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DROUGHT PREDICTION AND ANALYSIS OF WATER LEVEL BASED ON SATELLITE IMAGES USING DEEP CONVOLUTIONAL NEURAL NETWORK

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ABSTRACT:

Resolution enhancement (RE) schemes (which are not based on wavelets) suffer from the Disadvantage of losing high-frequency contents (which results in blurring). The discrete-wavelet-transform-based (DWT) RE scheme generates artifacts (due to a DWT shift-variant property). A wavelet-domain approach based on dual-tree complex wavelet transform (DT-CWT) and nonlocal means (NLM) is proposed for RE of the satellite images. A satellite input image is decomposed by DT-CWT (which is nearly shift invariant) to obtain high-frequency sub-bands. The highfrequency and the low-resolution (LR) input image are interpolated using the Lanczos interpolator. The highfrequency sub-bands are passed through an NLM Filter to cater for the artifacts generated by DT-CWT (despite of it's nearly shift invariance). The F i ltered high-frequency sub-bands and the LR input image are combined using inverse DT-CWT to obtain a resolution-enhanced image. Objective and subjective analyses reveal superiority of the proposed technique over the conventional and state-of-the-art RE techniques.

INTRODUCTION

In the Recent years there is increased in the demand for best quality images in the various applications such as medical, astronomy, object recognition. Satellite images are used in diverse areas such as monitoring the processes on the Earth's surface, discovery of changes in atmosphere; measuring as well as estimating geographical, biological andphysical parameters, etc. The resolution of these images is extremely significant to obtain information from satellite images so it plays a main role in satellite image enhancement. And the Image Enhancement is a process of obtaining a high quality or high resolution image from low quality otherwise low resolution satellite image, for supplementary processing of an image, such as analysis, detection, segmentation along with recognition [2]. It is an essential step in image processing of satellite images. Image resolution enhancement is also widely useful for satellite image applications which contain bridge recognition, building construction in GPS technique. For image enhancement method there are two domains has been occupied into consideration one is image domain as well as transform domain. Transform domain conclude which transformations used in the Enhancement. Image interpolation is usually used resolution enhancement scheme for different applications . Image interpolation is the process of using recognized more data to

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approximation values at unknown locations. Interpolation method select new pixel from surrounding pixels. Mostly there are two types of interpolation algorithms.

1. Adaptive algorithm- This algorithm changes depending on what they are interpolating.

2. Non adaptive algorithms - contain linear interpolation algorithms Linear interpolation includes Adjacent, bilinear,bicubic interpolation.

But images obtained by these linear interpolation technique produces numerous artifacts similar to blurring, blocking etc. To avoid these problems non linear interpolation algorithms are intended for Resolution Enhancement.

LITERATURE SURVEY

A. Discrete Wavelet Transform (DWT) Discrete Wavelet Transform is any wavelet transform which uses wavelet coefficients. The DWT technique which captures both frequency and location information of an image. Resolution is an important feature in satellite imaging. The satellite image have high frequency contents as well as low frequency contents. And the image may have losing of high frequency contents. So, the DWT technique has been employed for resolution to preserve the high frequency components of the satellite images [10]. The process is to divide the satellite input image into four sub bands. They are Low-Low(LL), Low-High(LH), High- Low (HL), High-High (HH). Then the high frequency sub bands are estimated. The high frequency sub band images and the low resolution input images are interpolated and using inverse DWT we can get a resolution enhanced image [4]. The interpolation process is used to preserve high frequency contents of the image. The DWT technique is mainly used to produce the sharper enhanced image.

B. Stationary Wavelet Transform (SWT) The Stationary Wavelet Transform is used to overcome the lack of translation-variance of the Discrete Wavelet Transform (DWT). And SWT technique is redundant. As like DWT, the SWT also divides the input image into different sub bands. The high frequency sub bands obtained by DWT and SWT are added with each other which mean they have the same size [13]. That is, the interpolated high frequency sub band coefficients have been corrected by the SWT high frequency sub band coefficients [5]. After that, the images are combined using inverse process to get resolution

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enhanced image. So, the technique generates a super resolved image.

C. Inter Sub band Correlation Technique (ISC) This method which uses same phase for the sub bands. So, the sampling phase is considered. The method has the filter bank to estimate the sub bands [11]. The sub bands have correlation that is between low frequency band and high frequency band. If we have different phases, the sub bands will have low correlation with one another. This method has three steps. They are,

1) First apply the wavelet transform to all different phases of each sub band.

2) The filters are used to estimate the bands in higher level.

3) Inverse wavelet transform is applied to enhance the resolution of an input image. Thus, using the same phase for estimating the sub bands, this method will produce a time consuming process.

D. DCT The DCT transforms or converts a signal from spatial domain into a frequency domain. DCT is real-valued and provides a better approximation of a signal with few coefficients. This approach reduces the size of the normal equations by discarding higher frequency DCT coefficients. Important structural information is present in the low frequency DCT coefficients. Hence, separating the high-frequency DCT coefficient and applying the illumination enhancement in the low–frequency DCT coefficient, it will collect and cover the edge information from satellite images. The enhanced image is reconstructed by using inverse DCT and it will be sharper with good contrast.

PROPOSED SYSTEM

Dual-tree Complex Wavelet Transform This method, dual-tree CWT (DT-CWT) [4] [8] is used to decompose an input image into different sub-band images. In this method direction selective filters are used to generate high frequency sub-band images where filter demonstrate peak magnitude responses in the existence of image features oriented at angle +75, +45, +15, -15, -45 and -75 degrees, respectively [9]. Subsequently six complex valued images are interpolated. Once interpolated, combine all images to create a new high-resolution image by using inverse DT-CWT. Resolution is achieved [8] by using directional selectivity provided with the CWT, where the high-frequency subbands contribute to the sharpness of the high-frequency details. Finally IDTCWT used to join all these images to construct resolution enhanced image.

OPERATION

Both the double-density DWT and the dual-tree DWT have their own distinct characteristics and advantages, and as such, it was only natural to combine the two into one transform called the double-density complex (or double-density dual-tree) DWT. To combine the properties of both the double-density and dual-tree DWTs we ensure that: (1) one pair of the four wavelets is designed to be offset from the other pair of wavelets so that the integer translates of one wavelet pair fall midway between the integer translates of the other pair (Eq. 1), and (2) one wavelet pair is designed to be approximate Hilbert transforms of the other pair of wavelets (as stated in [2]). By doing this, we are then able to use the double-density complex wavelet transform to implement complex and directional wavelet transforms. To implement the double-density dual-tree DWT, we must first design an appropriate filter bank structure (one that combines the characteristics of the double-density and dual-tree DWTs). We have seen what type of filter bank structure is associated with the double-density DWT in the previous sections (mainly that it is composed of one low pass scaling filter and two high pass wavelet filters), so we will now turn to the properties of the dual-tree DWT. The dual-tree DWT is based primarily on concatenating two critically sampled DWTs. We do this by constructing a filter bank that performs multiple iterations in parallel. More detail about the dual-tree DWT can be found at this website. Consequently, the filter bank structure corresponding to the double-density complex DWT consists of two oversampled iterated filter banks operating in parallel on the same input data. (The oversampled filter bank is illustrated in Fig. 1 in this section.) The iterated oversampled filter bank pair, corresponding to the simultaneous implementation of the double-density and dual-tree DWTs, is illustrated in Figure 2 below.

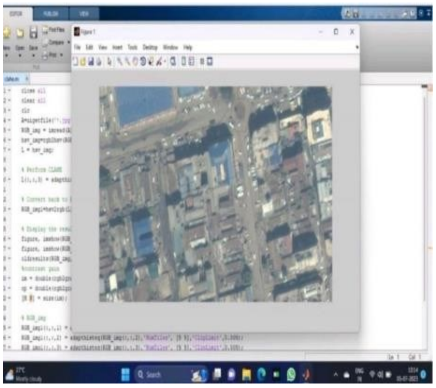

Fig.1. Input results image 1.

Where the superscript r refers to the HR coordinate. Instead of estimating the target pixel position in nearby frames, this algorithm considers all possible positions where the pixel may appear; therefore, motion estimation is avoided [11]. Equation (7) apparently resembles

(1), but (7) has some differences as compared with (1). The weight estimation in (2) should be modified because is corresponding matrix O has to be of the same size as the HR image. Therefore, a simple up scaling process to patch V is needed before computing K. The total number of pixel Y in (7) should be equal to the number of weights K. Thus, a zero-padding interpolation is applied to L before fusing the images [11].

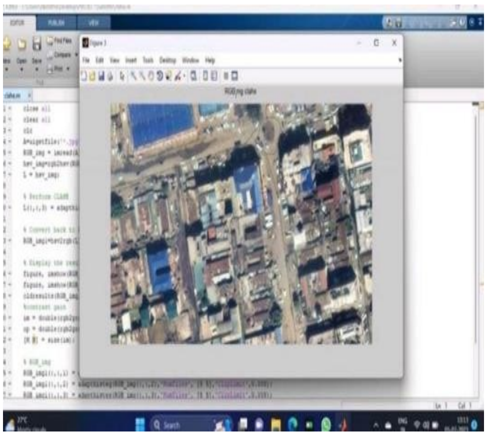

Fig.2. Output results.

CONCLUSION

An RE technique based on DT-CWT as well as an NLM filter has been proposed. Wavelet coefficients and the LR input image were interpolated using the Lanczos interpolator & The NLM filtering is used to overcome the artifact generated byDT-CWT&to enhance the performance of proposed technique in the term of MSE & PSNR & simulation results highlight the performance of proposed technique. In view of the above discussion the proposed system can be one ofthe best image resolution enhancement Technique.

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