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IMAGE DIGITIZATION BY WAVELET COEFFICIENT WITH HISTOGRAM SHAPING AND SPECIFICATION

Shivam Sharma[1], Mr. Lalit Singh[2]

[1,2]M.Tech Scholor, [2]Assistant Professor GRDIMT, Dehradun (India)

ABSTRACT

Many applications of histograms for the purposes of image processing are well known. However, applying this process to the transform domain by way of a transform coefficient histogram has not yet been fully explored. This method combines two very popular techniques of enhancement, Wavelet decomposition and histogram shaping & shifting. We will use this method for enhancement of commercial images as well as natural images. In this algorithm, a original image (gray scale and color image) is first decomposed in its wavelet coefficients. Then these coefficients filtered by global thresholding. This threshold is calculated by histogram shaping & shifting method with the variable value of coefficient K. Inverse wavelet transform of filtered and modified coefficients of image give the reconstruction of original image. With this algorithm, a new and efficient algorithm for reshaping of histogram that is capable in enhancing local details as well as properly preserving the image brightness is presented. In this paper, we show that a modified version of the measurement of enhancement by entropy (EME) can be used as an image similarity measure, and thus an image quality measure. Until now, EME has generally been used to measure the level of enhancement obtained using a given enhancement algorithm and enhancement parameter. In terms of EME values, this combination will produces better results.

In this a new and efficient algorithm for reshaping of histogram that is capable in enhancing local details as well as properly preserving the image brightness is presented. When residual bad pixels exist in the image, the dynamic range of the scene will be heavily suppressed when it displayed on a regular monitor. The proposed method is reduced the dynamic range compression and improve the dynamic range and contrast. The proposed algorithm also works on zero frequency components that exist sometimes in the original histogram, and they can enhance the contrast by redistributing the original gray scales uniformly onto full Gray scale range. The dynamic range of the image is much improved after proposed method and the details hidden in the original image are enhanced. Simulation results show the efficient performance of proposed weighting method in terms of Entropy and EME.

Keywords: Contrast Stretching, Contrast Entropy, Discrete Wavelet Transform, Entropy, Histogram Transformation, Image Enhancement.

I. INTRODUCTION

Contrast Stretching is a systemic operation in Contrast Enhancement is a systemic operation in image processing which enhances human recognition of details secret in the scene and also renewed very rapid recognition of interested purposes. It makes various contents of images easily perceptible through suitable increase in contrast. Histogram modeling techniques provide sophisticated methods for modifying the dynamic range and contrast of an image by altering each individual pixel such that its intensity histogram assumes a desired shape. The goal of this thesis in objective image i.e. color and grey scale images contrast quality assessment is to produces quantitative measures that can quickly predict perceived image quality.

DWT decomposes image into four sub bands. These sub bands are low-low (LL), low-high (LH), high-low (HL) and high-high (HH). These sub bands are of, half the dimensions of that of image under assumptions, Stationary wavelet transform (SWT) is also being used for the resolution and contrast enhancement of different kind of images. Here we have proposed a new method for image resolution enhancement which is based on combination of DWT and SWT components.

II. PROPOSED WORK

In order to test the proposed method, Simulation using MATLAB 7.7.0 (R2008b) are performed on input images. To evaluate the image enhancement performance, EME used as the criterion to calculate the entropy of enhanced image.

$$EME = \frac{1}{K_1 K_2} \sum_{I=1}^{K_2} \sum_{k=1}^{K_2} \frac{I_{max}(K,I)}{I_{min}(K,I)} \log \frac{I_{max}(K,I)}{I_{min}(K,I)} ....(1)$$

EM E:-Measure of Enhancement Higher the value of EME denotes a higher contrast and information clarity in the image.

2.1 Histogram Shaping

A histogram is a graphical way of representation of the brightness values that comprise an image. The brightness values (i.e. 0-255) are displayed along the x-axis of the graph. The frequency of occurrence of each of these values in the image is shown on the y-axis. The exact histogram specification is based on sequencing among image pixels by calculation of local average values for contrast enhancement.

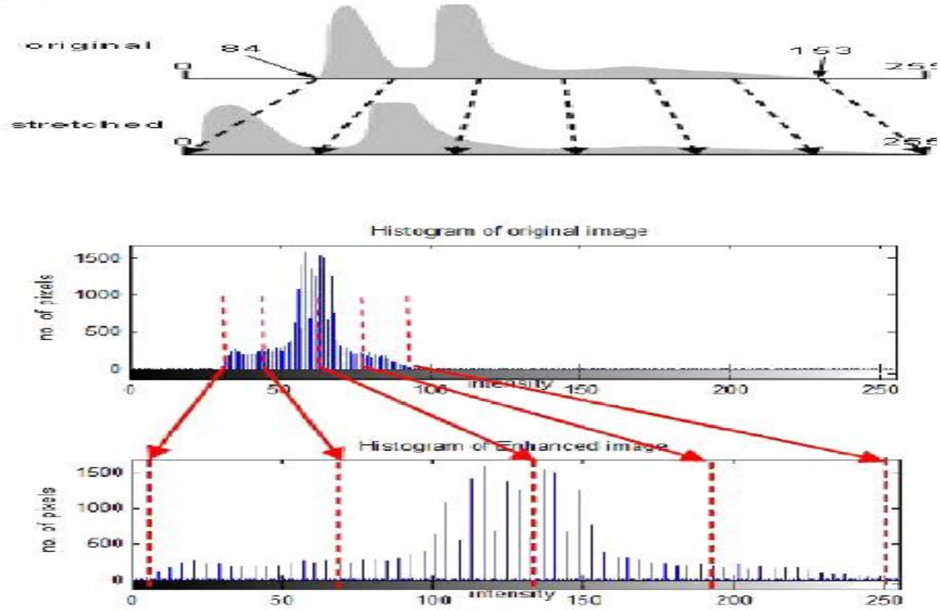

Fig 2.1 Setup for Proposed Histogram Reshaping

2.2 Block Diagram

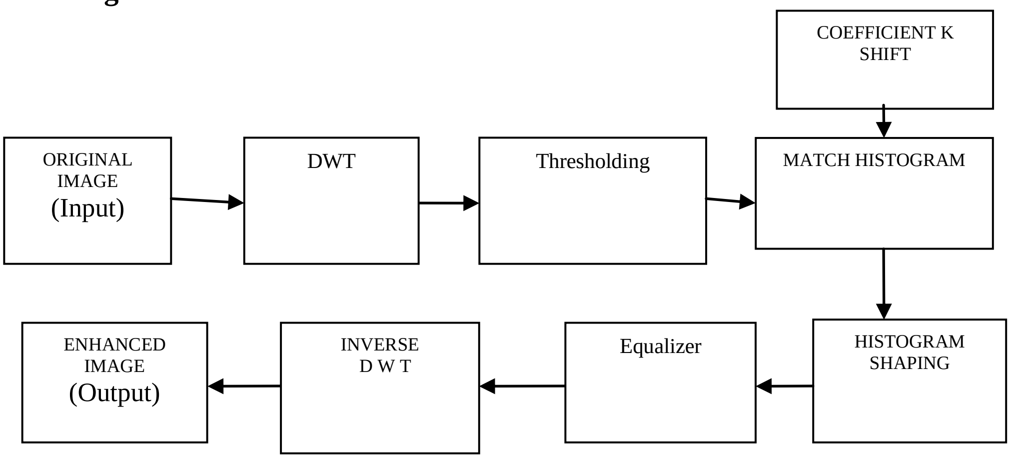

Figure 2.2 Proposed Block Diagram

2.3 Algorithm Proposed

The following steps are used in proposed algorithm:

Step 1: Upload an original image in MATLAB.

Step 2: Draw the histogram of the uploaded original input image.

Step 3: Calculate minimum and maximum value of the frequency component in the histogram.

Step 4: Fetch Wavelet decomposition of load image.

Step 5: Plot LL, LH, HL, HH Histograms.

Step 6: plot LL orig + shifted, LH orig + shifted,HL orig+ shifted, HH orig+ shifted Histograms

Step 7: Take Processed image, if it is not met then go to step 3 again.

Step 8: Calculate the EM E (Entropy) of the original image.

Step 9: Calculate EM E (Entropy) of the enhanced image.

III. SIMULATION & RESULT DISCUSSION

Figure 3. Original Images - a) Building b) Rock c) Seed

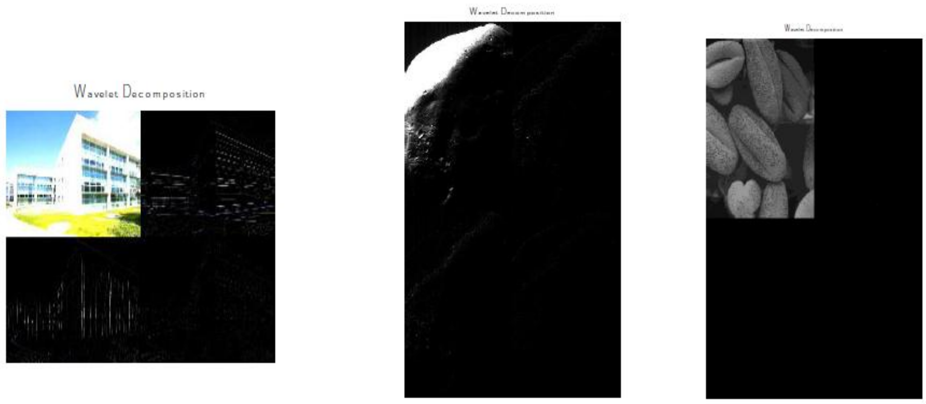

Figure 3.1 Wavelet Decomposition of a, b ,c Images Respectively for k = 1

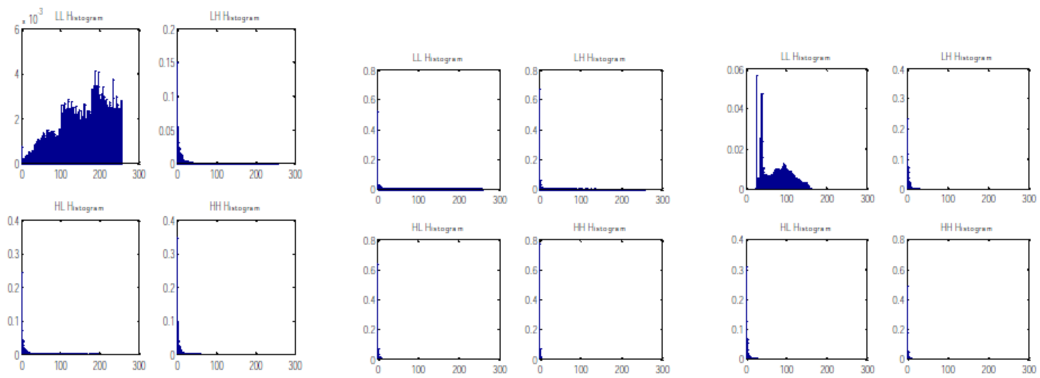

Figure3.2. LL,LH,HL, HH Histograms of Images a,b,c Respectively for k= 1

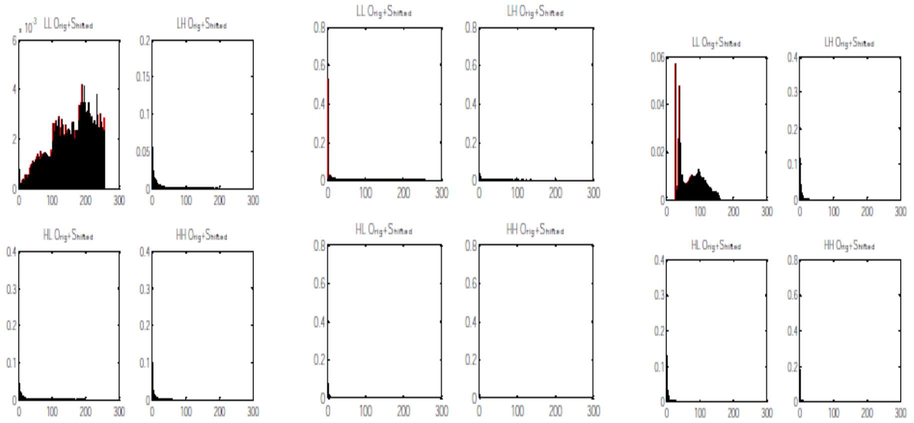

Figure 3.3 LL,LH,HL,HH's orig + Shifted Histograms of Images a,b,c Respectively.

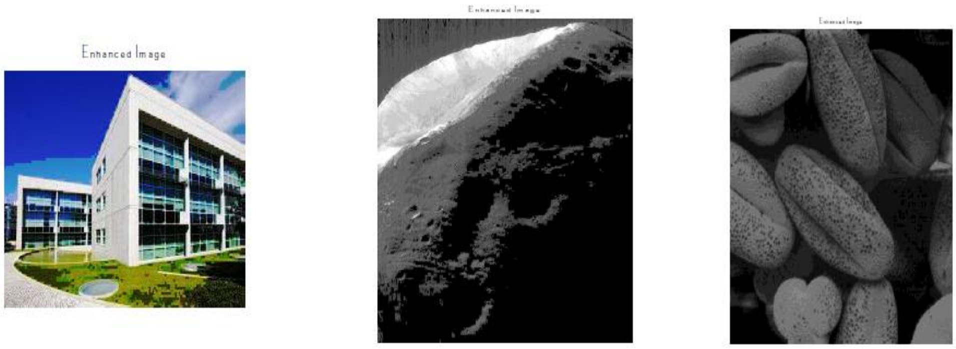

Figure 3.4 Enhanced Version of Loaded Original Images for k = 1

Figure 4. Wavelet Decompostion of a,b,c Images Respectively for k = 10

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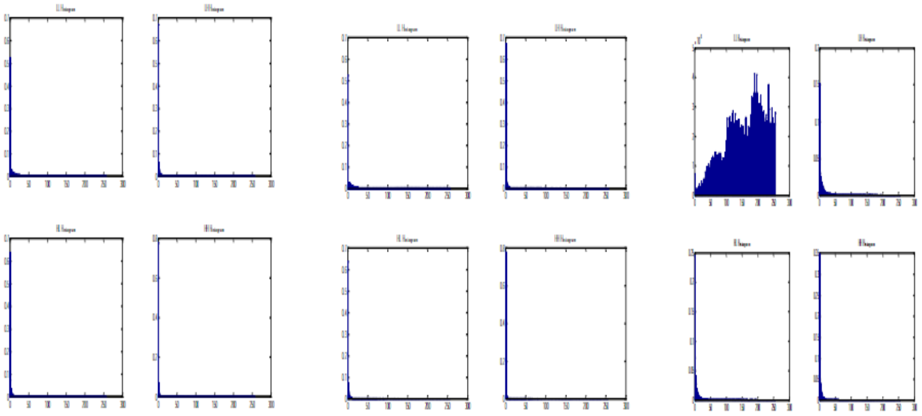

Figure 4.1 LL,LH,HL,HH Histograms of Images a,b,c Respectively for k= 10

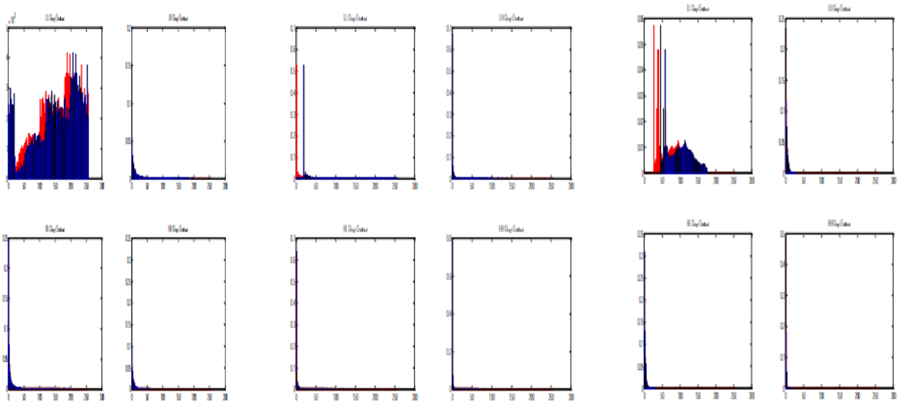

Figure 4.2 LL,LH,HL,HH's orig + Shifted Histograms of Images a,b,c respectively for k=10

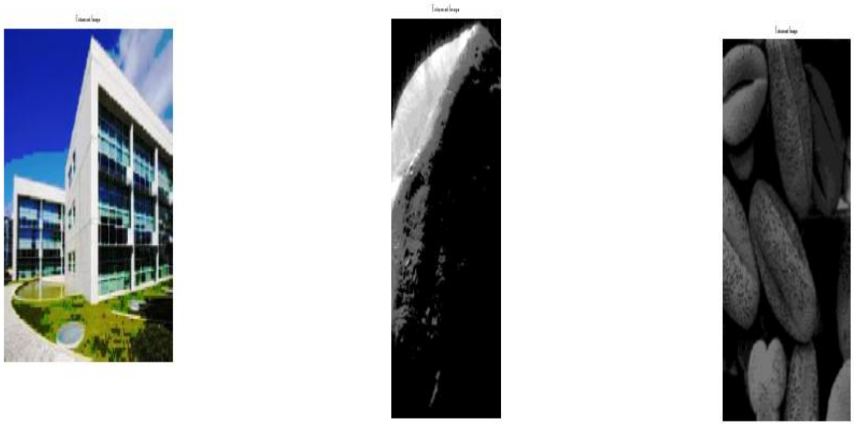

Figure 4.3. Enhanced Version of Loaded Images a,b,c.

Figure 5 Wavelet Decomposition of a, b, c Images Respectively for k = 15

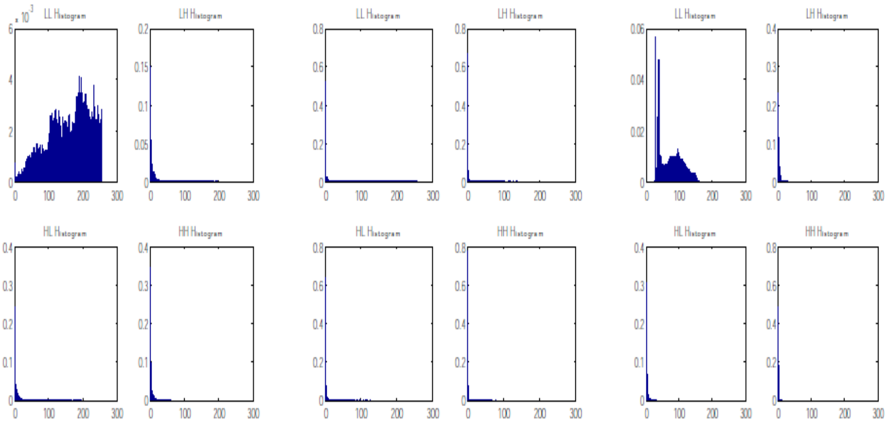

Figure 5.1 LL,LH,HL,HH Histograms of Images a,b,c Respectively for k= 15

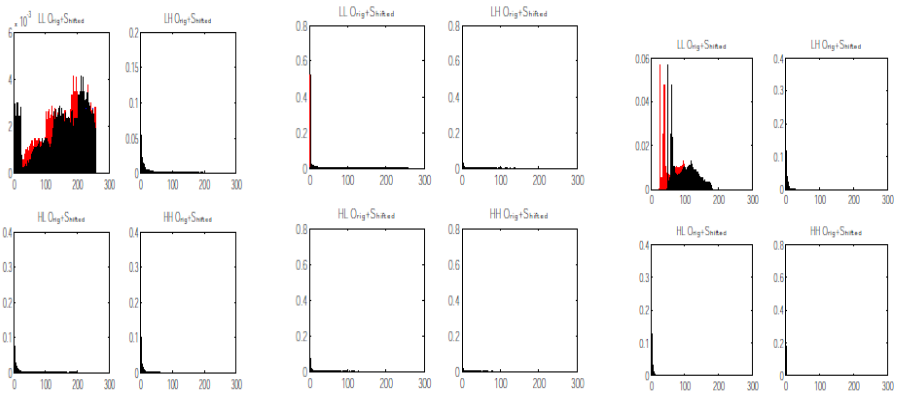

Figure 5.2 LL,LH,HL,HH's Orig + Shifted Histograms of Images a,b,c Respectively for k= 1 5.

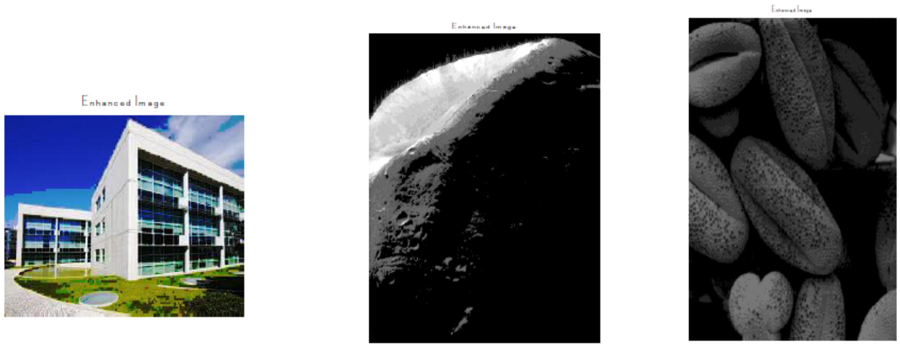

Figure 5.3. Enhanced Version of Loaded Original Images for k =15

Calculation of EME For Loaded Enhanced Images for different value of K

Table 1.1 Calculation of EME of Images For K=1, K=10, K=15.

IMAGES	BUILDING	ROCK	SEED
EME FOR K=1	7.582	4.194	6.71
EME FOR K=10	7.593	3.533	6.46
EME FOR K=15	7.597	3.243	6.17

IV. CONCLUSION

It is concluded from the thesis that Wavelet decomposition by histogram shifting & shaping method has better contrast and resolution of enhanced image. The final result shows the good visual quality without any inconvenient washout effect and blurred of images. It also increases the value of measurement of enhancement entropy (EME). This work shows the comparison for different images over EME parameters. The dynamic range of the image is much improved after proposed method and the details hidden in the original image are enhanced. Transform histogram shifting and shaping is the best method presented in this thesis.

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