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CONTRAST IMPROVEMENT TECHNIQUE SATELLITE IMAGES APPLYING FILTRATION METHOD

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Abstract-In this paper introduces advanced contrast technology considering. The input images taken from remote Satellites are used in many applications but the images taken are not very enhanced and may contain blurry or less contrast. Despite the growing demand for better remote sensing pictures different methodology was proposed but they are not able to preserve the edge details and Saturation of high and low brightness images areas. Histogram equalization (HE) was the most familiar approach to raising the contrast in various applications. But cannot maintain the shape information and cannot preserve the average Image brightness, which may be lower or higher than the reprocessed image saturation. The suggested algorithm solves this type problem by using effective techniques used for enhanced satellite image contrast using the atomization resolution of atomization of dominant brightness level, ADT function and smoothing of boundary. Experimental results show, that the suggested method rise the contrast and the perspective of the local details that is improved than current techniques and retains poor image information. The advanced approach can definitely improve any depressed contrast images and maintain the edge contingent Purchased with a satellite camera and are also suitable for other imaging devices such as user digital cameras, and compression cameras.

Keywords- Histogram, Curvelet, Discrete wavelet transform (DWT), Contrast enhancement, Remote sensing image.

I. INTRODUCTION

A few decades, the usefulness of remote sensing pictures has played an important performance in many areas, such as education, meteorology, geology, agriculture, radar medicine. Unfortunately, incoming images that capture digital devices sometimes do not really very good in contrast and brightness level. Therefore, a process is image improvement is often needed to advance the condition of these low quality images. The aim image improvement is to bettering image quality, because the picture is improved than the original. Numerous techniques for image improvement introduced by various researchers spatial and transform both the domains. According to spatial domain manner, concentration values of images have been personalized.

Histogram detection [1] was the maximum renowned views to contrast enhancing in the several application areas like as speech recognition, medical image processing, object tracking etc. Image condition can often be enhanced when displaying visual objects at different low contrast values. Histogram detection is a simple method to improve the spectral distribution enhancement of pixel data to improve in a uniform way; the improved image has a linear histogram. The HE Technique is a universal operation; it's does not carry the same Image-based methods cannot maintain the moderate brightness level, which can be found result in under recycled image or super saturation. To overcome this issue, Bi-histogram (BHE) and dual-image sub-image equalization approach have been generalized by using a decomposition of 2 sub-histograms. To minimize this type of problems, Bi-histogram (BHE) and dual-image sub-image equalization approach have been generalized using a decomposition of 2 sub-histograms. For ahead reformation, the recursive mean-separate HE (RMSHE) methods of doing BHE in detail and produces separately equalized sub-histograms.

The singular value deformation on the DWT of LL sub-band [2], in spite of the developed image contrast, they -compliance defective picture in the development areas of low intensity the process biased to alter the picture in low along with areas of high intensity. Now remote sensing pictures, the common monument caused by current contrast enhancement approach, namely drifting brightness, saturation, and distorted details, requirement to be structure because pieces of crucial information are widespread throughout the image appearance in the sense of both spatial locations and intensity levels. For this reason, algorithms for enhancing satellite images include reducing, but not only, have improving the intensity of satellite imagery but also minimized deformation pixel resolution at compass of low and high intensity. The captured digital images for all variety of display gadgets. Unfortunately, the remote sensing pictures captured by these devices are struggling to asset the edges of this type of images. For To overcome this type of problems, we introduced a new approach that is Contrast Enhancement approach considering satellite images applying Filtration method More specifically, the introduced contrast enhancement technique firstly executes the DWT to decompose the processes input image to an established of band-limited components, called HH, HL, Low-High, and Low-Level sub-bands. Outcome of the Low-Level sub-band has the radiance information [3], the log-average radiance is figure out in the Low-Level sub-band for figure out the dominant brightness level of the processed input image [3][4][5].

DWT includes any wavelet transformation for which wavelets are sampled discreetly. The mostly used wavelets with haar wavelet, daubechies wavelets (DB).The wavelet transform used here is the haar transform, since haar transform captures not only a notion of the frequency content of the processing by inspects on different levels, but also its chronological content, at the time this type of frequencies is occur. After applying the DWT value, the image underwent Histogram balancing. Sometimes, the elements of the processed image that contains the convenient information are represented by small contrast values. Applying Histogram balancing approach the contrast of these areas is enhanced which provides improved image quality. The new proposed method is to identify bright regions through discrete wave transformations the new proposed method includes identifying the bright regions using discrete wavelet transform (DWT).

A. Curvelet Transformation

First formation of alteration is a multi-scale directional transform which has been constructing to represent boundaries and other strangeness along curves effectively [6]. It enables directional study inputs images in different scales. Second generation curvelet transform called the discrete curvelet transform (DCvT) has been introduced with less complexity and fast computation [7].It has two different decay namely unequispaced DCvT (UDCvT) and the wrapping DCvT (WDCvT). In UDCvT, curvelet coefficients found by irregular sampling the Fourier transform of the images. In WDCvT, a series of translation and packaging techniques are used.

B. Enhancement based on Wavelet Transform.

The wavelet transform is firstly used to image compression, that is the really predominance in image transformation. Later, the WT is also used to classify the boundaries data, enhancement, fusion, denoise, and so on. For now, there are some other kinds of wavelet can be selected, including mayer, daubechies, symlet and shannon, etc. For the same signals, different wavelets lead different results because of their different characters on compact, fluency and orthonormal. But, it is still confusing us that how to select the most sufficient one in a more specific application.

As we know, no matter which kind of WT we used, the low frequency coefficients are corresponding to the main contour of a processed image. On the contrary, the high frequency coefficients reflect the details and the noise All of the coefficients are all very useful in promoting picture quality. In most situations, parts of the noise can be confined by enhancing coefficients which belong to low-frequency and low-pass high-frequency. But, the low-pass threshold is not simple to control. If a low pass threshold filters most of high frequency coefficients, much of the noise will be deleted, and the picture becomes smoother. But, the picture will also come blurred, due to more detail attribute are also deleted. This means that it is not sufficiency to distinguish noise factor from detail ingredient simply allow to the density of WT. The key of the approach is how to separate two variety of information effectively

C. Gaussian filter

The **Gaussian filters** detection method is introduced in 1986 by John Canny. Use this method to asset the edges established on the local maximum of f (x, y). The coordinates is determined by the Gaussian filter derivative. This approach contains two thresholds to find weak and strong edges, and contain the weak boundaries on output only if linked with strong boundaries. Therefore, additional likely to identify the true weak edges

Application of this method

1. Used to find the boundaries in images.
2. That used for defense, security and some other this type of application or security projects.
3. Face Detection or Detecting Human.

Fig.1: Using Canny Edge detector.

II. RELATED WORK

According to Yeong-Tage Kim, [9]. The disadvantage of Histogram balancing is the brightness of the processed image may be changed after Histogram balancing, due to the histogram smoothing function. The main aim behind this approach was to manage the brightness of the taking image during the time of enhancing its contrast. Yu Wang, et al [10] introduced dualistic sub-image Histogram balancing (DSIHE). They also do the same concept as BBHE but the criteria for separating histograms are the median value.

Minimum mean brightness error bi-Histogram balancing (MMBEBHE) method was proposed by chen and ramli [11]. In this technique the histogram is partitioned depend on the threshold level which is equivalent to minimize the difference among the processed input mean and the output mean. The brightness of original image is preserving in this case with the help of method is more improved than BBHE and DSIHE. Chen and ramli also provide approach recursive mean separate Histogram balancing [12]. Where the histogram is recursively partitioned depends on local mean values and the total number of sub-histograms (2^r) is given through the user.

A. Discrete Wavelet Transform.

The DWT is separate in time domain and scale; that means that the DWT coefficients may have floating point values, excluding the time and scale significances used to index these coefficients. A signal is break down by DWT into more than one levels of resolution (also called octaves), A one-dimensional, one octave DWT. Details are preserved, but higher octave averages may be ignored because they calculated during inverse transformation.

Each channel's output has only half the input's and a few amount of data plus a few coefficients due to the filter. Thus, the wavelet illustration is around the identical size as the original. The DWT can be 1-Dimensional, 2-D, 3-D, etc. B. 1-D Wavelet Architecture.

B. 1-D Wavelet Architecture.

One-dimensional architectures may be classified into large numbers of types, the important ones are: space multiplexed, systolic array, digit-serial time multiplexed and folded. There are some methods for improving these designs, which include lattice, pipelining/register networking, combined DWT and IDWT, and approximating results. However, each advancement involves a certain tradeoff: for example, lattice uses less space at the expense of a slower speed.

Examples of each category will be discussed below. Architectures are often designed with applications in mind. For 1-D transforms, applications can mentioned a de-noising a nuclear magnetic resonance (NMR) signals, resigning the seismic information, and analyze noisy FM signals.

The Multi-Histogram balancing methods were proposed by Menotti et, al. [13]. According to them, although bi-HE techniques retain brightness of original processed input image and the processed output image may not seem as natural as the original image. They introduced the technique which is on one hand preserves the brightness of the processed input image and on the other hand generated images with natural appearances. Later in the same year, Ibrahim et. al. Proposed their method for preserving the brightness entitled preserving dynamic Histogram balancing (BPDHE), in which a histogram is first subjected to 1-D Gaussian filter and then it is sub-partitioned into a number of sub-histograms based on its local maximums. Each sub-histogram is then equalized separately.

In 2010 H. Demirel, et.al [14]. The proposed method uses a new satellite contrast improvement approach based on discrete waveform modifications (DWT) and a unique decomposition value. The technique uses DWT technology and decomposes the processed input image into four frequency sub-bands and approximates the singular value matrix of the lower-sub-band image after the image is inverted by DWT. Standard general Histogram balancing and local histogram. This technique proves itself than equalization, advanced techniques like a brightness, dynamic adjustment of the histogram and the singular value equalization.

In 2011 Wei-Ming Ke, [15] proposed a protocol combining bilateral tonal adjustment (BiTA) and weighted salicycet contrast enhancement (SWCE) methods. This is for an innovative image enhancement framework. BiTA strengthens half areas and light and dark areas. They conjointly resented quantitative relation of saliency-weighted relative entropy to noise to judge the improved quality. This protocol achieves high contrast improvement with very little noise and nice image quality.

III. BACKGROUND

Up the standard of the photographs is that the primary target of all image enhancement algorithms Several image enhancement approaches exist both in spatial domain along with transform domains. Particular of the famous existing techniques includes image enhancement applying Curvelet Transform first and after that applying Histogram balancing. But the results can be improved. The DWT produce comfortable data each for the analysis and the synthesis of particular signal, within a fleeting decrease within the calculation time. The sufficient information are provides by the DWT for both analysis and synthesis of the actual signal, within a momentary decrease in the calculation time. In DWT, the affecting original image is first high-pass filtered, which provides the three larger images, where each describes local modification in brightness in the authentic image then it is low-pass filtered and downscale, which provides an approximation image; this image is then high-pass filtered to provide the 3 smaller detail pictures After that applied low-pass filtered to supply the ultimate approximation image within the upper-left. Once DWT is applied, then the bar chart equalisation is finished to re-assign the intensity worth of pixels within the processed input image such the processed output image contains a regular distribution of intensities. It will also result in higher contrast of previously lower contrast regions and areas thus the augment the contrast of the overall image.The region identification is then done using the Filtration method. After implementing the method, we have tried to make a correlation of the newly introduced method with the already existing technique for image brightness conservancy based on various evaluation parameters.

A. Dominant Brightness Levels

Despite growing demand for improving satellite remote sensing pictures, contrast enhancement depend on the existing methods histogram cannot maintain edge detail and present objects saturation in the region of high and low intensity. In this section, we have a represent new algorithm for the contrast enhancement Satellite pictures exploitation the dominant brightness level-based adaptative intensity transformation. If we do not examine spatially varying intensity distributions, corresponding contrast-enhanced images can have deformation intensity and losing image data in the some areas. To overcome this type of issues, we decompose the processed input image into more than one layer of single dominant brightness levels.

With the help of low-frequency luminance component, we perform DWT on remote sensor input images with the log of the average Brightness in the LL sub-band. Given that high-intensity is dominant in the brighter region the dominant Brightness at position (u, v) is calculated as..

$$D(u,v) = \exp\left(\frac{1}{N_L}\sum_{(u,v)\epsilon S}\{\log L(u,v) + \epsilon\}\right) \quad (3)$$

Where

- S = Encompassing of the rectangular region (υ, v),
- L (u, v) = Intensity the pixel at (u, v),
- N_L = The total number of pixels in S, and
- ε = A sufficiently Tiny constant that stop to the log function from diverging to negative infinity.

IV. PROPOSED METHODOLOGY

The investigation of remote sensing picture is very critical task because remote sensing picture do not preserve edge and brightness. In existing method use the adjustment function of gamma and the transfer function of the knee for global contrast enhancement. The knee transfer performs bridge the low intensity area by deciding the knee point in according with the dominant brightness of every layer. Since the knee transfer function alters the whole image information in the high and low intensity layer. The additional benefit is performed with the help of gamma function of adjustment the adjustment function of Gammas is changed by translation and scaling to the knee transfer function. Problem in this approach it could not preserve regional contrast enhancement and possible edge data of remote sensing pictures.

Now we proposed Filtration method for identifying the edge information optimally. This method provide better result as compare to existing technique in the terms of smoothness of the detecting edges and it also work well for detecting the local edge information along with global edge information. One broad reason to go with Filtration method this technique is identifying the edge information of the remote sensed images is inherently noisy and this method responds all over textured regions.

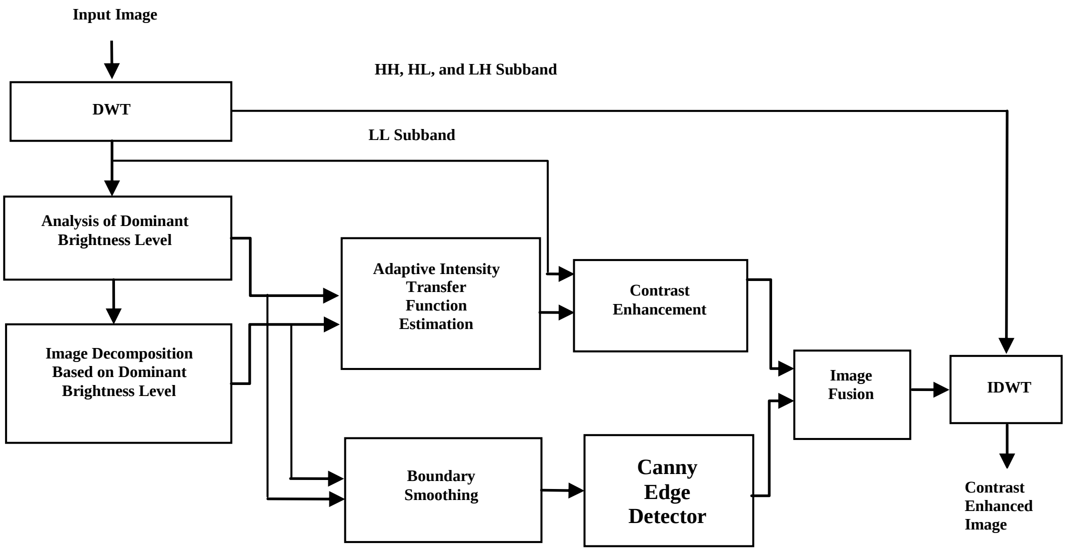

Fig.2. Block diagram of the new proposed work

Process of proposed method firstly, performs the discrete wavelet transform (DWT) on the processed input image. DWT decompose the processed input image within the some number of levels HH, HL, and LH sub band then do the Analysis of dominant brightness level and the image deformation is depends on dominant brightness level. After that applying the function of intensity function of transfer to adapt to other levels of magnitude of the processed image is decomposed, then smoothed and then the image transmitted to the smooth with the help of Filtration method of edge identifying technique subsequently incorporated with the techniques of contrast enhancement and spit out. After image synthesis and inverse DWT, HH, HL, LH bands applied to the image. Then the resultant image data is smooth and Sharpe the edge detail.

***The steps of proposed algorithm are given blow*.**

1. Take satellite image as an input image.
2. Apply DWT transformation of the input image.
3. The investigation of the dominant brightness level of

the LL band of the DWT is processed out.

4. The investigation of the dominant brightness level of the LL band of the DWT is processed out is carried out.
5. Apply adaptive intensity transfer function on distinct intensity levels of the processed decomposed picture and the final resultant image is smoothened out.
6. The resultant smoothen image passed through with in the Gaussian filter that is used for the edge information detection techniques which is emerged within the contrast enhancement methods and is phased out..
   The inverse DWT is applied to the fusion image and HH, HL, LH bands to get the resultant image

V. RESULT ANALYSIS

Here show the benefit of the contrast enhancement for satellite image using the filtration method. This method firstly get remote sensing pictures as an input, corresponding image has blurred and does not clarify the edge details of the all image easily. In this image, we apply DWT for decomposition of images into HH, HL, LL and LH Sub band. Then examine the dominant brightness level of these entire sub bands in perceptions of the local and global details of the remote sensing pictures. The dominant brightness level decomposed towards the low, middle and high intensity layer. For these layers adaptive intensity transfer function is generated and image smoothest through the filtration method. The result of the both outputs merged because for enhancing the visibility along with maintains the structural property of a resultant remote sensing image. After that perform inverse discrete wavelet transform for obtaining the final output. The benefit of this technique is providing the better results in the terms of enhancing the visibility of remote sensing image.

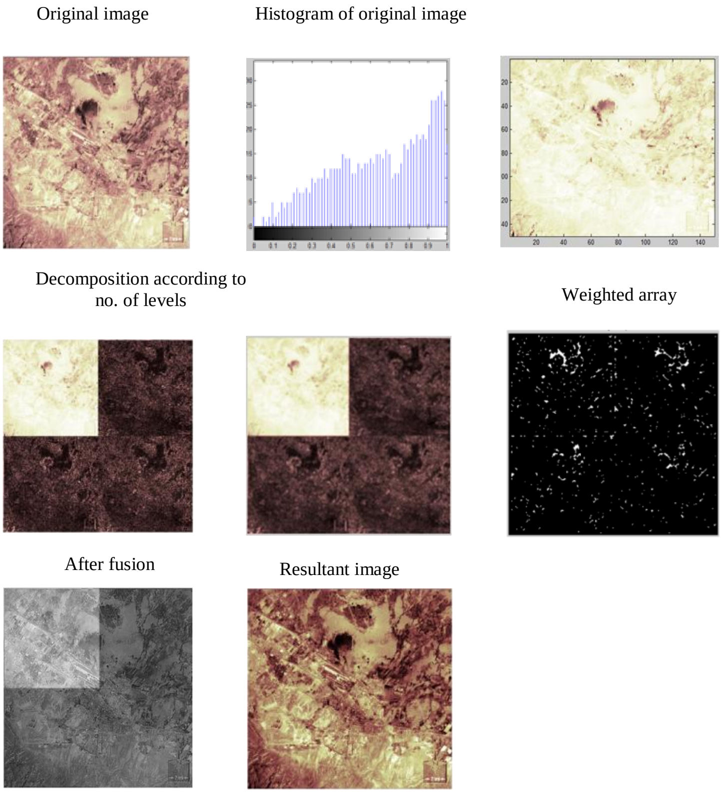

Fig. 3: Outline flow of the Existing Work

Table 1showing result analysis of existing work. The some parameters are taken for the analysis.

Table 1.Analysis of Existing Work

IMAGE	MSE	PSNR	NCC	NAE
	1.70E+04	5.8211	0.0071	0.9918

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 identify the object in the scene. The algorithm was not efficient to identify the edge in particular region along with object. The proposed method has improved the contrast of images and detected the edges in particular region along with in the object. Fig. 4: Outline flow of the New Work.

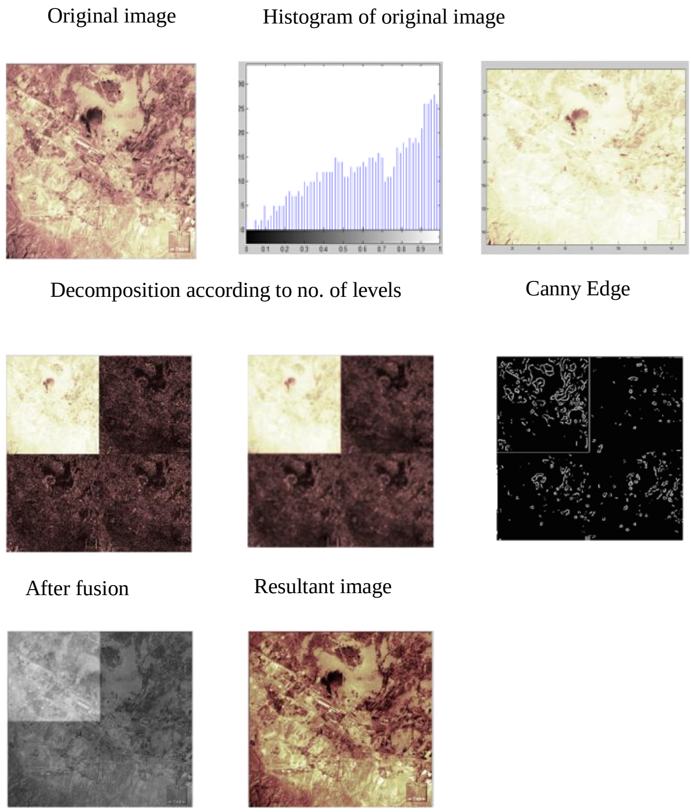

Fig. 4: Outline flow of the Proposed Work

Table 2 shows the parameters analysis of the new work. The some parameters are taken for the analysis.

Table 2: Analysis of Proposed Work

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

The image shown in fig 4 is an outline of the filtration method, the original image in the figure is satellite image which is blurred and corrupt. After the applying of the filtration method of the satellite has been improvised, the edge has been cleanly detected and blurry has been removed, the object in the processes image may be separately identified. The new method has been verified for a number of images and efficient result is obtained.

VI. COMPARISON AND PERFORMANCE EVALUATION

The performance of the proposed new method can be evaluated according to different parameters. These parameters are MSE, PSNR, NCC, NAE, where PSNR represents a maximum possible power of a signal. MSE represent a measure the average of the squares of the errors. NCC represents to use for finding incidences of a pattern or object within an image and NAE represent a measure of how far is the decompressed image from the original image. Figure 8 represents the two different types of satellite image.

Table 3:MSE, PSNR (in decibel), NCC, NAE values of existing method.

Satellite Images	Image (a)	Image (b)
MSE	1.70E+04	1.25E+04
PSNR	5.8211	7.1424
NCC	0.0071	0.0079
NAE	0.9918	0.9901

Table 4: MSE, PSNR (in decibel), NCC, NAE values of proposed method

Satellite Images	Image (a)	Image (b)

MSE	3.40E+03	2.84E+03
PSNR	12.814	13.589
NCC	0.724	0.707
NAE	0.439	0.4621

Table 3 represents the result of MSE, PSNR, NCC and NAE values of existing method and Table 4 represents the result of MSE, PSNR, NCC and NAE values of proposed method. In the result of the proposed method, the mean squared error and the normalized absolute error are reduced compared to the existing method, correspondingly peak signal to noise ratio and normalized cross co-relation is improved as compared to existing methods. For these reasons the quality of the image is improved and the final result after the filtration method is to be enhanced.

VII. CONCLUSION

The planned methodology will effectively enhance any low contrast pictures and maintain the edge contingent taking by a satellite camera and it's additionally appropriate for pictures captured from different varied imaging devices like digital cameras, photorealistic reconstruction systems, and computational cameras. This contrast enhancement technique uses adaptive intensity transfer and boundary smoothing estimation function through the filtration method. The proposed method gives optimal resultant may be effectively enhance the overall quality and visibility of global details along with local details of remote sensing pictures. This technique reduced mean square error and normalized absolute error, and increases the peak signal to noise ratio and normalized cross correlation value.

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