REVIEW OF IMAGE ENHANCEMENT HISTOGRAM EQUALIZATION TECHNIQUES

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Abstract- **In this paper an analysis of image enhancement histogram equalization techniques is done. The need for an improvement in existing Automatic contrast enhancement (ACE) methodologies that are applied in several low level image processing techniques has led to usage of many histogram equalization techniques. Usage of several histogram equalization techniques is seldom due to the disadvantages it introduces in terms of over enhancement and intensity saturation. Several existing techniques available have tried to solve the issues faced in the equalization process. However all techniques seem to have a limitation in their approach and it is for this reason histogram equalization is still not being used in several electronic equipments. This paper reviews several techniques and variational approaches for image enhancement. The different techniques are analyzed to find the efficient technique to enhance the texture of the images.**

Keywords: **Brightness preservation, contrast enhancement, histogram equalization, intensity mapping, total variation.**

I. INTRODUCTION

The optical and sensing constraints that are connected with standard digital image obtaining frameworks incited the interest for adaptable image processing methods that have the ability to augment the visual moves between protests that are available in the image information. Therefore around a lot of people low-level image processing errands, the improvement of automatic contrast enhancement (ACE) methodologies structures one unique heading of examination. The principle purpose for this impressive investment is roused by the way that expert systems are regularly utilized as antecedents to larger amount image investigation errands, for example, image segmentation, feature extraction and pattern recognition and their requisition considerably upgrades the execution of the by and large ACE vision frameworks. The fundamental standard behind ACE is to feature the intensity moves between the items caught in the image information and this procedure normally includes a reach of linear or non-linear histogram changes. All the more particularly, to augment the image information, the histogram change requirements to redistribute the likelihood of event for every intensity level $i \in M$ (M being the extent of intensity qualities) in the output image to accomplish an uniform circulation.

Taking into account this approach, a few contrast enhancement (CE) calculations have been proposed either in the Fourier/wavelet [1], [2] domain or in the image (spatial) domain [3], [4]. Around these procedures the recent demonstrated more famous when connected to buyer images caught by standard digital cameras, and the significant target dwells in the distinguishing proof of an intensity mapping capacity g(.) that permits the maximization of the image contrast: $O_{i\,j} = g(Ii\ j)$, where O is the output (contrast enhanced image), I is the data image and (i , j)indicates the pixel position in the image network. To accomplish contrast enhancement and uphold the presence of the enhanced image like that of the first image, the intensity mapping capacity g(.) must be monotonically expanding over the domain K that blankets the reach of intensity values in the input image I, $K \subseteq M$, where M is the complete extent of intensity values (for monochrome images M = [0, 255]).

Thusly, a wide range of linear and non-linear capacities could be hypothetically utilized for contrast enhancement where the most oversimplified details are those that execute contrast extending and gamma adjustment. To bypass the inconveniences connected with the usage of subjective spatially obliged methods and the event of staircase impacts, the contrast enhancement has been approached as a global histogram warping procedure, and around numerous potential executions the strategies dependent upon global histogram equalization (GHE) demonstrated generally basic [3], [4], [5]. While the requisition of GHE techniques maximizes the information content (entropy) in the changed picture, it is critical to specify that this global change presents immersion impacts and over-enhancement. Lightening of these issues has pulled in generous examination interest and a few methodologies dependent upon multi-objective optimization [4], contrast limited adaptive histogram equalization [6], [7] and on the adaptive mixture of global and local contrast enhancement[8]have been seriously investigated.

II. EXISTING TECHNIQUES

A. Contrast limited adaptive histogram equalization

Histogram equalization [6] 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

equalization to overcome such a disservice of histogram equalization. The quintessence of the proposed calculation is to use free histogram equalization's independently over two sub images got by disintegrating the input image dependent upon its mean with a requirement that the ensuing adjusted sub images are limited by one another around the input mean. It is demonstrated scientifically that the proposed calculation saves the mean shine of a given image essentially generally contrasted with average histogram equalization while improving the contrast and, in this manner, gives a characteristic enhancement that could be used in buyer electronic items.

B. Minimum mean brightness error bi-histogram equalization

Histogram equalization [5] 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 a 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.

C. Dynamic histogram equalization

In this paper a sharp contrast enhancement system dependent upon routine histogram equalization (HE) calculation is proposed. No misfortune parts are created during the image enhancement in the results of the customary HE by this dynamic histogram equalization (DHE) [7] strategy.DHE parts the image histogram dependent upon nearby minima and allots particular light black level extents for each one allotment before evening out them independently. These allotments further go however a repartitioning tests to guarantee the unlucky deficiency of any ruling segments. This technique beats other present methodologies by upgrading the contrast well without presenting serious reactions, for example, washed out manifestation, checkerboard impacts and so forth, or undesirable ancient rarities.

D. Total variation models for variable lighting face recognition

This paper introduces the logarithmic total variation (LTV) model [9] for face distinguishment under changing light, including common lighting conditions, where we infrequently know the quality, heading, or number of light sources. The proposed LTV model can factorize a solitary face image and acquire the enlightenment invariant facial structure, which is then utilized for face distinguishment. Our model is propelled by the SQI demonstrate yet has better edge-protecting ability and less complex parameter choice. The value of this model is that not, one or the other does it oblige any lighting supposition nor does it require any preparation. The LTV model arrives at quite high distinguishment rates in the tests utilizing both Yale and CMU PIE face databases and in addition a face database holding 765 subjects under outside lighting conditions.

E. Augmented perception via cartoon rendering

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.

III. RESULTS

A. Contrast limited adaptive histogram equalization

This method solves numerically, the algorithm where mean brightness of a given image protects altogether overall contrasted with common place histogram equalization while enhancing the contrast and, therefore, gives a characteristic enhancement that might be used in customer electronic items.

B. Minimum mean brightness error bi-histogram equalization

This paper proposes to perform the division dependent upon the threshold level, which might yield minimum absolute mean brightness error (AMBE - the absolute distinction between input and output mean).

C. Dynamic histogram equalization

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This method defines a most peculiar sensation to see one's self as a cartoon avatar, as it were, face-to-face.

IV. CONCLUSION

In histogram equalization field various techniques have been proposed to enhance the quality of image such as minimum mean brightness error bi-histogram equalization (MMBEBHE), contrast limited adaptive histogram equalization, brightness preserving bi-histogram equalization and dynamic histogram equalization. Histogram equalization is normally used in medical imaging, radio sensing and in electronic appliance like TV. All these existing methods over enhance the image and also cause intensity saturation. Further work can be done to avoid the occurrence of intensity saturation and over-enhancement that are characteristic for conventional histogram equalization.

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