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Hybrid Decomposition and Filter Techniques for Contrast Image Enhancement

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ABSTRACT— The SAR images which are termed as Synthetic Aperture RADAR (SAR) images are employed in various fields of research oriented work. One of the drastic problems of these classifications of images is their low perception value. A new method is advised to overwhelm the satellite image which uses the normal type of basic level wavelets and threshold decomposition techniques. The novel algorithm that proposes, use Discrete Wavelet Transformation with a level of 2 dimensional in nature. This is to decompose the input image into various levels of sub bands. Frequency sub-band separation is done in the level of decomposition. Then, the high-frequency band separated (HH) images and the input low-validated image (LL) have been compared to give a new highly enhanced image by using the reverse process of Discrete Wavelet Transform. Thresholding is a scheme that is employed in nonlinear image analysis. This hybrid method will give greater results. In order to get an image with a greater level of accuracy, a mid level stage for estimating the sub bands has been proposed. The results identified should be validated with some parameters such as Peak Signal-to-Noise Ratio and Root Mean Square Error. The results show deviation of the proposed technique over the conventional systems.

KEYWORDS— Wavelet Decomposition, 2D-level DWT, sub band separation, SAR images, RMSE, PSNR

I. INTRODUCTION

Resolution of an image is important issue that mainly depends on the pixel substitution and the occurrence of pixel levels, etc. Video-processing related works such as resolution enhancement, satellite image resolution enhancement has been widely used in many image processing categories, such as reconstruction of SAR images and image resolution enhancement. Wavelets are also playing a vital role in many image processing applications. The 2D level DWT based wavelet decomposition of an image can be attained by performing the single dimensional level Discrete Wavelet Transform (DWT) along with the rows of the input signal first and then the results are transformed along the columns

The separation of bands results in various decomposed sub-band images named as a pair of two low pass filters (LL), a low and a high pass filter (LH) & (HL) and a pair of two high pass filters (HH). The ingredients of those sub-bands cover the full frequency spectrum of the original image. Filter operation should operate on the image in order to give dissimilar sub-band frequency images. Enhancement of resolution of images using wavelets is a novel one and many algorithms are there to measure the unknown details of wavelet coefficients to make the sharpness of the reconstructed images more efficient.

II.LITERATURE SURVAY

The estimation of many researchers was brought out by investigating the evolution of wavelet transformation. Edges identified [1] by an edge detection process in the lower level of frequency sub-bands, that were employed to develop a model for calculating the edges in higher level frequency bands and coefficients with notable values were calculated as the evolution of the wavelet coefficients. Few researchers [2]-[4] have done hidden sub band separation that has also been implemented to calculate the coefficients. The real-valued filter [3] coefficients of the new filter must be determined.

With the use of the new threshold decomposition architecture, an adaptive algorithm is developed for filters

validation under the Mean Square Error [1]-[5] (MSE) criterion. The brought out adaptive algorithm termed to weight median algorithm, having complexity in comparing the previously done algorithm. Implementation of DWT to Histogram estimated image and the given image respectively.

Decomposing process of an image is done row-wise manner and then column wise also. Thus by Discrete Wavelet Transform process [1]-[5] the image will be divided into four major sub bands. Of the four various sub images brought out, the first one obtained by low signals filtering is referred to as the LL image. Another one obtained by low signals filtering the rows and high signals filtering the columns is referred to as the LH images and vice versa this process is being carried out for remaining HL and HH sub bands also. This process is done in 2D level of DWT.

III. EXISTING SYSTEM

The existing system comes with the level of decomposing the image that comes with the identification of the histogram shifting and the histogram expansion and equalization. The parameters are validated up to some extent, such that the values get drastic increase or decrease in the contrast level. Histogram equalization with the various levels such as Generalized Histogram (GE), Difference Histogram Equalization (DHE) along with SVD values (Singular Value Decomposition), DWT with 1D level, etc are included in the existing system work. Generalized Histogram with the various levels of identification of the difference in decomposition values give the deviation of the change in the contrast levels.

Manual analysis of the contrast output images are not that much peculiar. So, the increasing level of contrast can be done as per counts in pixel level. Histogram shifting level with some greater extent can be done accordingly to reduce down the noise levels up to a limit and finally parameters can be validated finally. Contrast enhancement with some other techniques of identifying the diamond cut if pixels are diagonally brought out. Many of researchers have used many enhancement features and the techniques. Even DWT with the limitation of Singular Value Decomposition comes with the existing system because the validation methods and techniques are quite outdated. One dimensional DWT process initially decomposes the image correspondingly with the extent of identifying the low pass and high pass filters, etc. Many wavelet decomposition techniques have been brought till now including Stationary Wavelet Transform (SWT), Complex level (CWT), etc.

IV. PROPOSED SYSTEM

The proposed system deals with the implementation of simulated part with the editor coding in Matlab and the hardware implementation of image enhancement with the Blackfin Processor (BF532). Color Image enhancement is still in some criteria of identifying the pixel ranges and these values give the change in contrast enhanced level as per each and every pixel. Proposed system uses mainly a few parameters. They are described in the following.

Image enhancement with the level of 2D Discrete Wavelet Transformation (DWT) and morphological filters can also be implemented over here. Our total functional flow can be described as mentioned in the below block diagram.

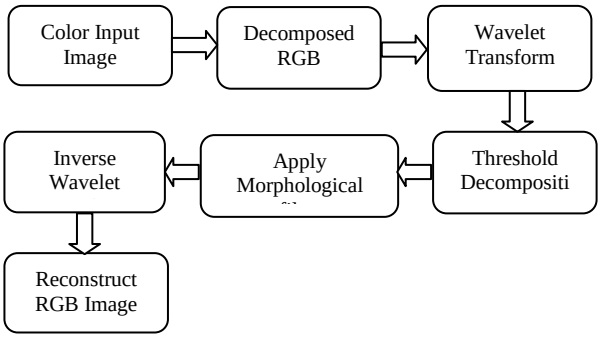

Fig. 1Overall Block Diagram

The above mentioned block diagram describes the functional flow of the total process in the simulated part. After selecting (shown in Fig.2),the input image is decomposed using the parameters such as gray scale conversion (Color image is decomposed and converted into Grayscale image) and from the color conversion technique can also be functionally brought out. The process whatever we implement in the functional flow will be having the reverse process. Thresholding or Threshold decomposition comes with the value allocation of the minimum level in either row or column.

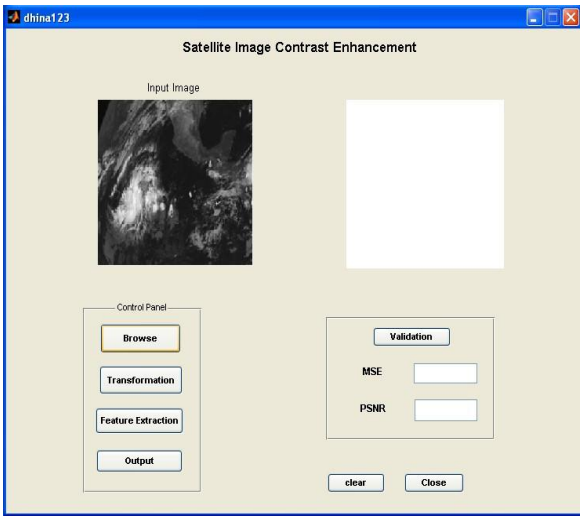

Fig. 2 Selection of Input Image

Although weighted median filters offer merits over traditional linear filters, they lack the changeability to a number of signal processing issues. Weighted median filters are corresponding to normalized filters constrained to have only positive weights. This follow is to analyze and design this class of filters. The new threshold decomposition is used to develop algorithms to optimally formulate the real-valued filter coefficients. The new weighted median filter formulation leads to more capable and effective addressing by prior weighted median filter structures and its derivates.

A. Wavelet Transform

Wavelet transformation can be implemented with the ease of identification of separation of Low Pass Filter and High Pass Filter. 2D level Discrete Wavelet Transformation occurs (as shown in Fig.3.) with the change in attaining in the filters correspondingly.

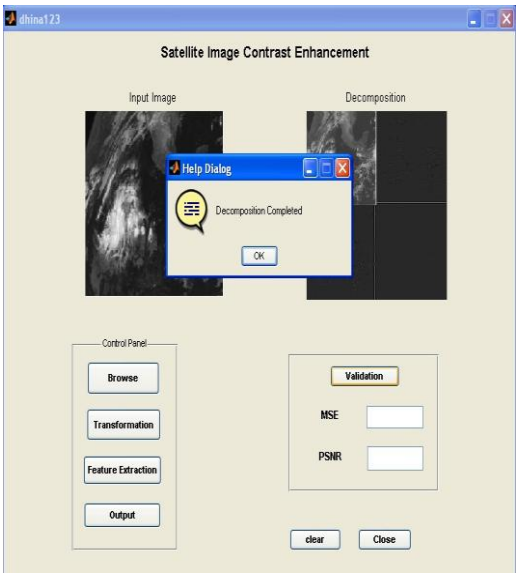

Fig. 3 Wavelet Decomposed Image

B. Morphological Filters

Morphological Filters are not even any complex filters but they come with the normal conventional filters such as dilation and erosion. Dilation is nothing but the factor of analyzing the pixel values with some sufficient data. If the data is not mentioned with the enough pixel rates and values means, the data should be made sufficient, such that to make the image enough sufficient, erosion and dilation step functionality flow should be gone through. Discrete Wavelet Transform (DWT) is the wavelet Transformation technique where we need not look after much because the parameters are comparatively accurate.

Parameters should be validated (shown in Fig.5) accordingly, then after that, implementation of a hardware DSP processor i.e. Blackfin Processor BF 532 is to be implemented. From that, generating an Ldraw file leads to the implementation of Image enhancement through hardware implementation is achieved

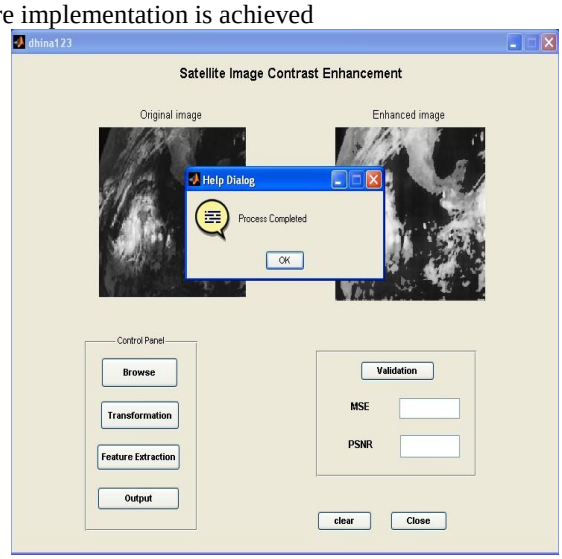

Fig. 4 Enhanced image using Morphological Filters

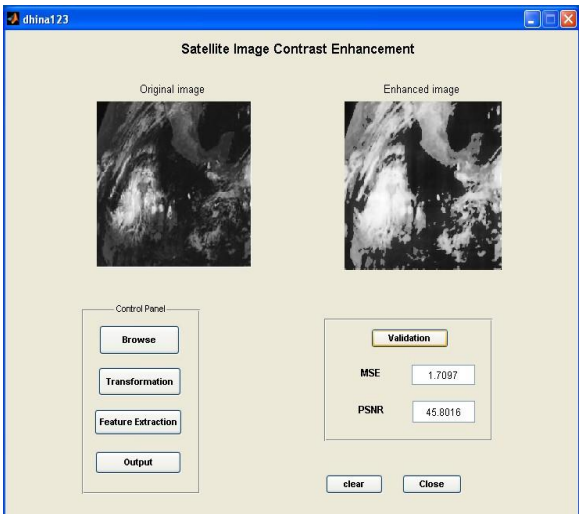

Fig. 5 Parameter validation

V. RESULT AND DISCUSSIONS

The overall result is shown with the implementation of the image contrast enhancement with the simulated part which is achieved through the software package Matlab, next to that the hardware implementation can also be done with the blackfin processor BF532. The overall performance can be measured through the identification of parameters such as MSE and PSNR values.

MSE = sum(sum(I1-I2).^2)/(r * c) ……..(1)

Where,
I1 – Input image
I2 – Output image
R – Total number of rows
C – Total number of Columns

$PSNR = 10 \log_{10}(R^2/MSE)$ ……..(2)

Where,
R^2 – Total number of Pixels
MSE – Mean Square Error

Through these parameters it's identified about the accuracy and efficiency, etc.

VI. CONCLUSION

In this paper we have enhance the satellite images using DWT and Morphological filter to overcome the drastic problems. And the novel algorithm also implemented in blackfin processor BF532. The novel algorithm reduce the unwanted flickering and reduce the distortion in original image. The unique feature of this algorithm is that it also treats chromatic components in addition to the processing of the luminance component improving the visual quality of the images to a great extent .

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