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A Novel Technique of Resolution Enhancement in Hyper Spectral Images on proposed CHLAE Technique

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ABSTRACT

Resolution plays an important role in hyper spectral images like satellite images. The discrete wavelet transform based (DWT) resolution enhancement scheme generates artifacts due to a shift-variant property. Resolution enhancement based on dual-tree complex wavelet transform (DT-CWT) and nonlocal means (NLM) suffers from high latency. In this paper a new method based on adaptive local histogram equalization (CHLAE) is proposed for resolution enhancement of hyper spectral images. Satellite Images acquired by satellite is affected by impulse noise. This impulse noise distorts the edge pixels in the satellite image, which degrades the segmentation process. Hence, this impulse noise should be removed before enhancing satellite images. Optimum Edge preserving impulse noise removing algorithm is proposed in this paper to remove the impulse noise present in the satellite image. CHLAE technique which is similar to local histogram equalization is proposed to capture the orientation of edges in the image that enhances the resolution. Performance analysis is made by calculating PSNR and MSE value which reveals superiority of the proposed technique over the conventional and state-of-the-art RE Techniques.

KEY WORDS: Contrast Limited Adaptive Histogram Equalization (CHLAE), Resolution Enhancement (RE), Hyper spectral image.

1. INTRODUCTION

Resolution of a picture has been perpetually a crucial issue in several image-and video-processing applications like video resolution improvement, feature extraction, and satellite image resolution improvement. The performance of the projected technique over performs all obtainable state-of-art strategies for image resolution improvement. The visual and quantitative results area unit given within the results and discussions section Interpolation in image process could be a technique to extend the quantity of pixels in a very digital image. Interpolation has been wide employed in several applications it been used for an extended time and lots of interpolation techniques are developed to extend the standard of this task. There are a unit 3 well-known interpolation techniques is a lot of subtle than the opposite 2 techniques and produces sander edges.

The essential thought behind the bar chart of orientating Gradient descriptors is that native object look and form at intervals a picture is represented by the distribution of intensity gradients or edge directions. The implementation of these descriptors is achieved by dividing the image into tiny connected regions, known as cells, and for every cell collecting a bar chart of gradient directions or edge orientations for the pixels at intervals the cell. The mix of those histograms then represents the descriptor. For improved accuracy, the native histograms are contrast-normalized by scheming a live of the intensity across a bigger region of the image, known as a block, so victimization this price to normalize all cells at intervals the block. This standardization ends up in higher unchangingness to changes in illumination shadowing.

2. PRELIMINARIES

Hyperspectral image: Many applications involve the detection of associate object or activity like a vehicle or vehicle tracks. Hyper spectral imaging sensors give image information containing each special and spectral data, and this data will be used to address such detection tasks. The basic plan for hyper spectral imaging stems from the actual fact that, for any given material, the number of radiation that's reflected, absorbed, or emitted i.e., the radiance varies with wavelength. Hyper spectral imaging sensors live the radiance of the materials among every picture element space at a awfully sizable amount of contiguous spectral wavelength bands. A hyper spectral remote sensing system has four basic parts: the radiation (or illuminating) supply, the region path, the imaged surface, and the device. Satellite pictures, hyper spectral pictures may be used for resolution sweetening.

Histogram equalization: An image bar graph may be a style of bar graph that acts as a graphical illustration of the tonal distribution in an exceedingly digital image. It plots the quantity of pixels for every tonal worth. By viewing the bar graph for a selected image a viewer are able to choose the whole tonal distribution at a look. Image histograms are gift on several fashionable digital cameras. Photographers will use them as AN aid to point out the distribution of tones captured, and whether or not image detail has been lost to blown- out highlights or blacked-out shadows. Histogram leveling technique sometimes will increase the world distinction of the many pictures, particularly once the usable knowledge of the image is pictured by shut distinction values. Through this adjustment, the intensities can be better distributed on the histogram. This allows for areas of lower local contrast to gain a higher contrast. Histogram equalization accomplishes this by effectively spreading out the most frequent intensity values.

Local histogram equalization: Histogram leveling is employed for enhancing the contrasts in Associate in Nursing intensity image. This commonly works quite well for smaller pictures or pictures wherever most of the various intensity levels square measure depicted. Bar chart leveling may be a technique wont to improve distinction in face pictures. It differs from standard bar chart leveling within the respect that the Local methodology computes many histograms, every similar to a definite section of the image bar chart leveling is applied on the complete image. Native bar chart Equalization is applied on the 3*3 over lapped block on the complete image. for every pixer on a picture, we tend to perform the bar chart leveling on the native w- by-h window centering on this pel using: wherever x is that the pel intensity worth, cdf (x) is that the accumulative distribution perform of the bar chart of the pel intensities in the w-by-h window, coffin is that the minimum intensity during this window, and L is that the desired range of output grey levels=256. Usually a sq. window is employed and that we outline k = w = h. we tend to decision the middle of the k-by-k window the anchor. For LHE, the anchor purpose is that the pixer to be processed itself. For the complete image, every pel repeats the higher than operation and uses f (x) to induce its new intensity worth.

Contrast limited adaptive histogram equalization: The noise problem which is prevailing in the traditional adaptive histogram equalization can be reduced by limiting the contrast enhancement in homogenous areas. This new version of adaptive histogram equalization is said to be (CLAHE). This method works it adjusting the intensity values of an image. CLAHE divides the image into small portions and each portion is said to be one tile.

Proposed system: The proposed system is an algorithm and contrast limited adaptive histogram equalization. Color images are often represented in RBG color space and CLAHE is applied to each component of the RGB color space such as r, g and b individually. For the resultant image, all the components are combined. It is observed from the experimental results that the output image is corrupted and it lacks in human sense of color. Since adaptive histogram equalization is applied to all the channels, the results get corrupted The Contrast limited adaptive histogram equalization are applied to the low contrast image separately. The output image obtained has more clarity than the output of existing algorithm. DT-CWT-NLM-RE.

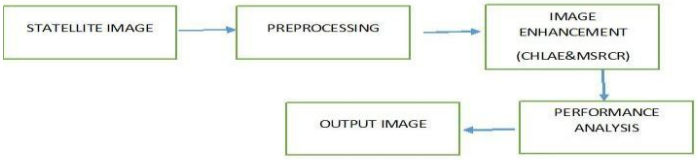

Fig.1.Blockdiagram of proposed system

A low contrast image is given as input image. The MSRCR algorithm is applied on this low contrast image. But the output image has graying out and halo artifacts at the edges. CLAHE is the bilinear interpolation is used to combine these small regions of the image. By limiting the contrast in homogeneous areas, it reduced the noise in the images. It enhances the contrast of these small regions of the image. The edge based color constancy can be attained by using CLAHE. It improves the local contrast of images. So graying out of the images and halo artifacts at the edges can be reduced using CLAHE. CLAHE cannot be applied directly to the color channels in a color image as it changes the color balance of the image.

Algorithm description:

Applying CLAHE to only G Component: To avoid the higher than drawback, we applied CLAHE to solely inexperienced part and different parts, viz. R and B area unit unbroken unchanged. Since changed CLAHE methodology is exploitation reconciling bar graph deed technique, variety of tiny regions (tiles) of a picture is taken into account. 2 component vectors of positive integers represent the quantity of tiles, M and N. The minimum tiles ought to be at least 2 and also the total variety of tiles of a picture is capable M * N.

The overall procedure is as follows: The input image is browse initial. 2 (Ep) and Best parameter (Bp) is employed. Bp is that the best price for the sweetening parameter EP. Then sweetening performs for Bp and its fitness perform area unit known as. The sweetening performs for the sweetening parameters Ep and its fitness perform is calculated using least common multiple and objective perform. Then the sweetening perform for p and its fitness perform area unit calculated. If Ep is larger than Ep best, then p is appointed to p best and its fitness price. Then sweetening parameter is incremented and once more the whole method is recurrent until Ep become one. The image is reconstructed with recent R, parts and new G parts. Finally the adaptive bar graph deed is applied with distinction threshold price and also the resultant image is increased image.

Local Contrast Modification (LCM): For local contrast modification, parameter value of of the total image is used. The mean value is calculated using the expression

$$m = \frac{1}{n \times n} \sum_{x=0}^{n-1} \sum_{y=0}^{n-1} f(x, y) \qquad (2.1)$$

Where n is the size of the image, f (x,y) indicates the product of reflectance and intensity values and m is the mean for the whole image. The standard deviation is calculated using

$$\sigma = \sqrt{\frac{1}{n \times n}} \sum_{x=0}^{n-1} \sum_{y=0}^{n-1} (f(x,y) - m(x,y))^2 \qquad (2.2)$$

Objective Function: This function is based on entropy of the image, sum of edge intensities and number of edge pixels. It is observed that enhanced image has more number of edge pixels and higher intensity value at edges than the original image.

$$F(I_g) = \log(\log(E(I_s))) \times \frac{n_{edgels(I_S)}}{M \times N} \times H(I_s) \qquad (2.3)$$

Where the green component is enhanced image. The edges and edges are determined by using Isobel edge detector. Represents the sum of M x N pixel intensities of Sobe image edge, edges indicates the number of pixels whose intensity value is higher than threshold value used in sobe edge image.

Table.1.Comparison of the Existing and Proposed for the 'Washington DC' image

Alogrithm	Mse	Psnr
SWT-RE	0.0464	13.33
DWT-RE	0.0419	13.780
SWT-DWT-RE	0.0335	14.7280
LANCZOS-RE	0.0269	15.6666
DTCWE-RE	0.0253	15.9770
DT-CWT-NLM-RE	0.0242	16.1576
PROPOSED CHLAE-RE	0.0112	70.61

3. RESULTS AND DISCUSSION

To ascertain the effectiveness of the proposed CHLAE histogram equalization RE algorithm over other wavelet domain RE techniques, different LR optical images obtained from the Satellite Imaging Corporation tested. The image of Washington DC ADS40 Ortho rectified Digital Aerial Photography −0.15 m is chosen here for comparison with existing RE techniques.

4. CONCLUSION

An RE technique supported CHLAE bar graph deed formula has been planned. The technique decomposes the LR input image victimization optimum edge protective impulse noise removal. Moving ridge coefficients and therefore the LR input image were interpolated victimization the Lenclos interpolator. The planned technique has been tested on well-known benchmark pictures, wherever their PSNR and MSE and visual results show the prevalence of the planned technique over the old. The PSNR improvement of the planned technique is up to sixty eight.61dB compared with the DT-CWT-NLM-RE. This work is principally most well-liked for low resolution pictures although they furnish improvement output to high resolution pictures in addition. The exactness and accuracy of improvement are going to be additional for low resolution pictures compared with high resolution pictures. Once this work is applied to high resolution pictures, we have a tendency to solely get associate accuracy of seventieth except for low resolution pictures we have a tendency to acquire associate accuracy of concerning ninety fifth on the output image.

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