribution function of the input interval. To take ac- count of the hypothesis that homogeneous regions in the image rep- resent homogeneous silences (or set of Gaussian components) in the image histogram, the Gaussian components with small variances are weighted with smaller values than the Gaussian components with larger variances, and the gray-level distribution is also used to weight the components in the mapping of the input interval to the output interval. Experimental results show that the proposed algo- rithm produces better or comparable enhanced images than sev- eral state-of-the-art algorithms. Unlike the other algorithms, the proposed algorithm is free of parameter setting for a given dynamic range of the enhanced image and can be applied to a wide range of image types

Record Terms: Contrast Improvement, Gaussian Blend Mod-Eling, Worldwide Histogram Leveling (GHE), Histogram Parcel, Ordinary Dispersion.

I INTRODUCTION

THE goal of a picture improvement procedure is to convey out concealed picture subtle elements or to build the difference of a picture with a low element go [1]. Such a strategy delivers a yield picture that subjectively looks superior to the first picture by expanding the dark level contrasts (i.e., the difference) among items and foundation. Various upgrade ment systems have been presented, and these can be partitioned into three gatherings: 1) strategies that disintegrate a picture into high-and low-recurrence signals for control [2], [3]; 2) change based methods [4]; and 3) histogram adjustment procedures [5]–[16].

Procedures in the initial two gatherings regularly utilize multiscale butt-centric ysis to break down the picture into various recurrence groups and upgrade its coveted worldwide and neighborhood frequencies [2]–[4]. These methods are computationally mind boggling yet empower worldwide and neighborhood differentiate upgrade at the same time by changing the signs in the suitable groups or scales.

II APPLICATIONS

2.1 For Image Enhancement in Colour and Gray Scale Images

Picture improvement strategies are utilized to underline and hone picture elements, for example, to acquire an outwardly more lovely, more point by point, or less boisterous yield image. Image upgrade is the way toward applying these methods to encourage the advancement of an answer for a Digital imaging issue.

2.2 Underwater Image Enhancement

Kashif Iqbal et al. (2007) proposed a an approach based on slide stretching algorithm to enhance the underwater images in which the clarity of the images is degraded by light absorption and scattering and as a result one color dominates the image. This involves contrast stretching of RGB algorithm which is applied to equalize the colour contrast in images. Further, Saturation and intensity stretching of HSI is used to increase true colour and solve the problem of lighting in images. Interactive software is developed for under water image enhancement and quality of images which is statistically illustrated through histograms. The methodology for underwater image enhancement

2. See-through image enhancement through sensor fusion Bo fu et al. (2012) proposed a novel image enhancement method to improve the frame visual quality captured by camera behind the see through screen. An algorithm is developed which out-performs the traditional image enhancement method in recovering colored image with less noise and more detail information.

Colored satellites image enhancement using wavelet and threshold enhancement using wavelet and threshold decomposition Muna et al. (2011) made a study to enhance the satellite image using an intelligent aspect of filtering and describe multi-threshold technique with an additional step in order to obtain the perceived image. A new enhancement filter is introduced for digital satellite images

This method involves conversion of RGB to gray, wavelet transformation, partition into sub locks and appropriate filters such as mean filter, mode filter, median filters for image filtering of weak edges, sharp edges, homogeneous block filtering. The visual examples shown have demonstrated that the proposed method was significantly better than many other sharpener type filters in respect of edge and fine detail restoration

3.Image Enhancement of low light scenes with infrared flash images Sosuke Matsu et al. (2010) developed a technique for enhancing an image using near infrared flash images.

III.EXIXTING METHOD

Besides, they re-quire suitable parameter settings that may some way or another re-sult in picture debasements. For instance, the middle encompass Retinex [2] calculation was created to accomplish softness and shading steadiness for machine vision applications. The consistency alludes to the flexibility of saw shading and gentility to spatial and ghostly light varieties. The advantages of the Retinex calculation incorporate element run pressure and shading inde-pendence from the spatial conveyance of the scene enlightenment. In any case, this calculation can bring about "corona" relics, particu-larly in limits between substantial uniform districts. Additionally, "turning gray out" can happen, in which the scene tends to change to center dark. Among the three gatherings, the third gathering got the most consideration due to their direct and instinctive implementa-tion qualities. Direct difference extending (LCS) and worldwide his-togram balance (GHE) are two generally used techniques for worldwide picture improvement [1]. The previous directly modifies the dynamic scope of a picture, and the last uses a contribution to-yield mapping acquired from the combined dissemination func-tion (CDF), which is the vital of the picture histogram. Since the complexity pick up is relative to the tallness of the histogram, dark levels with huge pixel populaces are extended to a bigger scope of dim levels, though other dim level reaches with less pixels are compacted to littler extents. Despite the fact that GHE can ef-ficiently use show forces, it tends to over improve the picture differentiate if there are high tops in the histogram, frequently bringing about an unforgiving and loud appearance of the yield picture. LCS and GHE are basic changes, yet they don't al-ways create great outcomes, especially for pictures with vast spatial variety interestingly. Furthermore, GHE has the undesired impact of overemphasizing any commotion in a picture.

To overcome the previously mentioned issues, neighborhood histogram-evening out (LHE)- based improvement strategies have been proposed, e.g., [5] and [6]. For instance, the LHE technique [6] utilizes a little window that slides through each picture pixel consecutively, and just pixels inside the present position of the window are histogram adjusted; the dim level mapping for improvement is done just for the middle pixel of the window. In this manner, it uses neighborhood data. In any case, LHE now and then causes over improvement in some bit of the picture and en-hances any clamor in the info picture, alongside the picture fea-tures. Moreover, LHE-based techniques deliver undesirable checkerboard impacts.

Some examination works have likewise centered around enhancing his-togram-adjustment based difference improvement, for example, mean protecting bihistogram balance (BBHE) [8], break even with range dualistic subimage histogram leveling (DSIHE) [9], and least mean-splendor (MB) mistake bihistogram balance (MMBEBHE) [10]. BBHE first partitions the picture histogram into two sections with the normal dark level of the information picture pixels as the detachment force. The two histograms are then autonomously evened out. The strategy endeavors to take care of the splendor conservation issue. DSIHE utilizes entropy for histogram partition.

MMBEBHE is the augmentation of BBHE, which gives maximal splendor safeguarding.The previously mentioned systems may make issues while upgrading an arrangement of pictures, when the histogram has spikes, or when a characteristic looking improved picture is required. In this paper, we propose a versatile picture evening out calculation that is successful as far as enhancing the visual nature of various sorts of info pictures. Pictures with low complexity are automat-ically enhanced as far as an expansion in the dynamic range. Pictures with adequately high difference are additionally enhanced however not to such an extent. The calculation additionally improves the shading nature of the information pictures as far as shading consistency, higher difference amongst closer view and foundation objects, bigger element extend, and more noteworthy points of interest in picture substance. The proposed algo-rithm is free from parameter setting. Rather, the pixel estimations of an info picture are demonstrated utilizing the Gaussian blend display (GMM). The crossing point purposes of the Gaussian segments are utilized as a part of dividing the dynamic scope of the info picture into information dark level interims. The dark levels of the pixels in each information interim are changed by the overwhelming Gaussian part and the CDF of the interim to acquire the differentiation adjusted picture.

This method is applicable for dynamic scenes. A joint local mean algorithm is used to remove noise and motion blur. A multispectral imaging system is implemented which captures a color image and NIR flash images without causing any interference. The effectiveness of the technique is confirmed through experiments using real images. The flow of denoising and deblurring methods is explained with the help of NIR flash images.

IV. PROPOSED METHOD

Give us a chance to consider an info picture of size pixels, where . Give us a chance to accept that has a dynamic scope of , where . The principle goal of the proposed algorithm is to produce an improved picture , which has a superior visual quality regarding

A GMM can display any information dissemination as far as a direct blend of various Gaussian dispersions with various parameters. Each of the Gaussian parts has an alternate mean, standard deviation, and extent (or weight) in the blend demonstrate. A Gaussian part with low standard de-viation and huge weight speaks to minimal information with a thick dissemination around the mean estimation of the segment. At the point when the standard deviation gets to be distinctly bigger, the information is scattered about its mean esteem. The human eye is not touchy to little varieties around thick information but rather is more delicate to generally scattered changes. Along these lines, so as to build the differentiation while holding picture points of interest, thick information with low standard deviation ought to be scattered, though scattered information with exclusive expectation deviation ought to be compacted. This operation ought to be done as such that the dim level conveyance is held. Keeping in mind the end goal to accomplish this, we utilize the GMM to segment the circulation of the info picture into a blend of various Gaussian parts.

The dim level dispersion , where , of the info picture can be demonstrated as a thickness work made out of a straight blend of capacities.

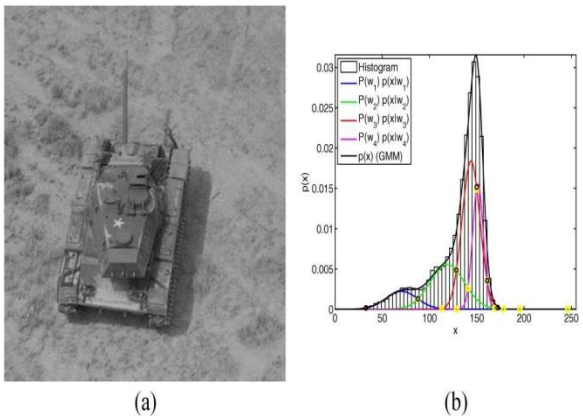
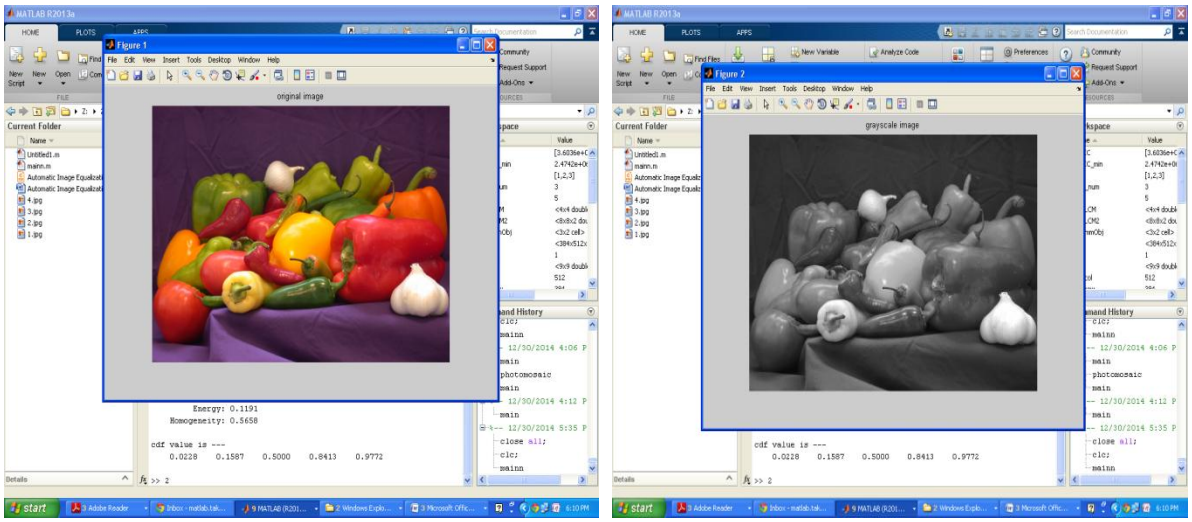


Fig. 1. (a) Gray-level image and (b) its histogram and GMM fit.

V.SIMULATION RESULT:

Original Image: **Gray Scale Image:**



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www.ijates.com
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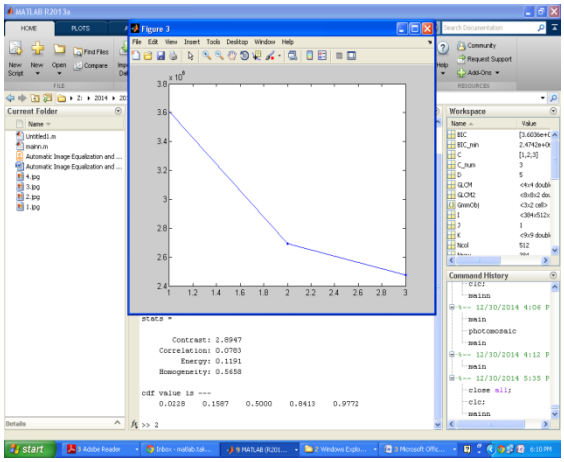
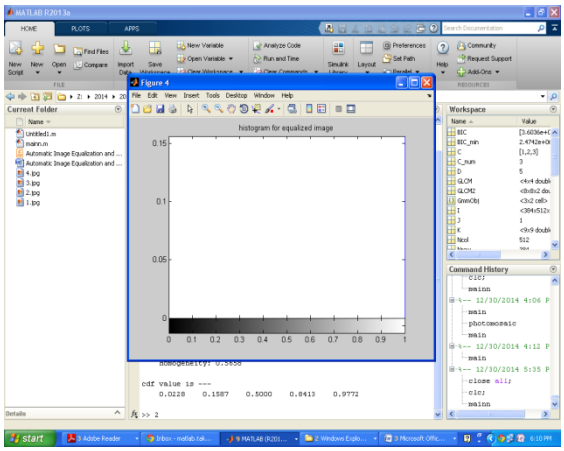
ISSN 2348 - 7550

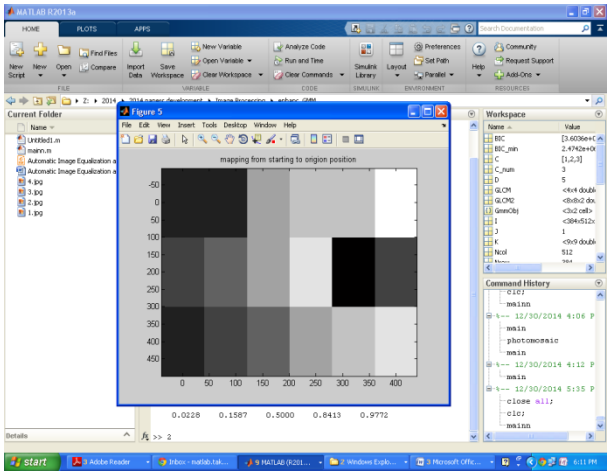
Bar Graph



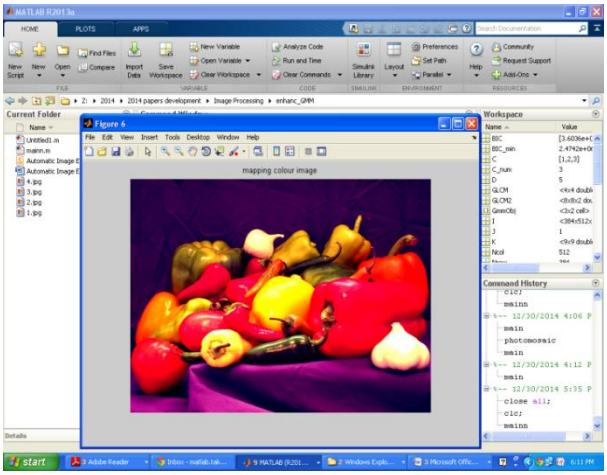
Histogram for Equalized Image



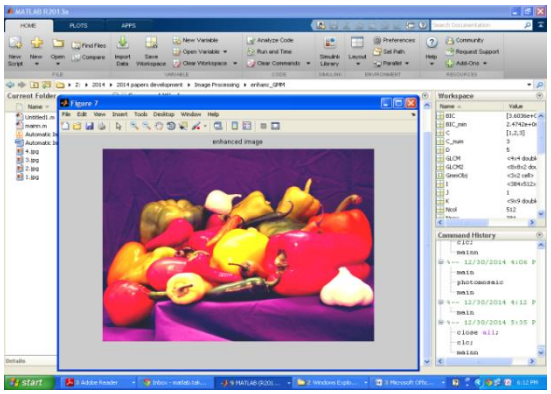
Mapping From Starting to Origin Position



Mapping Colour Image:



Enhanced Image



VI CONCLUSION

In this paper, we have proposed a programmed picture upgrade ment calculation that utilizes Gaussian blend displaying of an info picture to perform nonlinear information mapping for creating outwardly satisfying improvement on various sorts of pictures. Execution examinations with cutting edge procedures demonstrate that the proposed calculation can accomplish picture adjustment that is adequate even under differing light conditions. The proposed calculation can be connected to both dim level and shading pictures with no parameter tuning. It can be likewise used to render HDR pictures. It doesn't divert the general substance of an info picture with differentiation that is sufficiently high. It encourage im-demonstrates the shading substance, shine, and differentiation of a picture consequently. Utilizing the trial of criticalness on the Berkeley informational index, it has been demonstrated that the proposed technique accomplishes splendor protection, DE safeguarding, and differentiate enhance ment under the 99% certainty level.

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