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Survey for Fuzzy-Contextual Contrast Enhancement

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Abstract**—** *This paper presents contrast enhancement algorithms based on fuzzy contextual information of the images. We introduce fuzzy similarity index and fuzzy contrast factor to capture the neighborhood characteristics of a pixel. A new histogram, using fuzzy contrast factor of each pixel is developed, and termed as the fuzzy dissimilarity histogram (FDH). A cumulative distribution function (CDF) is formed with normalized values of FDH and used as a transfer function to obtain the contrast enhanced image. The algorithm gives good contrast enhancement and preserves the natural characteristic of the image. In order to develop a contextual intensity transfer function, we introduce a fuzzy membership function based on fuzzy similarity index and coefficient of variation of the image. The contextual intensity transfer function is designed using the fuzzy membership function to achieve final contrast enhanced image. The overall algorithm is referred as the fuzzy contextual contrast-enhancement (FCCE) algorithm. The proposed algorithms are compared with conventional and state-of-art contrast enhancement algorithms. The quantitative and visual assessment of the results is performed. The results of quantitative measures are statistically analyzed using t-test. The exhaustive experimentation and analysis show the proposed algorithm efficiently enhances contrast and yields in natural visual quality images.*

Keywords**—** *Contrast enhancement, fuzzy logic, histogram equalization, context adaptive.*

I. INTRODUCTION

Contrast enhancement improves the visual perception of an image. The details of the image are enhanced by increasing the intensity difference between the objects and background to improve the visual quality. There are several contrast enhancement algorithms in the literature. Histogram equalization (HE) is one of the most popular enhancement techniques. The advantage of HE is its simplicity with reasonably good results. However, HE tends to over-stretch intensity levels. Thus, HE introduces various artifacts such as saturation and halo artifacts. The fuzzy theory has also found many applications in contrast enhancement. The contrast enhancement is achieved by minimizing fuzzy entropy. The proposed algorithm for the enhancement of the under exposed and overexposed images using fuzzy theory. The bacterial foraging algorithm (BFA) is used for parameter optimization. The algorithm performs well, however complexity is high due BFA. Sheet et al. used a fuzzy histogram to smoothen the histogram and presented a modified BPDHE algorithm.. However, global enhancement ignores local characteristics of a pixel and may result in artifacts. In the local histogram equalization (LHE), pixels in the small neighborhood are considered for histogram equalization. LHE incorporates local property, but may introduce the checkerboard artifacts. The constructed a two dimensional histogram to consider contextual properties of the pixels. However, the pixels with equal intensity are transformed to the same intensity irrespective of the pixel's location. Moreover, creating a 2-D histogram increases the complexity, which makes these methods computationally inefficient. It proposed a layered representation of 2-D histogram. The contrast enhancement is achieved by optimally increasing the frequently occurring gray level differences. Celik presented another enhancement algorithm referred as spatial entropy-based contrast enhancement in discrete cosine transform (SECEDCT). The algorithm performs local contrast enhancement using the spatial entropy of a 2-D histogram, and global contrast enhancement is achieved by DCT. A fuzzy membership function is formulated to characterize the neighborhood property of the pixels. The exhaustive experimentation shows that the proposed algorithm results in a natural visual perception for contrast enhanced image. The introduction of the fuzzy similarity index and fuzzy contrast factor (FCF) to develop the fuzzy measures of dissimilarity of a pixel with its neighborhood. The introduction of an FDH, based on FCF, to achieve the global contrast enhancement, involving contextual properties of the image. The development of a new fuzzy membership function using the fuzzy similarity index, and the coefficient of the covariance (CV).

II. LITERATURE REVIEW

1) The histogram equalization (HE) algorithm is proposed. This Dynamic Histogram Equalization (DHE) technique takes control over the effect of traditional HE so that it performs the enhancement of an image without making any loss of details in it. DHE partitions the image histogram based on local minima and assigns specific gray level ranges for each partition before equalizing them separately.
2) We have two exposure based recursive histogram equalization methods for image enhancement. The proposed methods are very effective for images acquired in low light condition like underwater sequences or night vision images. The recursive exposure method is based sub-image histogram equalization (R-ESIHE) that recursively performs ESIHE method till the exposure residue among successive iteration is less than a predefined threshold.
3) A model for grey-tone image enhancement using the concept of fuzzy sets is suggested. It involves primary enhancement, smoothing, and then final enhancement. The algorithm for both the primary and final enhancements

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includes the extraction of fuzzy properties corresponding to pixels and then successive applications of the fuzzy operator "contrast intensifier" on the property plane.

4) A new approach is presented for the enhancement of color images using the fuzzy logic technique. An objective measure called exposure has been defined to provide an estimate of the underexposed and overexposed regions in the image. Objective measures like fuzzy contrast and contrast and visual factors are defined to make the operators adaptive to the image characteristics. Gaussian and triangular membership functions (MFs) are chosen for the underexposed and overexposed regions of the image, respectively.

5) This paper proposes an efficient method to modify histograms and enhance contrast in digital images. Enhancement plays a significant role in digital image processing, computer vision, and pattern recognition. We present an automatic transformation technique that improves the brightness of dimmed images via the gamma correction and probability distribution of luminance pixels.

6) The illumination is obtained by iteratively solving a nonlinear diffusion equation. The proposed estimation method has the following two merits: First, the boundary areas are preserved in the illumination, and thus, halo artifacts are prevented; and second, textural details are preserved in the reflectance to not suffer from illumination compression, which contributes to the contrast enhancement in the result.

7) The proposed method constitutes an empirical approach by using the regularized-histogram equalization (HE) and the discrete cosine transform (DCT) to improve the image quality. More specifically, this technique uses the sigmoid function and the histogram to generate a distribution function for the input image. Compared with conventional methods, the proposed method can generate enhanced remote sensing images with higher contrast and richer details without introducing saturation artifacts.

III. METHODLOGY

Image improvement plays a major role in vision applications. Several techniques are projected to this point for enhancing the pictures. It's been found that the foremost of the prevailing techniques are primarily based upon the remodel domain methods; could which can introduce the color arte facts and conjointly may cut back the intensity of the input remote sensing image. To beat this drawback a changed approach is introduced during this analysis work. The new integrated approach has the aptitude to boost the distinction in digital pictures in economical manner by mistreatment the changed fuzzy primarily based improvement rule. Changed fuzzy image improvement has integrated image gradients with input image for image improvement. Once image improvement mistreatment changed fuzzy primarily based algorithms the color standardization has are available action to scale back color artifacts. So as to gauge the numerous improvements of the projected varied renowned pictures has been hand-picked for experimental results. The experimental results have shown that the projected technique has quite effective improvement over the offered techniques.

IV. IMPLEMENTATION

We are proposing java to execute this project as a results of java is one in all the foremost we have a tendency toll-liked programming languages accustomed turn out we tend to be and image process applications primarily based platforms. It had been designed for flexibility, allowing developers to write code which will run on any machine, in spite of style or platform. As results of Java's robustness, easy use, cross-platform capabilities and safety options, it's become a language of choice for providing worldwide internet solutions. Here digital Image process (DIP) deals with manipulation of digital pictures employing a digital rule.

V. CONCLUSION

In this paper, we proposed a contrast enhancement algorithm FDHE and its extended version FCCE. We proposed a fuzzy dissimilarity histogram, to effectively capture intensity level differences in the neighborhood of the pixels. FDHE enhances the intensity level differences without losing the natural characteristics of the images. The use of fuzzy theory enables FDHE in retaining continuity in smooth regions, while increasing the contrast. FDHE provides global contrast-enhancement using local characteristics of the pixels. We extended FDHE as FCCE to achieve contextual contrast enhancement. We proposed a contextual intensity transfer function, which transforms an intensity level based on its spatial location in the image and its intensity

VI. FEATURE ENHANCEMENT

The classical improvement technique have the downside of underneath improvement and over improvement of a picture. By mistreatment nonlinear membership perform of fuzzy pure mathematics downside of over and underneath improvement of pictures will be corrected. Alternative fuzzy approaches used for distinction improvement ar step-down of opacity, leveling mistreatment fuzzy expected values, fuzzy hyper bolization, fuzzy rule primarily based approach etc. This paper centered on totally different fuzzy image improvement rule, that maps components from image element plane to fuzzy plane and to reworked plane by mistreatment fuzzy technique and offers higher approach for future analysis.

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