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Improved Hybrid Algorithm OBLCAE with Mix-Clahe Technique

Parneet Kaur*, Tejinderdeep Singh
CSE Department, GIMET,
India

Abstract: ***Image enhancement is use to improve the contrast images in digital image processing. The existing technique effort's are not much better in low contrast digital images. The proposed algorithm is different from all the existing techniques and shown the result after mixing OBLCAE algorithm with Mix-CLAHE .The method shown in this paper has shown better results on various parameters can be analyzed correctly.***

Index Terms: Low contrast image, Adaptive histogram Equalization, Contrast Enhancement, Mix-CLAHE, OBLCAE.

I. INTRODUCTION

As an important task in image enhancement, noise filtering can be viewed as replacing the gray-level value of each pixel in the image with a new value depending on the local context. Image enhancement is an important step in most image processing applications. The type of image enhancement algorithm to be used depends on the objective to be achieved by the enhancement process as well as the particular application. The intend of image improvement is to filter out impulsive noise, smooth out non impulsive noise, and enhance edges. Image improvement is usually used in the next three steps: noise decrease from image, contrast improvement of the very dull and bright picture, and high-light the edges of the objects in a blurring image. Image enhancement is one of the most important and difficult techniques in image processing. The plan of image improvement is to advance the visual emergence of an image, or to present improved alter representation for future automated image processing. Several images resembling medical images, satellite images and still actual life photographs experience from deprived contrast and noise. It is very important to improve the contrast and eliminate the noise to raise image quality. One of the most important stages in medical images detection and analysis is image enhancement techniques which improves the quality of images for human viewing, removing, blurring and noise. In this paper, Mix-CLAHE along with OBLCAE hybrid algorithm is proposed for very low illumination images. So this work has proposed a hybrid contrast enhancement technique which has fused the features of Mix-CLAHE as well as OBLCAE algorithm. The overall results of the proposed algorithm have shown the improved results than OBLCAE for very low illuminate images.

II. RELATED WORK

[1] has explained an automatic contrast enhancement technique using differential evolution for grayscale images. The resultant images obtained by the proposed method are compared with other image enhancement methods. The objective of image enhancement is to improve the quality of an image for subsequent analysis or for image display. [2] has discussed a new image filtering method, non local image guided filtering (NLGA), which is derived from a non local linear model. Utilizing the non local similarity of the guidance image, it shows superiority over the guided filter in different image processing applications such as image dehazing and depth map super resolution. In this, it also prevents the direct extension of guided filter to the non local case, non local guided filter.[3] has been focused from the very beginning of the idea of image processing, the researchers took the process of image enhancement process being an important focus since enhancing an image would bring about improvement in the image quality. Image needs to be enhanced just before any mentioned processing. An optimal Enhancement technique should enhance both good quality and low quality images, and should highlight even small details hidden in the image. [4] has provide a method for difference Stretching and Image sharpen methods. In this paper, an approach that simultaneously adjusts contrast and enhances boundaries is presented. Histogram method has been plotted to confirm caused by various cases arising because of performance of distinction stretching on image sharpening. The edges of the objects in the image will also be enhanced by this methodology. [5] proposed a novel method for image contrast enhancement centered on Discrete Shear let Transform (DST) for color images, capable to achieve high contrast improvement image, the RGB image is initial changed into HSV (Hue, Saturation and Value) color space. The converted hue color channel is just taken in to the account fully for DST decomposition.[6] presented a quad-histogram leveling strategy is proposed to improve the differentiation of the palm bone X-beam radiographs. For individual picture, the mean-change investigation technique is utilized to parcel the light black scale picture into four sub pictures. [7] has proved an adaptive guided image filter is proposed by incorporating edge aware weighting which is derived from normalized local variance of a guidance image into an existing guided filter. [8] has explained a quick and effective fluffy based color picture enhancement method has been proposed in this paper. Near analysis of proposed technique with routine histogram based contrast enhancement systems (like histogram leveling, adaptive histogram balance) alongside the late histogram based gray Level Grouping

system and the Fuzzy Logic strategy was auto ride out to determine which of these strategies is more qualified for automatic complexity upgrade of shade pictures. [9] had introduced a scientific morphology approach examination. States of workmanship strategies were contrasted and the methodology of the creators' to take care of the issue of low complexity pictures.

III. PROBLEM FORMULATION

A. Problem In Existing Work

In the existing work, the technique does not work on very low contrast images. The survey has shown that of existing techniques are not suitable for very low illumination image enhancement. Therefore not much work done has been done for the images with low illumination.

B. Problem Definition

The proposed algorithm use mix- CLAHE with OBLCAE algorithm whereas OBLCAE algorithm is suitable for low contrast images but we propose a hybrid algorithm by mixing the Mix- CLAHE to improve the images that have very low contrast.

IV. PROPOSED ALGORITHM

In order to better understanding of our algorithm, following are the steps involved in algorithm.

Step1: Read an input image (I) into the workspace.

Step2: Define required parameters:

gv = 5; //where gv is global value.

w = 2; is window mask size.

Ival = 2; //illuminate value.

Step3: Apply OBLCAE to get the enhanced image.

3.1: Evaluate illuminate non-linear mapping functions.

3.2: y =1- $(x-1)^2$,x€ [0,1]

y = $x^{\frac{a}{3}+1/3}$, a€ [0,1] ,x€ [0,1]

y = $\sqrt{ax}$,a€[0,1] ,x€[0,1]

3.3: Evaluate window2 that contains pixels higher saturation threshold and which are not included in window.

3.4: Evaluate brightness mapping function:

Y = 1- [1-sin^2 (ax)], x€[0,1] ,a€[1,$\frac{\pi}{2}$]

3.5 Evaluate local adaptive contrast adaptive enhancement.

CI = $\frac{I_{\max} - I_{min}}{I_{\max} + I_{min}}$

CI = $\frac{1}{3}(CI_R + CI_G + CI_B)$

3.6: Final color restore image

a(i,j) = $\frac{f_{e(i,j)}}{f(i,j)}$

fe^h(i,j) = a(i,j) f^h(i,j)

Step4: Apply Mixture Clahe color model

[rc_1 ,ge_1 ,bc_1] =[$\frac{R_c}{R_c}+\frac{R_c}{G_c}+\frac{R_c}{B_c}$, $\frac{G_c}{R_c}+\frac{G_c}{G_c}+\frac{G_c}{B_c}$, $\frac{B_c}{R_c}+\frac{B_c}{G_c}+\frac{B_c}{B_c}$]

4.1: Result of Clahe- Hsv is converted to RGB color model

C = V* S

H' =$\frac{H}{60°}$

4.2: The conversion from HSV to RGB which is denoted by (rc_2, gc_2 ,bc_2) is based on following conditions:

(rc_2 ,gc_2 ,bc_2) = (0,0,0) if H is undefined

(C,X,0) if 0≤ H'<1

(X,C,O) if 1≤ H'<2

(0,C,X) if 2≤ H'<3

(0,X,C) if 3≤ H'<4

(X,O,C) if 4≤ H'<5

(C,O,X) if 5≤ H'<6

Step 5: Return final Image.

V. EXPERIMENTAL SETUP

In arrange to apply the proposed algorithm the MATLAB has been used. Figure 1 shows the input image which will be used for proposed work on which technique OBLCAE algorithm and adaptive histogram Equalization is applied.

Figure 1 Input Image

Figure 2 shows the enhanced image that is obtained by applying existing technique i.e OBLCAE algorithm.

Figure 2 Enhanced Image

Figure 3 shows the output image that is obtained after mixing the OBLCAE algorithm with Mix- CLAHE technique.

Figure 3 Output Image

VI. PERFORMANCE EVALUATION

Table 1 and figure 4 shows the results of proposed method on Brightness variable quantity ΔL. The greater ΔL shows the better brightness enhancement ability.

Table I: Brightness variable quantity ΔL

Images	Existing Technique	Proposed
Image 1	0.6839	0.9706
Image 2	0.3835	0.9058
Image 3	0.0319	0.5620
Image 4	0.2262	0.2061
Image 5	0.0555	0.4469
Image 6	0.7549	0.4902
Image 7	0.3109	0.1576
Image 8	0.1020	0.3027
Image 9	0.0134	0.2925
Image 10	0.0191	0.1270

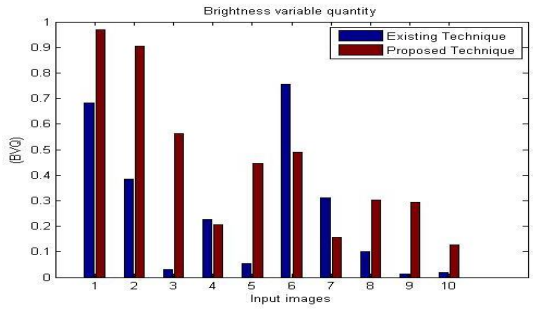

Figure 4. BVQ Analysis

The table 2 and figure 5 shows the results for Local Contrast variable quantity ΔCL (LCVQ) is better than existing algorithm.

TABLE II: Local Contrast variable quantity ΔCL

Images	Existing Technique	Proposed
Image 1	0.1074	0.2029
Image 2	0.0347	0.2241
Image 3	0.0031	0.0524
Image 4	0.0233	0.0937
Image 5	0.0050	0.0512
Image 6	0.0409	0.2048
Image 7	0.0207	0.1181
Image 8	0.0137	1.0526
Image 9	0.0014	0.0121
Image 10	0.0011	0.4330

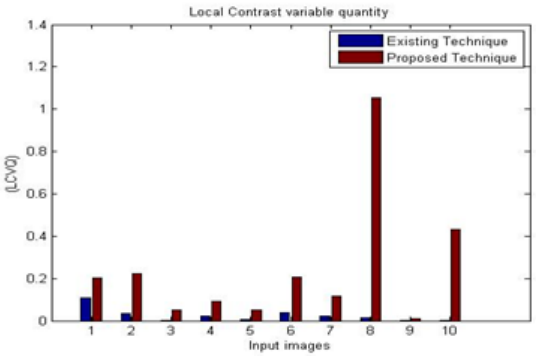

Figure 5. LCVQ Analysis

The table 3 and figure 6 shows the results for Average Error. Average error measures the average magnitude of the errors in set of forecasts, without considering their direction. It measures accuracy for continuous variables.

Table III: Average Error

Images	Existing Technique	Proposed
Image 1	2.4076	0.2208
Image 2	3.3698	0.0236
Image 3	6.8222	0.0334
Image 4	3.1746	0.0853
Image 5	0.1748	0.2693
Image 6	8.2658	0.0581
Image 7	0.4524	0.0198
Image 8	1.9673	0.0425
Image 9	4.0161	0.0360
Image 10	0.2400	0.0020

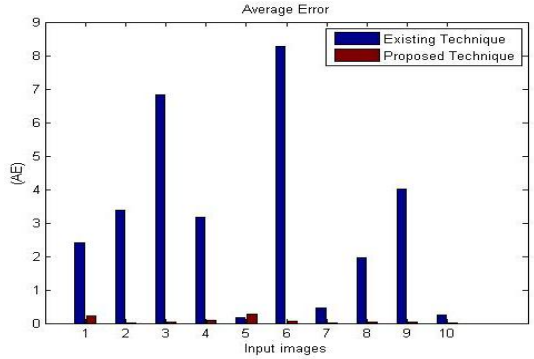

Figure 6. AE Analysis

The table 4 and figure 7 shows the results for Normalized Cross Correlation Error. It is commonly used for searching a long signal for a shorter, known feature. It has applications in pattern recognition, single particle analysis and averaging.

Table IV: Normalized Cross Correlation Error

Images	Existing Technique	Proposed
Image 1	0.9772	0.4399
Image 2	0.9985	0.9900
Image 3	0.9591	0.9703
Image 4	0.9709	0.9181
Image 5	0.9989	0.6403
Image 6	0.9712	0.9546
Image 7	0.9994	0.9677
Image 8	0.9992	0.9017
Image 9	0.9868	0.9455
Image 10	0.9988	0.9981

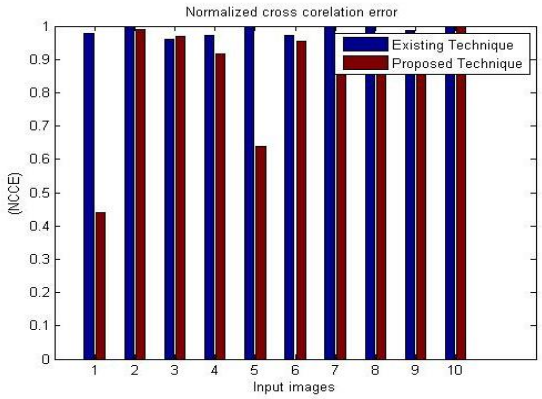

Figure 7. NCCE Analysis

VII. CONCLUSION & FUTURE SCOPE

The brightness enhanced image has good quality total contrast and has not hazy reaction. But still related work has shown that OBLACE has neglected many issues, so this work has proposed a hybrid contrast enhancement technique which has merged the features of Mix-CLAHE as well as OBLCAE algorithm. The overall results of the proposed algorithm have shown the improved results than OBLCAE for very low illuminate images.

This work has ignored the fact of image enhancement on potential edges in the image. This work has considered only natural images; therefore in near future we will use remote sensing images to extend the scope of the proposed technique further.

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