IMAGE ENHANCEMENT USING HISTOGRAM EQUALISATION AND DWT BASED IMAGE FUSION

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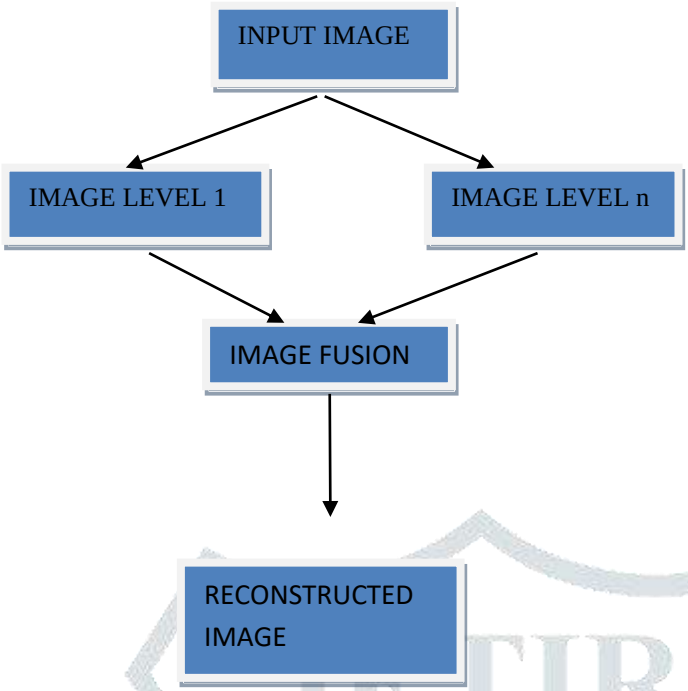
Abstract—Image fusion is emerged as one of the main image processing , here two or more images will be fused by retaining the most desirable characteristics of images.Discrete wavelet transforms (DWT) based image fusion is one of the most simplest kind of image fusion. The major step in image fusion is the multi scale decomposition of source images. The source images are divided into lower and higher sub bands. The pixel having largest wavelet coefficients are selected for operation. In this paper, for input image histogram equalization method is used to improve the contrast of the image.DWT fusion method is used to get enhanced image.

Index Terms—Image Fusion, Discrete wavelet transform(DWT), Histogram Equalization.

I.INTRODUCTION

The image fusion is a branch of data fusion and it is the process of combining two or more images to form a single image . So the fused image gives much better information than the original images . The Fusion process will reduce the volume of data by creating compatible images with perception capability of human operator by completing image processing tasks like: image segmentation, object detection or target recognition [1].Image fusion is used in the areas like defense ,surveillance, target tracking , Medical Imaging , Biometrics , Robot vision, Aerial imaging and Satellite imaging etc. The Fusion process can be classified into three levels. They are pixel level image fusion, feature level image fusion; decision level image fusion .The decision level and feature level fusions are high-level fusions that require more complex algorithms and more intensive computation. The pixel level fusion is the lowest level fusion that fuses the images from different physical channels pixel by pixel to enhance the features not complete in either channel. Therefore, it requires less processing time and is found suitable for time critical image fusion applications such as underwater image processing specially for defensepurpose[1].

DWT is any wavelet transform for which the wavelets are discretely sampled. It captures both frequency and location information Discrete wavelet transforms (DWT) based image fusion is one of the most simplest kind of image fusion. The major step inimage fusion is the multi scale decomposition of source images. The source images are divided into lower and higher sub bands. Thepixel having largest wavelet coefficients are selected for operation. DWT performs a transformation of image in spatial domain toimage in frequency domain. The fusion operators used in this method vary for different decomposition levels. The major advantage byusing DWT is that it preserves coefficient information since it uses different fusion rules so it provides better SNR. The final step inDWT based technique is the application of inverse discrete wavelet transform to the processed image.The basic steps in image fusionprocess using discrete wavelet transforms is shown in Figure.



The paper has been divided into five sections. Section II Describe the Histogram eqalisation method to enhance contrast of the image.Section III is for Discrete wavelet transform based fusion is discussed . Section IV gives Proposed method work flow.Section V followed Results and discussions. Conclusions are summarized in section VI.

II.HISTOGRAM EQUALISATION FOR CONTRAST ENHANCEMENT

Histogram equalization is a spatial domain method that produces output image with uniform distribution of pixel intensity means that the histogram of the output image is flattened and extended systematically.

We acquire the probability density function (PDF) and cumulative density function (CDF) via the input image histogram. Apply these two functions PDF and CDF for replacing the input image gray levels to the new gray levels, and then we generate the processed image and histogram for the resultant image. And when we discriminate input image histogram with the processed image histogram we found that the gray level intensities are stretched and depressed systematically. Consequently, we obtain that the histogram of the output image is systematically distributed. Yet, this accords the over enhancement in images above the actual gray scale span.

During histogram equalization approach the mean brightness of the processed image is always the middle gray level without concerning of the input mean. This procedure is not very convenient to be enforced in consumer electronics, such as television, by the reason of that the method tends to introduce irrelevant visual deterioration like the concentration effect. The particular explanation for this issue is to conquer this weakness is by perpetuating the mean brightness of the input image indoor the output image. Figure 1.2 shows an illustrating example of using Histogram Equalization (HE) for image contrast enhancement.

III.DESCRETE WAVELET TRANSFORM BASED FUSION

Wavelet is a famous technique used for analyzing signals. It has the ability to preserve the time and frequency details of the images to be fused [1]. It provides a variety of channels representing the image feature by different frequency sub-bands. Li et al [2] and Chipman et al [3] introduced DWT into image fusion. The discrete 2-dimensional wavelet transform is computed by the recursive application of low pass and high pass filters in each direction of the input image followed by sub sampling. The discrete wavelets transform (DWT) allows the image decomposition in different kinds of coefficients preserving the image information. When decomposition is performed, the approximation and detail component can be separated .

The DWT merges the coefficient to get the best result in the fused image. We can do it by considering the average of coefficient. The average method and it is one of the basic methods to implement discrete wavelet fusion.

3.1 Image fusion using DWT flowchart:

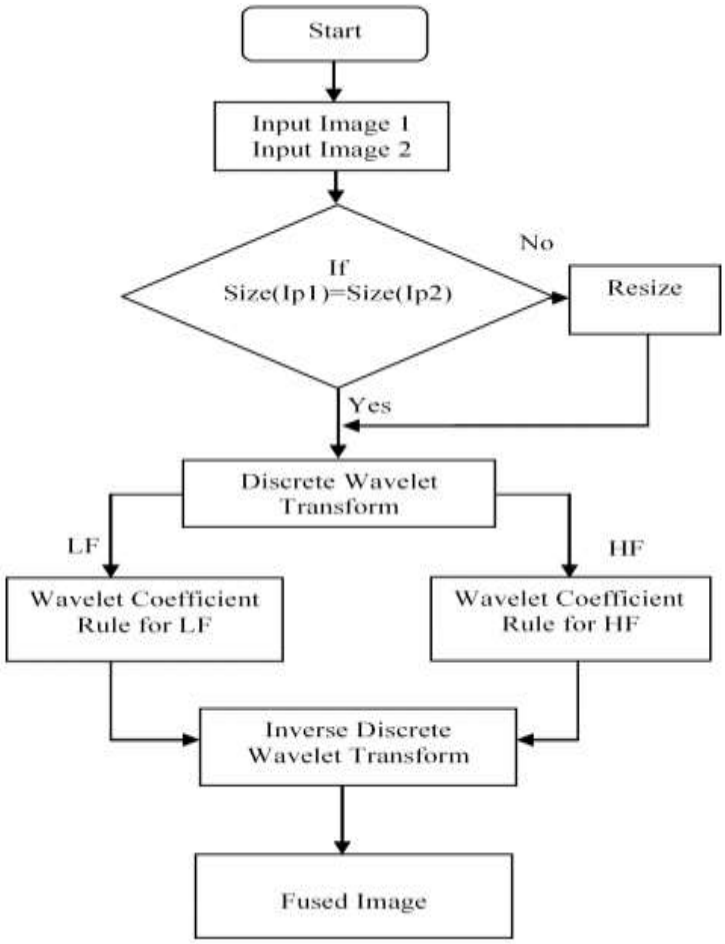


Figure : Image fusion using DWT flowchart

- Read two source images and resize both to same size.
- Apply Mallet algorithm to decompose source images into low pass and high pass sub images.
- At each level, we get four sub images.
- One low pass sub image, three high pass sub images (Horizontal, Vertical, Diagonal).
- Apply max wavelet coefficients rule to find fused coefficients.
- Apply Mallet reconstruction algorithm for construction from fused low pass and high pass coefficients. The fused image is obtained.
- Calculate Entropy, Correlation Coefficient, Mean values and Root Mean Square (RMS).
- Compare with other existing wavelets.

IV.PROPOSED METHOD:

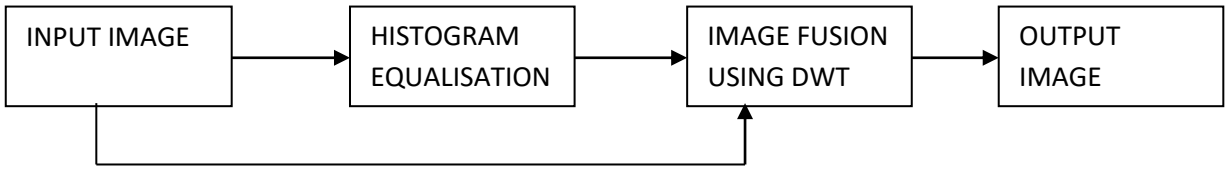


Figure : Block diagram for proposed fusion method

The above figure denotes that how the fusion of the image will be done after applying the histogram equalization method.In this process first the input image will be loaded and then histogram equalization function will be applied to get the more contrasted image.After the getting of the contrasted image the fusion will be done for given input image and the resulted image.Hence by applying the fusion function to these two images we get the more clear image which is more improved version of the input image.

V.RESULTS AND DISCUSSION

Here the results of the work in the form of screenshots obtained during the successful execution of the project which has been shown below.

Figure : input image

In this screenshot we are seeing the input image which is very dark.

Figure: histogram equalized image

In this screenshot we can see the brightened image which is obtained after applying the histogram equalization function

Figure : fused image

This screenshot shows the clear image of the input image after fashioning the input image with histogram equalized image.

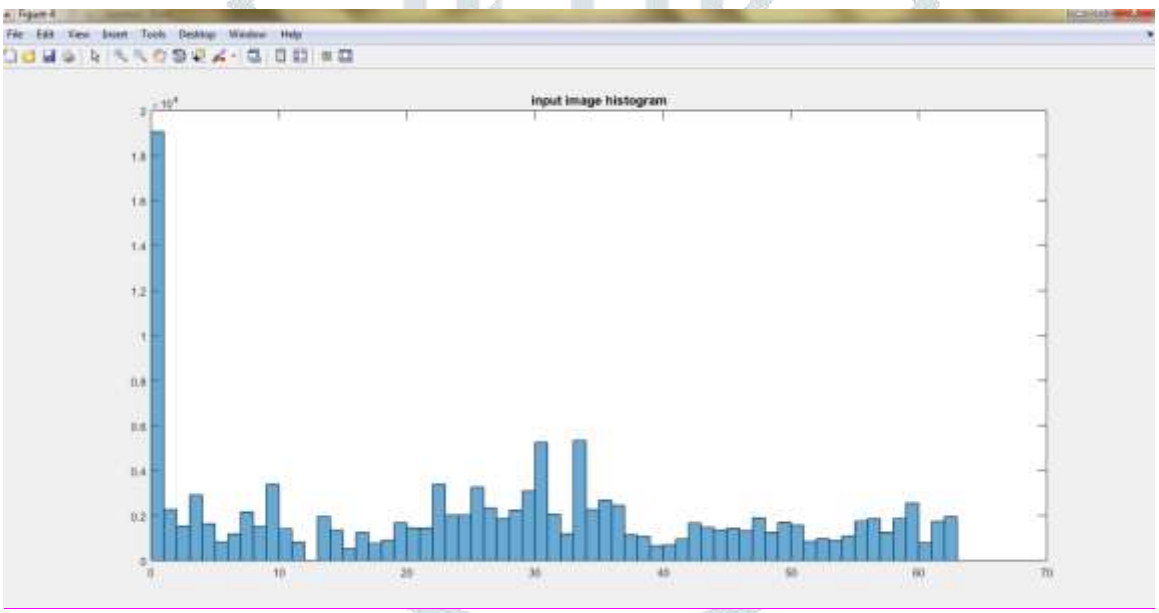


Figure : input image histogram

This screenshot will show the histogram for the input image,which indicate the pixel distribution in the image.

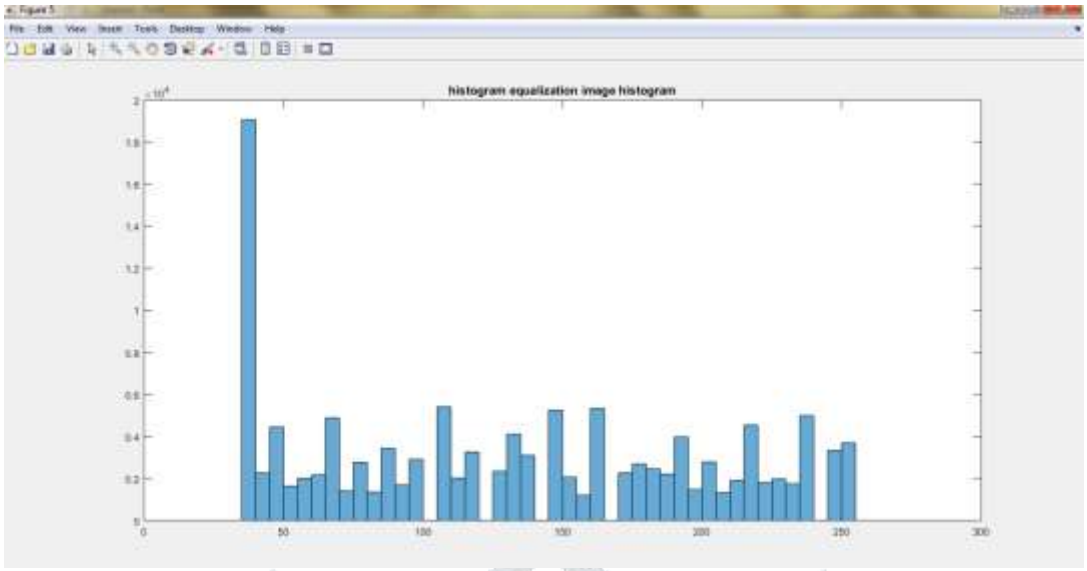


Figure : histogram equalized image histogram

This screenshot will show the histogram for the histogram equalized image, which indicate the pixel distribution in the image

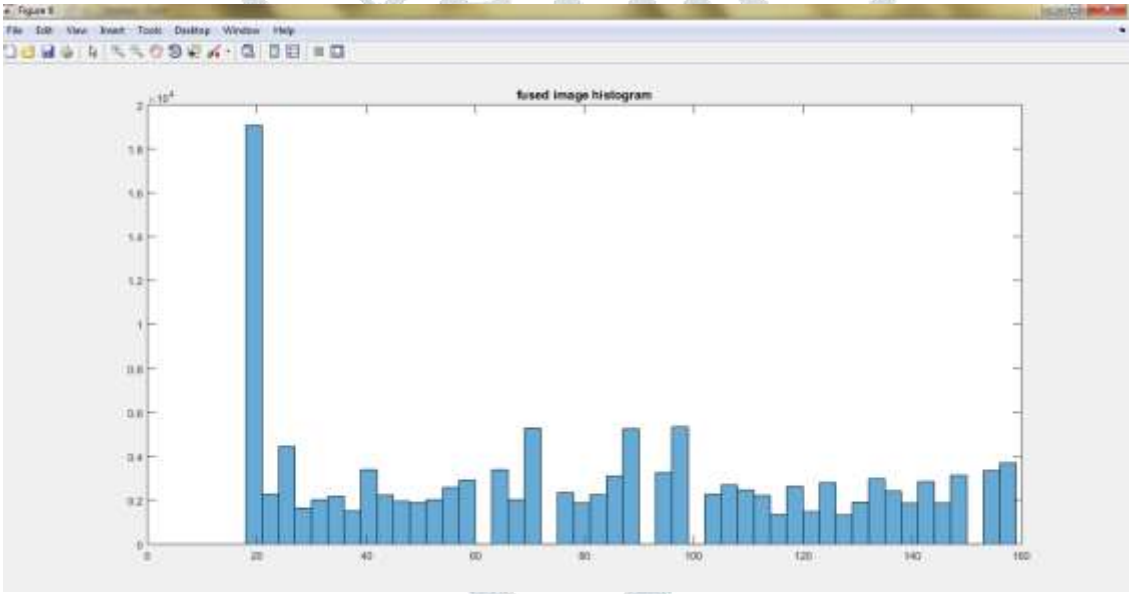


Figure : fused image histogram

This screenshot will show the histogram for the fused image, which indicate the pixel distribution in the image.

VI.CONCLUSION

In this paper,we proposed an Image fusion approach to improve the quqlity of the images by removing some problems found in images such as blurring,low contrast and noise.In our approach,we used histogram equalization method to improve the contrast of the Images and DWT based image fusion method to improve the quality of images.This approach is used for applications like underwater imagig,military images etc.

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