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Survey on Techniques for Enhancing the Quality of Satellite Images

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Abstract*: Satellite images are used in many fields of research (eminence factors in images comes from its resolution) and in many applications such as astronomy, geographical information systems & geosciences studies. Satellite images may be blurred or not clear due to many reasons. Therefore the important information in the images may be not so clear. Image enrichment can improve a satellite image which has complete information but is not visible. Image enrichment method is used to improve the eminence of the image to get useful information. Many methods have been developed to enhance the satellite images. Objective of this paper is to give information and methods which are useful in satellite image enrichment purpose. General issues of satellite images are enrichment of gray-scale/colour image, noise, artifacts, distortion, large size, resolution, weak colour information, high frequency content and many more. Here given a discussion of the previous work of authors to deal with these issues. So that information which is visible from the image is more informative and helpful to human beings in many applications.

Keywords*: Satellite Image, Image enrichment,

I. INTRODUCTION

The Pictures or images are the most convenient and common means of conveying or transmitting information. Images are worth a thousand words. Human receives 75% of information in a pictorial form. Interpolation in image processing is a method to increase the number of pixels in a digital image. Nowadays, many interpolation methods have been developed to increase eminence of image resolution enrichment. There are three main interpolation methods, which are nearest neighbour, bilinear & bicubic. Among these three methods, Bicubic interpolation is more sophisticated than other two & results in smoother edges. Noise removal & preservation of useful information are important aspects of image enrichment. Image enrichment is a process focused on processing an image in such a way that the processed image is more suitable than the original for the specific application. Digital images are consisting of pixels. Each pixel has its own color. Digital images are useful for conveying information. But usually these images are low contrast or contain noise. This makes the images less interpretable. So image enrichment is needed for better interpretation. There are various types of noises. Some are: Gaussian Noise, Speckle noise, Salt-Pepper Noise and Poisson Noise. Gaussian is also known as additive noise. In image in which Salt-Pepper Noise is present, dark pixels are present in bright regions and bright pixels are present in dark regions. Poisson Noise is also known as short noise. It is a type of electronic noise. Speckle Noise is known as multiplicative noise. The image enrichment methods are basically divided into two domains. They are: Spatial Domain and Frequency Domain. In spatial domain, the pixel values are manipulated for image enrichment. The spatial domain methods are usually used to achieve contrast enrichment. In frequency domain, the Fourier Transform concept is used. The basic idea for the frequency domain methods is to manipulate the transform coefficients for image enrichment. The enrichment of the image is also necessary to improve the visibility of the image to remove unwanted noise, artifacts, to improve contrast and to find more details. So that the some useful information is extracted to get enhance image. This is important reason behind image enrichment methods. [1,2]. The main objective of this paper is to understand the term related to the enrichment of satellite images. Image Enrichment methods are used for making satellite images more informative and so that it readily interpreted by human eye. The meaning of enrichment is the alteration of the appearance of an image in such a way that the information contained in that image is more readily interpreted visually. In the fig. no. 1 we have taken one example of sample image before enrichment which is taken from satellite of crop producing area, after enrichment its result visible in fig. no. 2 [1]. We can see the difference by using normal human eye. These satellite images are processed and used for crop production forecast, forest cover and type mapping, weather prediction, watershed development and monitoring, disaster management and many more [2].

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Figure1: Bad contrast ,low resolution Satellite Image


Figure2: Output good contrast ,high resolution Satellite Image

II. LITERATURE SURVEY

To study the concepts of satellite image enrichment we have studied many papers. As we know the satellite images has some issues enrichment of gray-scale/colour image, noise, artifacts, distortion, large size, resolution, weak colour information, high frequency content and many more. But it is difficult to deal with all problems together. Here discussing some previous papers from which authors view and proposed methods. P. Suganya, N. Mohanapriya et. al. [1] in this work author proposed method for satellite image enrichment which includes Haar filter for pre-processing, Multi Wavelet Transform, Interpolation Process, Inverse Process of Multi Wavelet Transform for the low resolution image. The Multi Wavelet Transform and Interpolation method used to produce fewer artifacts. Limitation of this method is not effective method to reduce distortion and for losing of high frequency content.

Abdullah-Al-Wadud et al., 2007 [2] proposed one method which uses global histogram modification method. Generally local histogram modification method performs equalization over small patches so that the small scale details become clear. However it can create several artifacts. Histogram Equalization and specification A good contrast enrichment method should specifically address several significant properties, some of which are listed below. (1) Noise tolerance: The contrast enrichment method should exhibit appropriate noise immunity. (2) Uniform contrast: The contrast enrichment method should provide uniform contrast of the entire image. (3) Brightness preservation: The contrast enrichment tec hnique should enhance the contrast of the image without losing brightness. (4) Convenient implementation: The contrast enrichment method should be able to be set up quickly and reliably.

Pavithra C, Dr. S. Bhargavi [3] author proposed a method for fusing two dimensional multi-resolution 2-D images using wavelet transform by using the combine gradient and smoothness criterion. Basically it decompose each registered image into sub-images by using forward wavelet transform which have same resolution at that same level and different resolution at different levels. Image fusion is performed based on the high frequency sub-images and final image is obtained using inverse wavelet transform. Using the inverse wavelet transform it can reconstruct the image. This reconstructed image has information gather from all the different images sources so this is more informative.

A new method for enhancing the color images by using Histogram Equalization has been presented in which there are two hierarchical levels used: local and global [4]. The main drawback of histogram equalization is that the brightness of the image gets changed after applying histogram equalization. This is because of flattening property of histogram equalization. Moreover, histogram equalization is a global operation so the brightness is not preserved

Anumolu Lasmika, K. Raveendra [5] author proposed a method for improving eminence of satellite images. Author present a method, DWT to decompose the input image into different sub bands and apply threshold method on it. Identify the areas of the edges by using threshold decomposition method. After that the edges are sharpened by using morphological filters. This method works for sharpening and reduce the distortion of an image. Limitation of this work may be extended for other problems related to satellite images such as artifacts.

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Milindkumar V. Sarode et.al [6] proposed one method using a mandani fuzzy inference system. This method enhances color of a tumor which helps to diagnose different region of tumor based on its enhanced color which not prominent from the original image. Further same system is applied on different image datasets for enrichment purpose.

A new image enrichment method for enhancing the satellite images has been proposed in [8]. In this approach, Discrete Wavelet Transform (DWT) and Singular Value Decomposition (SVD) have been used. The experimental results show that this method is better than the conventional and state-of-the-art methods for image enrichment.

In [9], satellite images are firstly enhanced by using DWT-SVD method and then segmentation is applied on the enhanced using MRR–MRF Model. 3-level DWT method for image enrichment has been implemented in [10]. In [5], a novel method for image enrichment has been presented which is based on Cuckoo Search Algorithm and DWT-SVD. DWT is used to decompose the image into four sub-band images (LL, HL, LH and HH). Cuckoo Search Algorithm is applied for optimizing each sub- band and then singular value matrix of LL thresholded sub band image is obtained and finally image is reconstructed by using inverse discrete wavelet transform (IDWT). The experimental results show that this approach is better than conventional methods and stateof-the-art methods. An image resolution enrichment method has been proposed in which discrete wavelet transform and stationary wavelet transform have been used [11]

III.RESULT AND DISCUSSION

In this paper we have discussed about importance of satellite image enhancement also some of the techniques which are present. Here we are discussing the problems related to the satellite images which are essential to solve. One of the important problems is sharpening of image so that it readily interpreted visually in terms of a particular need. Enhancing features which are not fully visible in the single image itself. In case of cloud cover some features may not be fully visible in one particular spectral band so there is need to fuse multiple bands. Also it is necessary to reduce noise, distortion, artifacts from the images. Image which lose high frequency content and appear as blurred image. These kind of images losses their important information, so it is essential to retrieve the information from the images. Edges contain important information in image. Therefore edge enhancement also one of the important part. So combination of noise removal, contrast enhancement, and edge enhancement technique may produce better results.

IV.CONCLUSIONS

This survey paper gives idea and analyses the performance of various and different resolution enhancement techniques. Resolution enhancements schemes are not based on wavelets have the drawback of losing the high frequency contents which resulting in blurring. Also, CWT technique is almost shift invariant and results in better performance. In future, Multi Wavelet Transform and fuzzy inference system based enhancement can be used to produce fewer artefacts when compared to other techniques for hyper spectral satellite images. Also enhance performance of an satellite image in terms of MSE and PSNR.

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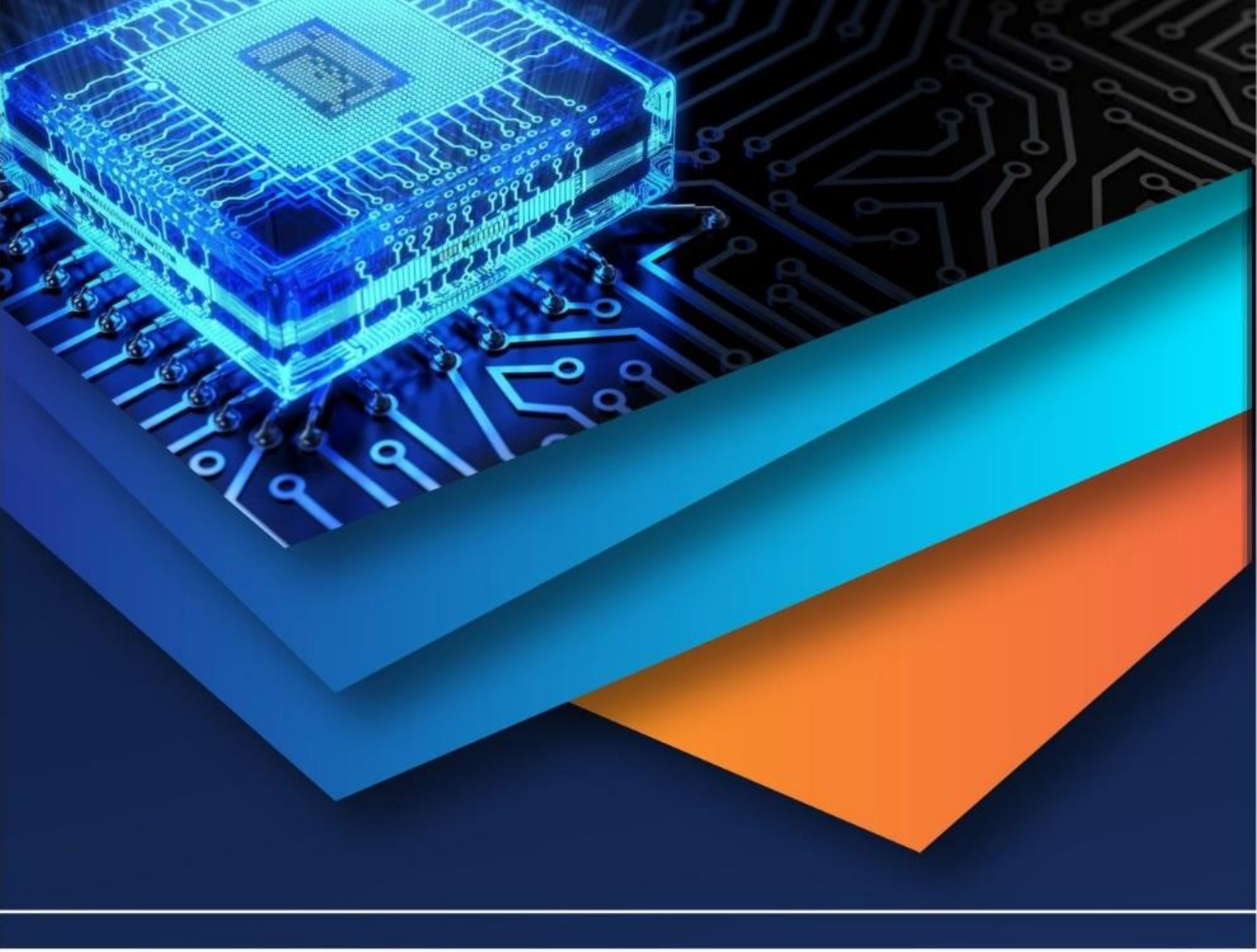
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