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Improved Fuzzy based Image Enhancement using Illuminate Normalization

Manwinder Kaur
Student of M.Tech
Department of CSE
LLRIET,Moga,India

Prof. Manvi Aggarwal
Associate Prof. & Head
Department of CSE
LLRIET, Moga ,India

***Abstract:-*Contrast image enhancement is better to enhance the visibility of an image and color reproduction. To improve the quality of low contrast color images by fuzzy logic. This paper has evaluated the performance of brightness level based on contrast Image enhancement technique. To overcome the problem of over enhance, the contrast enhancement has represented the new method of fuzzy set and fuzzy membership. The proposed work introduces the newest approach could have the ability to boost the contrast in digital images in efficient manner by utilizing the modified edge preserving smoothing hypothesis based fuzzy image enhancement algorithm. As edge preserving smoothing is ability to reduce the effects of noise and it preserves the edges in efficient manner so provides better results. Additionally the proposed technique is used color normalization based on gray world hypothesis to reduce the color artifacts.**

Keywords:- contrast image enhancement, fuzzy technique, performance measure CD, CII, EMEE, and ENTROPY

I. INTRODUCTION

Fuzzy image processing is used the collection of all approaches fuzzy sets and process of images segments. The key power of fuzzy image processing is at the center step modification of membership values. the data are transformed from gray level plane to the membership plane as fuzzification image then appropriate fuzzy techniques modification of an image membership values. Image enhancement is method used to improve the overall quality of the degraded images can be achieved by using enhancement methods Image Enhancement is essentially a simplest and attractive area. Contrast image enhancement is method used to enhance the overall superiority of the corrupted images can be attained by using enhancement mechanisms. Scale is a graphical illustration the distribution of data an image. It shows that how many times a particular grey level appears in an image.Brightness means that is effective or impressible technique for the images. Contrast enhanced images may contain intensity distortion and lose image information in various regions. However it is mostly fuzzy equalization produces unrealistic effects in photographs, often the same class of images to which one color.

II. METHODOLOGY

A. Convert RGB input image into HSV

The first step in the proposed method is to convert the given RGB image into HSV and then calculate the histogram h(x). The new fuzzy enhancement method uses HSV color space.

B. Enhance only V Components

The V component is stretched by preserving the chromatic information such as Hue (H) and Saturation (S). The Enhance method is meant exclusively for enhancing low contrast and low bright color images. Stretching method uses two intensification parameters K and M which controls the degree at which the intensity value x has to be intensified.

C. Image contrast using Fuzzy Based image enhancement Method

The proposed fuzzy enhancement method is required small changes to process low value of membership and demands more changes require high value of membership and new feature added to improve the visibility of digital images. Fuzzy membership values are used in image enhancement by utilizing the techniques.

D. Conversion HSV image to RGB image Using Techniques

It is modify fuzzy based enhancement by utilizing the edge preserving smoothing hypothesis and color normalization based upon gray edge hypothesis to reduce the color artifacts.

III. PROPOSED ALGORITHM

The proposed algorithm is to supply better results than exiting algorithm as following steps:

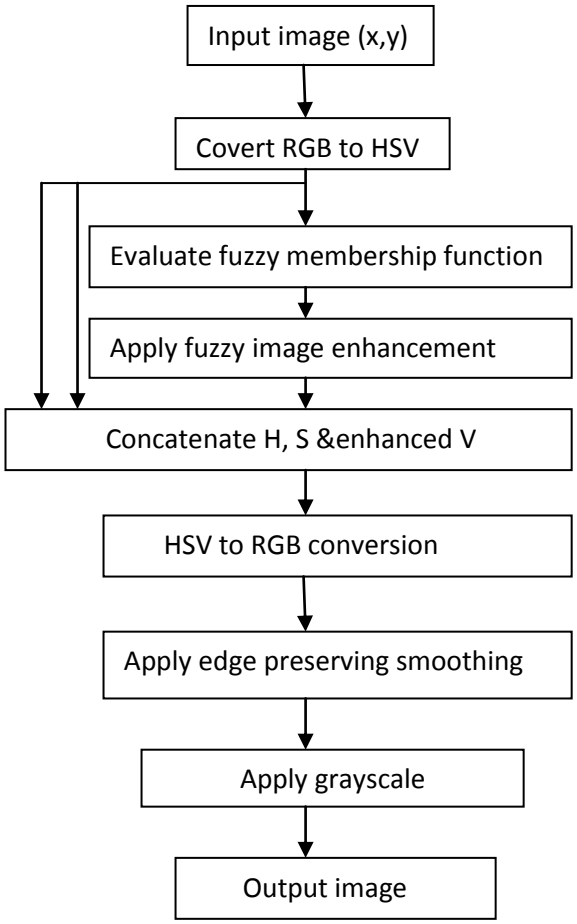


Figure 3.1: Flow chart proposed algorithm.

Step1: In step1 image is passed to the sand some pre-processing operation is applied on it.

Step 2: In the step2 image is converted in HSV plane. Step 3: As *H* and *S* component stay constant but *V* is the only factor which the need some alteration on for image while enhancing the images.

Step 4: Now Fuzzy membership function for image enhancement will be evaluated.

Step 5: Now fuzzy based image enhancement is applied on the image.

Step 6: Now concatenate *H*, *S*, and enhanced *V* component.

Step 7: Now re-convert given image to HSV to RGB again.

Step 8: Now apply technique edge preserving smoothing.

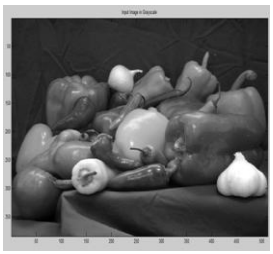
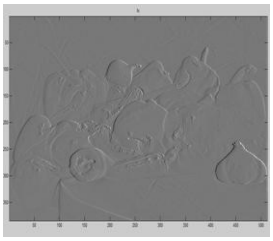
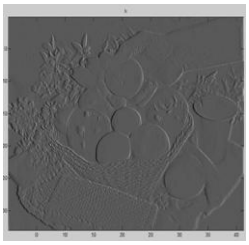
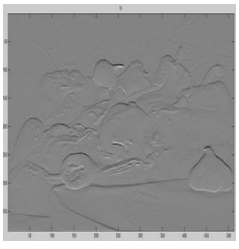
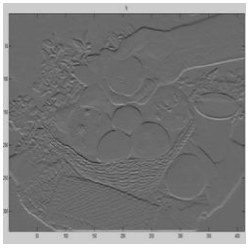
Step 9: Now apply color grayscale based upon the gray edge hypothesis.

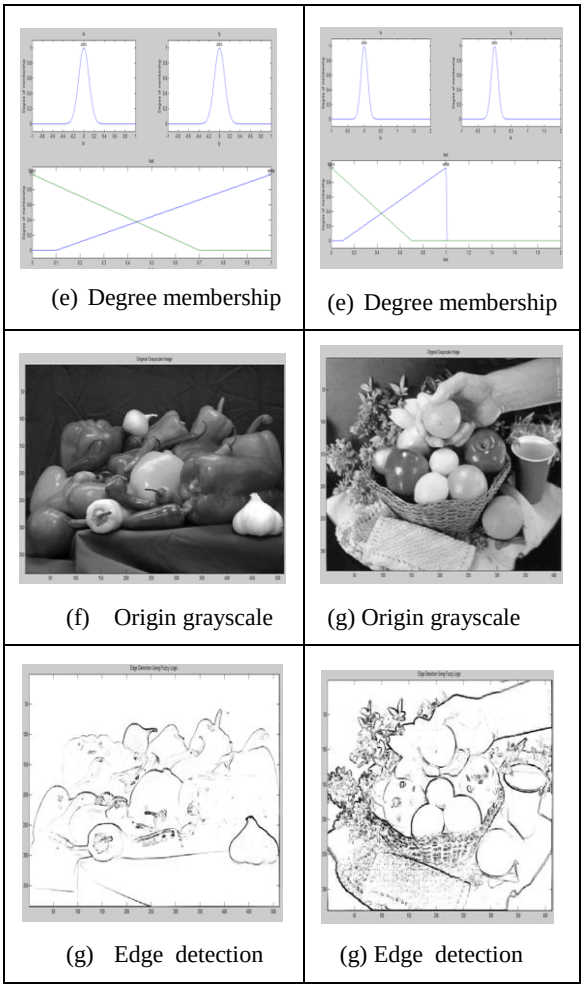
Step 10: Display the final enhanced image.

IV. RESULTS AND DISCUSSION

The proposed algorithm is tested on various images. The proposed algorithm is applied using various performance indices like CD, CII, EMEE, and ENTROPY. Out of these two images, these are non-standard standard images testing namely vegetables.jpg and furits.jpg taken from Google images shown as:

Table 1.The results of Fuzzy image processing applied to the color image.

 (a) Vegetables image	 (b) Fruits image
 (b)Image in grayscale	 (b)Image in grayscale
 (c) Image gradient lx	 (c) Image gradient lx
 (d) Image gradient ly	 (d) Image gradient ly



(e) Degree membership (e) Degree membership

(f) Origin grayscale (g) Origin grayscale

(g) Edge detection (g) Edge detection

Table 1: Test image (a) Input image (b) Image in grayscale (c) Image Gradient lx (d) Image Gradient ly (e) Degree membership (f) Original grayscale (g) Edge detection.

A. *Contrast difference*

Contrast difference is used to evaluate the average of ratio maximum pixel intensity IMAX to the minimum intensity Imin of the enhanced image.

B. *Contrast improvement Index*

CII is used to compare the results of exiting contrast enhancement methods and the fuzzy method is used to improve contrast of image, using the most well-known image enhancement measure. This metric is defined as the ratio of enhanced contrast to the original contrast.

C. *EMEE*

The average of ratio of maximum pixel intensity Imax to the minimum intensities Imin in decibel and maximum and minimum intensities of enhanced image (Iemax, lemin).

D. *Measure of Entropy (ME)*

The entropy is calculated by using Shannon's entropy theorem.The entropy is high it is clear that the image has high contrast. The histogram is distributed on lower intensity region then image entropy becomes high and uniformly histogram is distributed the intensity region high.

Table 2.The results of Fuzzy image processing applied to the color Vegetables image.

Perimeter	Gradient fuzzy	Fuzzy enhance
CD	5.0697	70.5194
CII	1.0082	1.4892
MLI	0.9977	0.9273
EMEE	3.8636	3.8636
ENTROPY	3.8443	7.5390

Table 3.The results of Fuzzy image processing applied to the color Fruits image.

Perimeter	Gradient fuzzy	Fuzzy enhance
CD	-0.5198	18.0381
CII	1.0059	1.3926
MLI	1.oo34	1.0417
EMEE	3.8476	3.9231
Entropy	3.1763	7.5460

V. CONCLUSION

In the proposed technique, contrast image enhancement has been successfully used for improving the quality of poor image by using the various linear and non-linear techniques. The proposed algorithm offers a wide variety of approaches for modifying images to achieve the visually acceptable images. The proposed method has modified fuzzy logic enhance, gradient fuzzy, grayscale and the brightness level .Here this method has the ability to boost the contrast in digital images in efficient manner by utilizing the modified edge preserving smoothing hypothesis and color normalization based fuzzy image enhancement algorithm. The fuzzy enhancement improves the contrast of low contrast images and low bright color images.

In near future, swarm intelligence can be applied on this algorithm to enhance the results and to balance the contrast level in both low contrast and over contrast color images.

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