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Noval Approach of Contrast Level of Images Captured from Satellite Using DWT and Sharpness Preserving Algorithm

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ABSTRACT

The Digital image processing is used to improve the properties of the image, with the help of extraction of important information about a particular object from the improved image. These images can be taken by different digital devices such as video cameras, web cameras scanners MRI machines, X-RAY machines, high definition satellites, ultra sounds etc. This work present contrast enhancement technique for satellite images using histogram analysis and discrete wavelet transform. Images captured from satellites are used in various applications areas but images are not very enhanced and images may be very blurry or contains less contrast. Proposed algorithm overcome such type of problems by using the more efficient technique which improves contrast level of satellite images using dominant brightness level, enhanced adaptive intensity transfer function and boundary smoothing technique. Obtained results shows that proposed work improves the contrast level of satellite images and it also preserves the edge detail in the image.

Keywords-Image, contrast, sharpness, DWT, wavelet, Discrete Wavelet Transform (DWT).

I. INTRODUCTION

Digital image processing [1] is used to improve the properties of the image, with the help of extraction of important information about a particular object from the improved image. These images can be taken by different digital devices such as video cameras, web cameras scanners MRI machines, X-RAY machines, high definition satellites, ultra sounds etc. Images and it is applicable in different areas such as research institutes, corporate, entertainment, traffic control, electronic industries, defense, investigations, and disaster control. The purpose of these all is to provide a sharp observation with the help of extraction of important information about the object which is to be viewed. Since the image processing is a broad area hence the author cannot predict where the image processing starts and where it stops. Both input and output are defined in the form of images. According to this definition it's very trivial task to compute contrast and intensity of an image in the image processing.

Since the image doesn't have any specific boundary for a particular section which is to be shown so we can made three types of considerations such as low level, mid level and high level processes. The operations performed by the low level process are contrast improvement, intensity improvement and image pre-processing to minimize the noise. Both input and output

are considered in the form of image at the low level processing. The mid level processing is used for image segmentation the image into number of sections), representation of objects to convert them in such a form which is best fit for computer processing, and identification or recognition of separate objects in the image. The input at mid level processing is considered as a image but its output is shown as the attributes found by the extraction from the images such as boundaries and recognition of separate objects. At the higher level processing the reassembly of objects in the different level is done with the help of some cognitive functions associated with the scenes.

II. Proposed Work

The wavelet transform is used for image compression, which is necessary in image processing. Wavelet transform method is also used to detect the edge information, fusion, noise and so on. For signals different wavelets lead different types of results because of their different characteristics on their compact and fluency. But, it is confusing that how to select the suitable one in a specific application. Satellite image contrast enhancement uses WT (Discrete wavelet transform) and singular value decomposition. In proposed work firstly we performs the Discrete Wavelet Transform (DWT) transformation operation on the input image (satellite image). The DWT transformation technique decomposes the input image into HH, HL, LH and LL sub bands. Analyze dominant brightness level and image decomposition based on different dominant brightness Level. After that we apply intensity transfer function in order to adapt different levels of intensity then smoothed out the image using canny edge detection technique. Finally image fusion and inverse DWT operation is applied to the image in order to get resultant image. The resultant image is smooth and Sharpe the edge detail.

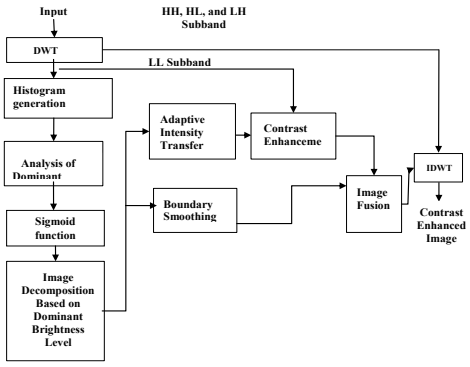

Figure 1: Block Diagram

III. Implementation and Result

In implementation work, we are taking sample images (satellite images) the then we apply the Discrete Wavelet Transform (DWT) transformation operation on the input image (satellite image). The DWT transformation technique decomposes the input image into HH, HL, LH and LL sub bands. Analyze dominant brightness level and image decomposition based on different dominant brightness Level. After that we apply intensity transfer function in order to adapt different levels of intensity then smoothed out the image using canny edge detection technique. Finally image fusion and inverse DWT operation is applied to the image in order to get resultant image. The resultant image is smooth and Sharpe the edge detail.

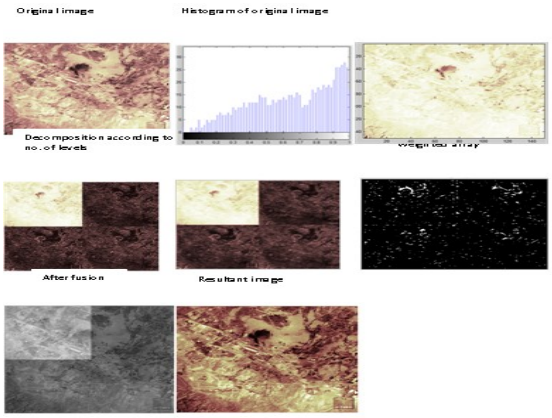

Figure 2: Outline flow of the Existing Work

Figure 1 shows the different images when the existing algorithm is applied to the input sample of the satellite image. The algorithm includes adaptive intensity function, contrast enhancement, DWT, Smoothing and Fusion of the image.

Table 1 shows result analysis of existing work. Various parameters like MSE, PSNR, NCC and NAE of contrast enhancement are taken for the analysis.

Table 1: Analysis of Existing Work

IMAGE	MSE	PSNR	NCC	NAE
	1.72E+04	5.8311	0.0072	0.9919

The image taken for experiment is the satellite image, the image has mean square error and normalized absolute error value is high but peak signal noise ratio, and normalized cross correlation is very low. The image is less contrast and edges are not sharp enough to detect the object in the scene. The algorithm was not efficient to detect the edge in particular region as well as object. In proposed work firstly we performs the Discrete Wavelet Transform (DWT) transformation operation on the input image (satellite image). After that we apply intensity transfer function in order to adapt different levels of intensity then smoothed out the image using canny edge detection technique. The proposed method has improved the contrast of images and detected the edges in particular region as well as in the object.

Table 2: Analysis of Proposed Work

IMAGE	MSE	PSNR	NCC	NAE
	3.40E+03	12.814	0.724	0.439

In table 2 shows the result analysis of proposed work. Following parameters of contrast enhancement are taken for the analysis.

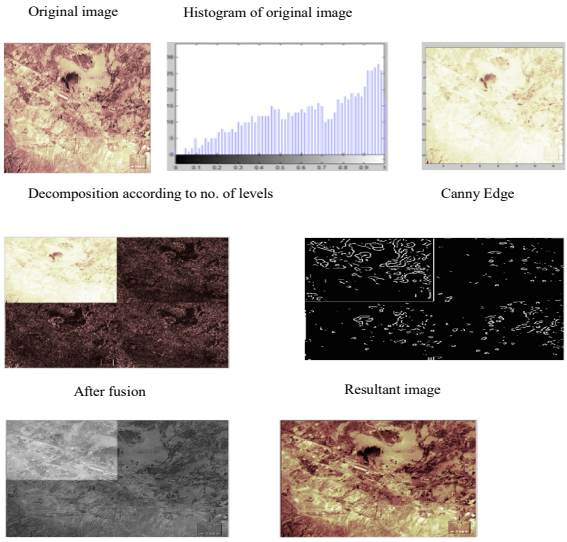

Figure 3: Outline flow of the Proposed Work

The image shown in figure 2 is an outline of the proposed work, the original image in the figure is satellite image which is blurred and corrupt. After the implementation of the canny edge detection method the image of the satellite has been improvised, the edge has been cleanly detected and blurry has been removed, the object in the image can be separately identified. The proposed method has been verified for a number of images and efficient result is obtained.

III. COMPARISON

Results obtained from proposed work have been compared with the previous work. The original image is satellite image which is blurred and corrupt. After the implementation of the canny edge detection method the image of the satellite has been improvised, the edge has been cleanly detected and blurry has been removed, the object in the image can be separately identified. The proposed method has been verified for a number of images and efficient result is obtained.

The comparison between the existing work and proposed work is shown in figure 4 &5.

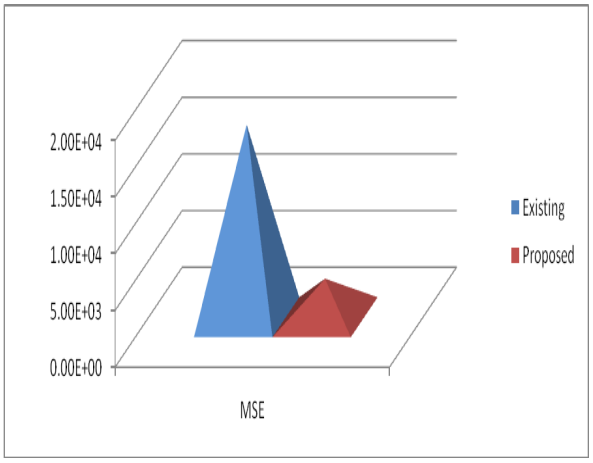

Figure 3: Comparison based on MSE (Mean Square Error).

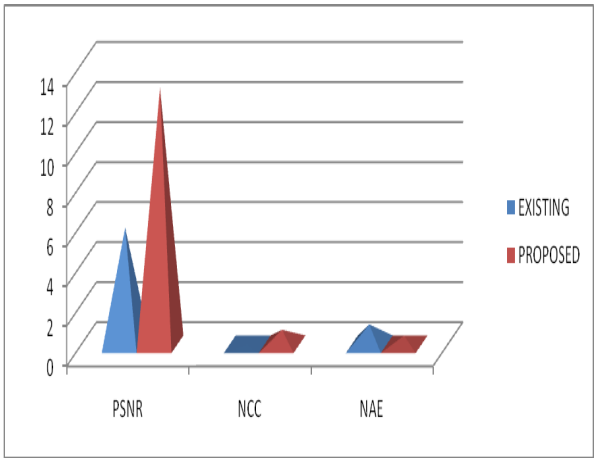

Figure 4: Comparison based on PSNR, NCC and NAE.

IV. Conclusion and Future Work

Improving the quality of the images is the primary target of all image enhancement algorithms. Several image enhancement techniques exist both in spatial as well as transform domains. One of the famous existing techniques includes image enhancement using Curvelet Transform first and then applying histogram equalization. But the results obtained can be still improved more. The DWT provides sufficient information both for analysis and synthesis of the actual signal, with a momentary decrease in the computation time. This technique reduces the Mean Square Error (MSE) and improves Peak Signal to Noise Ratio (PSNR). But in future this work can be improved by using other techniques in order to improve contrast level.

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