Presence Of Noise In Dualistic Sub-Image Histogram Equalization Technique of Image Enhancement

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Abstract

Histogram Equalization is one of the growing area of image enhancement in the field of digital image processing. Out of different histogram techniques Dualistic sub-image histogram equalization is one of the best method used in various fields. But after enhancement some noise may be present in output enhanced image i.e we do not get proper enhancing of image. Frame work of this paper is to show the presence of noise in enhanced image. This is done by comparing the different parameter like PSNR ,Contrast ,visualquality of image.

Keywords *HE,PSNR,visual quqlity,contrast*

1. Introduction

Histogram is the probalistic distribution of gray levels in a digital image[1]Histogram Equalization is used to obtain a uniform histogram for the output image image['2]which give us a general overview of an image such as gray level distribution and its density, the average luminance of an image, image contrast, and so on.[8] HE is simple and effective technique applied in many fields such as in medical image processing, radar image processing, and sonar image processing. When an image is converted into digital form this process of digital processing can add some degradation in image which can be removed by image enhancement[3]

1.1 Dualistic sub-image histogram equalization method

Some enhancement technique, change the luminance of the image significantly with the equalization, so it never be utilized in the video system. DSIHE technique for the enhancement is decomposed an image into two equal area sub-images on the bases of its gray level probability distribution function[4]. Then, these two images are taken in the equalization process respectively. Then, after the enhancement these two sub-images are composed into one image. Finally, result of the enhancement provides a enhanced image with its original luminance that make it possible to be used in video system directly.

1.2 Wavelets thresholding

De-noising can be accomplished using thresholding technique using a Daubechies wavelet order 4. The single trial was decomposed at level 5 and the detail coefficient were soft threshold [5],[6].
All wavelet filters use wavelet thresholding operation for de-noising. The basic procedure for all thresholding method is as follows.
Calculate the DWT of the image.

1) Threshold the wavelet coefficients
2) Compute the IDWT to get the de-noised estimate.
3) There are two thresholding function used, i.e. a hard threshold and a soft threshold.

The hard thresholding is described as

$$\eta_1(w) = w\, I(|W| > T)$$

Where W is the wavelet coefficient

T is threshold

The soft thresholding function is described

$$\eta_2 \quad -$$
(w)= (w sgn (w) T) I(|W|>T

3. Implementation

. Equal area Dualistic sub-image histogram equalization method [4]

Algorithm Steps:

Let us consider an input image X which is partitioned into two equal area sub- images X1 and X2 on the basis of median Xm. So we have X=X1 U X2. Here

X1= {X(i,j) | X(i,j) < Xm, ¥ X(i,j) є X }

X2= {X(i,j) | X(i,j) ≥ Xm ¥ X(i.j) є X }

It is obvious that sub-image X1 is composed by gray level of {X0, X1, X2……..Xm-1} and sub-image X2 is composed by gray level of

{Xm, Xm+1…….XL-1}

Then the normalized gray level PDF for both the sub images is

{Pi / P, i = 0,1 ,2 ,3……e-1 } and

{Pi / (1-P) i = 0,1,2…….L-1 }

So the corresponding CDF is

C1(Xk) = $\frac{1}{p}\sum_{i=0}^{k} pi$,k=0,1,……. e-1

C2(Xk) = $\frac{1}{p-1}\sum_{i=e}^{l-1} pi$, k=e,e+1,….. L-1

Based on the CDF function, the transfer function, for the two sub-images' histogram equalization are

F1(Xk)= X0+(Xe-1-X0)c(Xk), k=0,1,….e-1 .

F2(Xk)= Xe+(Xl-1-Xe)c(Xk), k=e,e+1,…….L-1

For the final result of DSIHE, two sub-images are composed into one image. Suppose Y denote the processed image, then

Y = { Y(i,j) } = F1(X1) U F2 (X2)

Finally this enhanced image is denoised with the wavelets thresholding technique.

4. Parameters

4.1Visual Quality

With the taking a look at the enhance image, anyone can easily determine the difference between the input image and enhance image and hence, performance of the enhancement technique is evaluated

4.2. Contrast

It defines the difference between the lowest intensity level and highest intensity level. Higher the value of contrast means more difference between the lowest and highest intensity level.

4.3. Peak Signal To Noise Ratio (PSNR)

It is the evaluation standard of the reconstructed image quality, is the most wanted feature [7]. PSNR is measured in the decibels (dB) and it is given by

$$PSNR = 10\log\left(255^2 / MSE\right)$$

Where the value 255 is the maximum possible value that can be attained by the image signal. Mean square error is defined as where M*N is the size of the original image. Higher the PSNR value betters the reconstructed image.

5. Tool To Be Used

In this implementation of the different enhancement technique MATLAB 7.6 is used. From it image processing toolbox is used. Matlab is a high performance language for technical computing. It integrates computation, visualization and programming

in easy to use environment where problem and solution are expressed in familiar mathematical notation.

6. Experimental Results

This result show the visual quality with the DSIHE enhancement technique

FIGURE-F.1 ORIGINAL IMAGE

FIGURE-F.2 DSIHE IMAGE

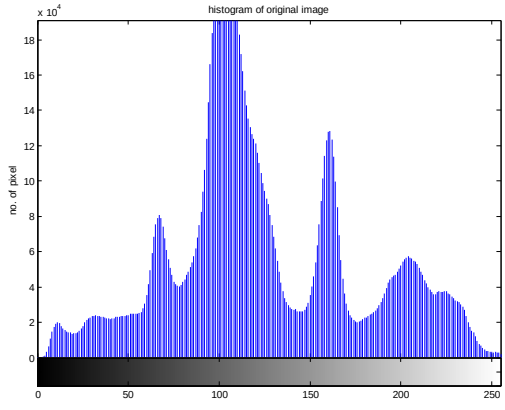

FIGURE-H.1 ORIGINAL HISTOGRAM

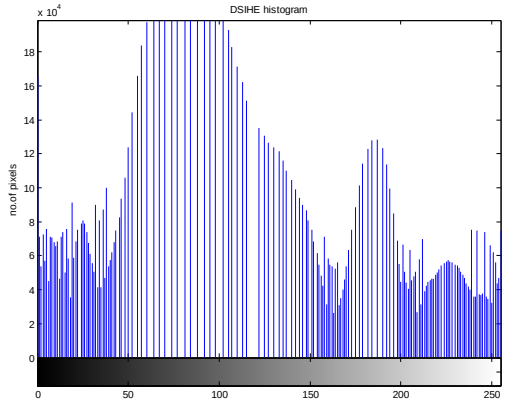

FIGURE-H.2 DSIHE HISTOGRAM

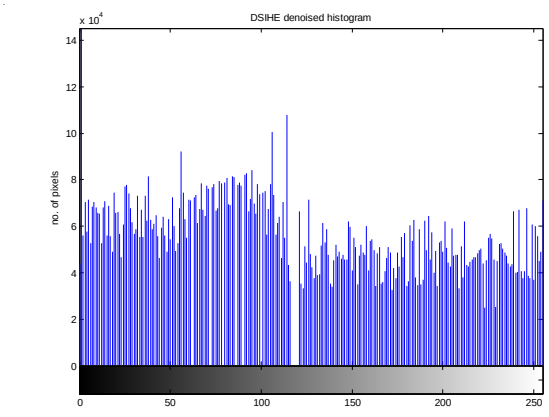

FIGURE-H.3 DENOISE DSIHE

Results

If we compare the value of PSNR we have27.6239 dB for enhanced image and 54.7698 after denoising of DSIHE enhanced imge.
If we compare the value of Contrast we have23.7566 for enhanced image and 0.0203 after denoising of DSIHE enhanced imge.This shows the presence of noise in DSIHE technique of image enhancement.

7. Conclusion And Future Scope

In this paper, a frame work for denoising of Equal area dualistic sub-image histogram equalization (DSIHE) Technique of enhanced image is shown. Its give the satisfactory results for presence of noise.so better implementations are required to get enhancement of an image.
In future, for taking the better result of the enhanced images different enhancement and denoising technique can be taken in various important fields where image enhancement is required like medical image processing,news paper internetwoking ,sonar image processing and so on.

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