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Enhanced Digital Image Using Histogram Equalization Method and HELNN

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ABSTRACT

Image improvement is one among the difficult problems in low level image process. Distinction improvement techniques are used for rising visual quality of low distinction pictures. Histogram equalization (HE) technique is one such technique used for distinction improvement. The image histogram requirement for an improvement in existing Automatic contrast improvement methodologies that are applied in many low level image process techniques has LED to usage of the many bar graph leveling techniques. During this paper, numerous techniques of image improvement through bar graph leveling are overviewed. To guage the effectiveness of the strategies illustrated, we've used the PSNR, tenengrad, and distinction as parameters. These parameters show that however the results vary on applying completely different techniques of improvement. The work is implemented on the MATLAB background. The varied techniques are reviewed.

Keywords- Contrast Enhancement, Foreground Enhancement, Histogram Equalization, Automatic contrast enhancement, RGB (red, green, blue), noise.

I. Introduction

Digital image improvement is one amongst the foremost necessary pictures process technology that is important to enhance the visual look of the image or to supply a far better transform representation for future automatic image process like image analysis, detection, segmentation and recognition. Several pictures have terribly low dynamic vary of the intensity values because of lean illumination and so got to be processed before being displayed. Sizable amount of techniques has centered on the improvement of grey level pictures within the spatial domain. These strategies embrace bar graph leveling, gamma correction, high pass filtering, low pass filtering, homomorphic filtering. Developed a way for distinction improvement victimization brightness protective bi-histogram leveling. Similar methodology for image distinction improvement is developed .A block overlapped bar graph equalization system for enhancing distinction of image is developed [1].presented an integrated neighborhood dependent approach for nonlinear enhancement (AINDANE) of color pictures. They applied the improvement to the grey element of the initial color image and obtained the output increased color image by linear color restoration method [2].

Histogram Processing: Histogram process is used in image improvement. The data inherent in bar chart also can utilize in different image process application like image segmentation and compression. A bar chart merely plots the frequency at that every grey-level occurs from zero (black) to 255 (white). The bar chart could be a distinct operates that's shown in figure. Bar chart represents the frequency of prevalence of all gray-level within the image, meaning it tell US however the values of individual component in a picture are distributed. Bar chart is given ash (rk) = nk/N wherever rk and nk are intensity and range of pixels in image with intensity severally. A graphical illustration is comparable to a bar graph that organizes a bunch of information points into user specified ranges. The bar chart condenses a an information series into an simply understood visual by taking several data points and grouping them into logical ranges or bins [3]

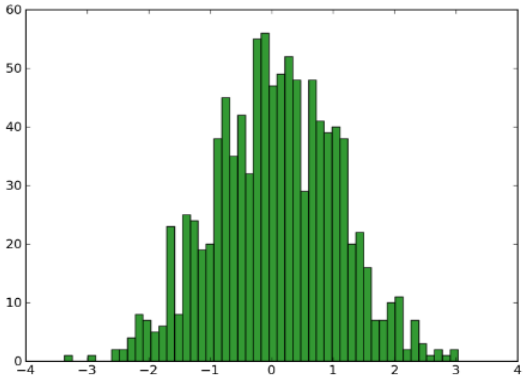

Fig1. Image Histogram Processing

Histogram Equalization: HE techniques are wide utilized in our way of life, specified within the field of client physics, medical image process, image matching and looking out, speech recognition and texture synthesis because it's high efficiency and ease. The most plans of HE-based strategies are to re-assign the intensity values of pixels to create the intensity distribution uniform to utmost extent to boost a picture, a brightness preserving Bi-HE (BBHE)

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methodology was projected in. The BBHE methodology decomposes the initial image into 2 sub-images, by using the image mean grey level, then applies the HE methodology on every of the sub pictures severally. At some extent BBHE preserves brightness of image. Dualistic sub-image bar chart equalization (DSIHE) is comparable to BBHE however DSIHE uses median as separation intensity to divide the bar chart into sub-histogram. Minimum Mean Brightness Error Bi-HE (MMBEBHE) is an extension of the BBHE methodology. In MMBEBHE the separation intensity is minimum mean brightness error between input image and output image. Algorithmic mean separate HE (RMSHE) is a reiterative technique of BBHE, rather than moldering the image one time, the RMSHE methodology proposes for acting image decomposition recursively, up to a scalar r, generating sub-image. In RMSE, once r will increase the brightness increase, however variety of decomposed sub bar chart may be a power of 2. Multi-histogram equalization (MHE) overcomes the disadvantage of bi-HE, it decomposed the input image into many sub-image then applying the classical HE method to everyone [4].As its name suggests, the bar chart is separated on the idea of norm recursively. Therefore we will say that it's extension of BBHE wherever division is completed one time and here it's wrapped to formula level r. that the variety of sub pictures can become 2r then as BBHE every sub image is equal severally. By this they'll additionally conclude that the brightness preservation will increase with increase within the formula level [5, 6].

II. Related Work

In A. Ramli et al. [7]. Histogram equalization is generally utilized for contrast enhancement. Nonetheless, it has a tendency to change the brightness of an image and thus, not suitable for buyer electronic items, where safeguarding the first brightness is vital to abstain from bothering relics. Bi-histogram equalization (BBHE) has been proposed and broke down scientifically that it can protect the first brightness to certain amplifies. Nonetheless, there are still cases that are not took care of well by BBHE, as they oblige higher level of protection. This paper proposes a novel expansion of BBHE alluded to as minimum mean brightness error bi-histogram equalization (MMBEBHE) to give greatest brightness safeguarding. BBHE divides the input image's histogram into two dependent upon input mean before evening out them freely. This paper proposes to perform the partition dependent upon the threshold level, which might yield minimum absolute mean brightness error (AMBE - the absolute contrast between input and output mean). A productive recursive whole number based reckoning for AMBE has been formed to encourage constant execution. Reproduction outcomes utilizing specimen image which speak to images with quite low, quite high and medium mean brightness indicate that the cases which are not took care of well by HE, BBHE and dualistic sub image histogram equalization (DSIHE), might be legitimately upgraded by MMBEBHE.

In L. Yang et al. [8] proposed a spatially variant erosions/ dilations and openings/closings approach. Structuring elements (SE) can locally adapt their shape and orientation across the direction of the structures in the image. The process of extracting shape and orientation of the SE at each pixel from the image is under study. This method is useful in the enhancement of anisotropic features such as coherent, flow like structures. A general method based on fuzzy implication and inclusion grade operators have been discussed.

In C. I. Larnder et al. [9]. The Developing Innovations area of not long from now meeting incorporates two autonomous ventures that change over live video into a cartoon-like image in real-time [10]. In one framework (Real-time video reflection, Northwestern College), you can see your face thinking over at you like a cartoon character, complete with dull line shape diagrams and even color "fill" of different surface territories. When you rotate your head, the cartoon character also rotates its head. Raise your right eyebrow and grin, the character does the same. He really seems as though you, however in a cartoon sort of way. It is most likely a most impossible to miss sensation to see one's self as a cartoon avatar, figuratively speaking, face-to-face.

In Zuiderveld k et al. [10]. Histogram equalization is generally utilized for contrast enhancement as a part of a mixture of requisitions because of its basic capacity and adequacy. Samples incorporate medical image processing and radar signal processing. One disadvantage of the histogram equalization might be found on the way that the brilliance of an image could be changed after the histogram equalization, which is primarily because of the straightening property of the histogram equalization. Accordingly, it is seldom used in buyer electronic items, for example, TV where saving the first input splendor may be essential in place not to present unnecessary visual weakening. This paper proposes a novel growth of histogram.

In Y. Wang et al. [11]. To mitigates the problems faced in BBHE; propose another modified HE named as DSIHE.

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Here, the histogram is separated in two sub-images based on the median instead of the mean and equalized similar to BBHE. Although DSIHE does not allow significant mean shift, it fails to preserve mean brightness in some cases. Besides this, DSIHE may also create artifacts or fail to enhance to some extent. For example, the image pixel intensities are 1, 2, 3, 200, 205, 208 and 210. Here, the median is 200, as a result the first three pixels can be over-enhanced which is not desired.

In M. G. Chung et al. [12]. Propose RSWHE which is another improved version of HE [6]. RSWHE consists of three modules such as histogram segmentation, histogram weighting and histogram equalization. In histogram segmentation module, multiple sub histograms are generated based on the image mean and median. Meanwhile, in histogram weighting module, separated histograms are weighted by normalized power law function. This module provides more probabilities to infrequent gray levels. Finally, HE is applied on each of the weighted histogram. However, some statistical information might lose after performing histogram transformation and the desired enhancement may not be achieved.

In S. C. Huang et al. [13]. Besides these HE based image enhancement techniques, some other techniques have been already proposed. AGCWD is proposed by Huang where gamma correction and luminance pixels probability distribution have been used. Although most of the cases AGCWD enhance the brightness of the input image, it might not give satisfactory results if the input image has lack of too bright pixels. Because in this case, the highest possible enhancement never crosses the maximum intensity of the input image which can be easily understandable.

In Ji-Hee et al. [14]. This paper discusses comparison of the performance of histogram color equalization method in gray. Because images contrast is worse after converting. So this paper suggests a 3 dimensional method of color that results in the same distribution on a gray scale histogram. The performance of Menotti algorithm also discusses on this paper, on its performance that depends on color component. With this, we have a conclusion that the method presented improves the contrast of the lighting effectively by generating the same pdf on a gray scale.

In Joung-Youn et al. [15]. POSHE is a so-called new contrast enhancement algorithm is the main topic on this paper. It is more effective and much closer than local histogram equalization. POSHE has a very important feature that is the own-pass mask-shaped filter gain function density probability sub-region which has the conclusion that the image size can vary. The global equity histogram method is not used because POSHE has an increase in brightness contrast to very large images and causes a preventive effect.

III. Implementation Environment And Result Analysis

(a) Implementation Environment:

MATLAB (matrix laboratory) may be a multi-paradigm numerical computing atmosphere Implementation Environment on MATLAB14 and for this work we use Intel 2.4 GHz Machine and operating system window7, window-98 etc. MATLAB14 version 14 is a high-level technical compute language and interactive environment for algorithm development, data visualization, records analysis, and numeric computation Mat lab is a software program that allows you to do data manipulation and visualization, calculations, math and programming. It can be used to do very simple as well as very sophisticated tasks. Database analysis, visualization, and algorithm development you can perform efficient data retrieve enhancement. Many functions in the toolbox are multithreaded to take benefit of multicore and multiprocessor computers an additional package Simulink, neural network. The key features of MATLAB 14 a high level language has a research in the field of localization schemes in wireless networks and identifies various challenges.

(b) Experimental Study Analysis:

The field of images contrast enhancement identifies various challenges. Find better visible and get better information. The planned methodology for image security improvement has applied on many pictures and that they have compared the results of our planned methodology and different image security improvement strategies equivalent to bar graph exploit, multi-histogram exploit and QHECL. To judge the effectiveness of our planned methodology, we've used the AMBE and PSNR. By examination the AMBE and PSNR of planned methodology with BBHE and QHECL, mathematically we've well-tried that planned methodology is healthier than BBHE and QHECL. The original image of Grlface_Image with corresponding bar graph that they need inserted to enhance image security because the visual image of Grlface_Image. In original image of flowers image, the image security is low just in case of the performance of bar graph exploit with corresponding bar graph on Grlface image. The general brightness of image has been improved in sure degree. The AMBE and PSNR that's calculated by BBHE for Grlface image. The performance of QHECL with

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corresponding bar graph. AS comparison to HE the QHECL give an improved visual image. The AMBE and PSNR square measure calculated by QHECL for Grlface image is because the performance of our planned methodology with corresponding bar graph.

Table 1 Experimental Analysis on Grlface Image AMBE and PSNR Values

Image	Techniques	AMBE	PSNR
Grlface_Image Grayscale Image (size 512x512)	BBHE	108.9256	31.2642
	QHECL	63.7762	37.5198
	HELNN	26.7946	68.2625

The AMBE and PSNR that's calculated by planned methodology for Grlface image is as follows the planned methodology provides an improved visual image as comparison to different image security improvement strategies as a result of it improves the image security with brightness preservation

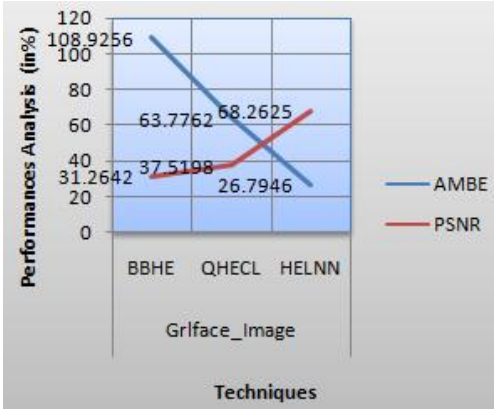

Figure1 Performance Analysis Based AMBE in Grlface Image

IV. Conclusion

A new effective associated economical image distinction sweetening methodology is planned supported an improved adaptation gamma correction. The methodology of negative pictures is employed to reinforce the distinction of bright pictures. Histogram Equalization with Linear Neural Networks truncation is planned to reconstruct the intensity-sensitive adaptation gamma for up the sweetening effects on dimmed pictures. Intensive qualitative and quantitative experiments show that our planned theme achieves higher or comparative sweetening effects than previous techniques. The distinction of each bright and dimmed input picture is increased effectively and expeditiously while not acquisition annoying artifacts within the future work, we might try and improve the potential of our planned methodology in enhancing additional varieties of pictures, rather than limiting to dimmed and bright one. Planned methodology conclude parameters particularly AMBE and PSNR, the planned methodology is compared with the present strategies particularly HE. Mathematically evidenced that the planned methodology is healthier than different image security improvement strategies. The sphere of pictures distinction sweetening identifies numerous challenges realize higher visible and acquire higher info realize absolute best answer during this paper, associate economical formula sup-ported object mean is enforced. The brightness of the image is preserved by victimization BBHE primarily based bar chart effort. Here in our work we've inflated pictures' victimization bar chart leveling of images by reconfiguring there element levels in bar chart victimization improvement techniques to judge the effectiveness of the ways illustrated, we've used the PSNR, tenengrad, and distinction as parameters. These parameters show that how-ever the results vary on applying entirely completely different techniques of improvement in addition the images inflated through entirely completely different bar chart leveling ways. Most of the techniques unit of measurement useful for sterilization the gray level values of individual pixels and therefore the excellence of the whole image. The captured photos of aerial image forever cause associate ambiguity that's that the most concern of study. The given paper provides the review of varied techniques to spice up the quality of an image. The image improvement quality could also be assessed by fully the Mean Brightness Error (AMBE), the distinct Entropy (H) and PSNR to assess the development quality between the dimmed input image and thus the inflated image.

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