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A Survey on Intensification Techniques used in Satellite Images

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Abstract: ***An image intensification is a required methodology in field of Satellite image research area. The images taken through satellite are captured from very longer distance and because of this images having garbling and noise as lots of airy barriers are present in between the path. The usage of Satellite images is very diverse in research areas like astrological studies, geographical studies, study of geoscience, etc. Nowadays, after taking a snapshot of an image, some of the radiometric or geometric based enhancement techniques are applied on the images taken from satellite but these techniques do not fulfill the requirements in all application areas. This is what there is a need to improvise the quality of an image before it is being actually used. The main objective behind this research work is to understand the different methodologies used in intensification of satellite images and how can we perform more improvements to existing techniques so these type of images which are taken from satellite are intelligible to the human eyes. The meaning of intensification in term of image is nothing but the altering of a look and feel of the image in a way that the information contained by that image is more readily intelligible visually.***

Keywords: Satellite Image improvement, Satellite Image processing, Satellite image intensification, Techniques for Image enhancement

I. INTRODUCTION

An image plays very important role in the process of information transmission. Image is and worth medium to transmit the information rather than thousands of words. Naturally, a human acknowledges 75% of an actual information in a pictorial form. In an image processing there is a method called Interpolation which is used to increase the total number of available pixels in an image. Currently, there are so many image interpolation mechanisms have been developed in order to improvise the quality of image pixel resolution. There are three popular and main image interpolation methods, which are nearest neighbor image interpolation, bilinear type of interpolation and bicubic type of interpolation. Among these three popular techniques of image interpolation, Bicubic image interpolation is more innovatory and advanced than other two methodologies and it also results in well-ordered edges. The removal process of a noise from an image and storage of useful and important information are important aspects of image intensification process. Image intensification is a process which is based on processing an image in a way so that the newly converted image is more accurate and clear than the original one used for the specific applications. There are variety in number of image enhancement techniques are existing in spatial domain. Considering satellite images which are being used in many different fields of research to gather the geographical and other information. The major issue with the satellite images is the quality of an image i.e. image contrast, noise which is present inside the data of an image, effect of obscure inside image.

The Satellite images are documented in digital format and then processed by some of the well-known computer software algorithms to extract the useful information from that image. Inside image if particular area of that image reflects more light energy will be processed brighten and alongside a remaining part of the same image which is reflecting less light energy will be processed as black. In the case of digital image taken from satellite contains discrete set of elements which is called as pixel. Each pixel in that image is represented as a number also called as DN (Digital number). Every digital number inside image represents image features such as color of an image, brightness of an image, frequency of radiated energy, wavelengths, or an element present inside that image. A digital image formed by pixels and those pixels are arranged in row and column formats which is called as a raster image. The information elements and dimensions of these pixels are dependent on the intent of the image.

There are mainly three general steps involved in the processing of digital image: Pre-processing of an image, Enhancement of an image and finally extracting an information from the image. At very first, the raw data of an image which is received from the sensors contains imperfections and weakness. In order to overcome this problem, there is a requirement of preprocessing of that image. The quality will get vary from image to image and it depends upon the condition of an image at the beginning, the format in which the image is captured, etc. Pre-processing of an image consists of various operations that constructs data for further subsequent analysis process that tries to correct or sometimes compensate for errors. Classification process of an image is a very important part of remote sensing mechanism, image analysis and recognizing the patterns inside image.

Based on the concept which tells that different feature types available on earth's surface may have a mismatched spectral reflectance and also settlement properties, their identification is carried out with the help of classification process. A classification of image can be elaborated as the process of categorization of all the available image pixels inside the image or raw data which is remotely sensed by the satellite in order to obtain the given group of labels or themes for land cover. In some instances, the classification itself may be the object of the analysis. Image Enhancement is done to improvise the interpretability of a picture by incrementing the contrast among various feature in image. Information extraction is last step towards the obtaining a final resulting output of image analysis. The process of classification of the Satellite image involves categorization of the image pixels' value into the understandable category.

II. SATELLITE IMAGE INTENSIFICATION TECHNIQUES

A. Image Resolution Improvement

Image pixel resolution is always a very important issue present in differently available image and video fining applications. Image interpolation process is a procedure of adding the number of image pixels into the digital image. The image resolution improvement based on interpolation is being used widely since very long period and many existing techniques of interpolation have been developed to improvise the task quality.

There are currently three famous interpolation techniques for image intensification and those are, nearest neighbor technique, bilinear technique, and the last is bicubic technique. Among this the Bicubic interpolation technique is more generalized than the other two methods and it produces smoother edges of image. Wavelets in the images are also plays an important role in satellite image processing applications.

A wavelet transform is used to break down an input of satellite image which contains low-resolution into independent sub bands. After this, the images pixels with high-frequency and the input image both are interpolated, and the task is followed by merging of all these images into a new very high-resolution images. T

he measurable peak signal-to-noise ratio and optical results defines the superiority of the methodology over the traditional bicubic interpolation.

B. Hue, Saturation and Intensity Transformation

The preservative system of primary colors is well accepted system. An alternate approach in setting intensity of the color is by setting up hue, intensity and saturation system. This method is useful just because it describes the colors more accurately as the human eyes can recognize them. Considering to the intensity (I), it represents the variations into the image brightness and it ranges from black also represented as 0 to white also represented as 255 and no color is correlated with it. Now, coming towards Hue (H) which represents the controlling wave of color. The last one which is Saturation (S) and it represents the freshness of color and it also specified within ranges from 0 to 255. A zero saturation means a color with complete impurity, whereas on the other end, high value or maximum value denotes that the color is very clear and original. When any of these three bands available of sensor data are combined with the RGB system, the output of those images typically loses the saturation, still the bands have been in contrast stretched. To removal of this problem, image data needs to be transformed from RGB mechanism to IHS mechanism and coordination is performed on the saturation part then that data is converted back to RGB system for representation.

C. Slicing of Image Density

In the process of slicing of a density of the image transforms the continuous greyed color of an image into a series of thick intervals, and each interval corresponds to a specified digital range called D. These slices may be presented as areas grouped by lines like matrix box. This technique highlights précised grey scale differences that may be recognizable to the viewer.

D. Enhancement in the Edge of Image

The image edge improvement is mainly concentrates on the improvement of the visual perceptiveness of image which is not clear because of blurriness. In general, the famous edge based enhancement image filtration is accomplished by using traditional filters, but all these filters are having several problems, especially while enhancement of a noisy image. The procedure of removing noise from image and storage of useful information are key aspects of image enhancement methodology. A wide range of processes have been introduced to solve the edge preservation and noise elimination problem. In recent years, researchers have concentrated their observations on nonlinear type of smoothing method in the spatial domain.

III. RELATED WORK

The Demirel Hasan, Ozcinar Cagri, and Anbarjafari Gholamreza [1], in their work authors has proposed some methods for intensification of satellite images which includes Discrete wavelet transform also known as DWT and Singular Value Decomposition which is also known as SVD. In the methodologies determined by them the images are given as a input and are divided into sub-bands of discrete wavelet and, after renovation of the singular value matrix of the lower most sub band also known as LL sub band, it regenerates an image by using inverse discrete wavelet transformation. This method was differentiated with brightness preservation dynamic histogram equalization method, local histogram equalization, general histogram and singular value based equalization techniques. The photographic outcomes on a final resulting image describes the quality and the superiority of the decomposition methods over the modern techniques used and the conventional. There are some kind of limitation present inside this method as it is not an effective method to enhancements in the contrast of an image, reduction in distortion present inside image and for misplacement of contents having higher frequency.

Hasan and Anbarjafari [2], have introduced and described a new methodology of resolution amplification which is based on implantation of the sub band images having high-frequency received from an input image and discrete wavelet transformation. The proposed methodology is verified and tested on benchmark images, and their root mean square error, peak signal to noise ratio and their visual output shows the power of the determined technique over the conventional and older image resolution improvement techniques. The peak signal to noise ratio advancement of this described methodology is upto 7.19 dB in contrast with the standard bicubic interpolation methods. Joon Ki Paik with Bong Soon Kang and Tae Keun Kim [3], in this an author's explains that the methods of improving image contrast system for image ordering can enhance the local contrast of an image with defeating or removing unnecessary noise amplification which is determined on spatio temporal process. In this paper we have proposed block-overlapping histogram equalization method which is used in enhancement of the image sequence.

In the mentioned contrast strengthning system, the local contrast of an end outcome has been ultimately enhanced without any loss of contrast in case of lesser bright block. Hasan, GholamrezaAnbarjafari along with Mohammad N. SabetJahromi [4], in this paper introduced a singular value based decomposition image equalization technique. The proposed equalization methodology of singular value equlization, is afterwords compared with general histogram equalization methodology to determine the visual and quantitative performance testing's. The singular value based matrix denotes the intensity of an information inside the captured image provided as an input to the system. The input image intensity can be changed in case if there is any kind of change detected inside singular value. The presented method acquires an image and converts it into the single value decomposition domain and after the normalization process of the singular value matrix, the same image is reorganized and arranged in spatial domain with the help from updated singular value matrix. K.Hepsibah Persis, along with J. Sethuram along with M. Saravanan [5], in their paper, authors described a method which is basically on Contourlet and decomposition of singular value for satellite image contrast intensification technique. In this methodology, the given input image is partitioned into Contourlet sub bands, after this it is being updated using the singular value matrix present at the low-low(LL) sub band of an image. The reformation of image is achieved by using inverse Contourlet Transformation. Haidi Ibrahim along with Nicholas Sia Pik Kong [6], in their paper the described technique called as brightness preserving dynamic histogram equalization (BPDHE), is nothing but the extension created with the help of histogram evaluation technique. By using this technique, we can generate a response image also with containg mean intensity which is nearly equivalent to the mean image intensity, and thus achieving the primary requirement of preservation of the mean image brightness. This method gives us excellent outcome as compared with the other available brightness preserving histogram equalization methods based on mean and enhancement in the grade of an image successfully without any kind of disturbance and problems and it also preserves the mean input brightness of an image input given. Chi-Chia Sun, Shanq-Jang Ruan, Mon-Chau Shie, Tun-Wen Pai [7], in this paper dynamic specific histogram contrast enhancement algorithm is anticipated. The anticipated DHS algorithm not only enhance the contrast dynamically but also tries to maintain the actual histogram distribution shape features. The anticipated DHS algorithm achieve contrast enhancement, although reduced the infuriating effects, and also keeps the features of original histogram distribution.

IV. CONCLUSION

This paper provides an information related to the intensification methods of satellite images. In this paper we have also provided a survey of some of the papers which are related to the enhancement of images from satellite and about the methodologies they had introduced in their work. We have also mentioned the comparison of these methods in the table. These all methods are very helpful in improvement of the quality of a satellite images so that it we can grab more accurate information from them and which will be very helpful in variety of applications. This paper will provide help to study the different effective methods used for satellite image improvement's. As already mentioned there are large number of applications in which satellite images are used.

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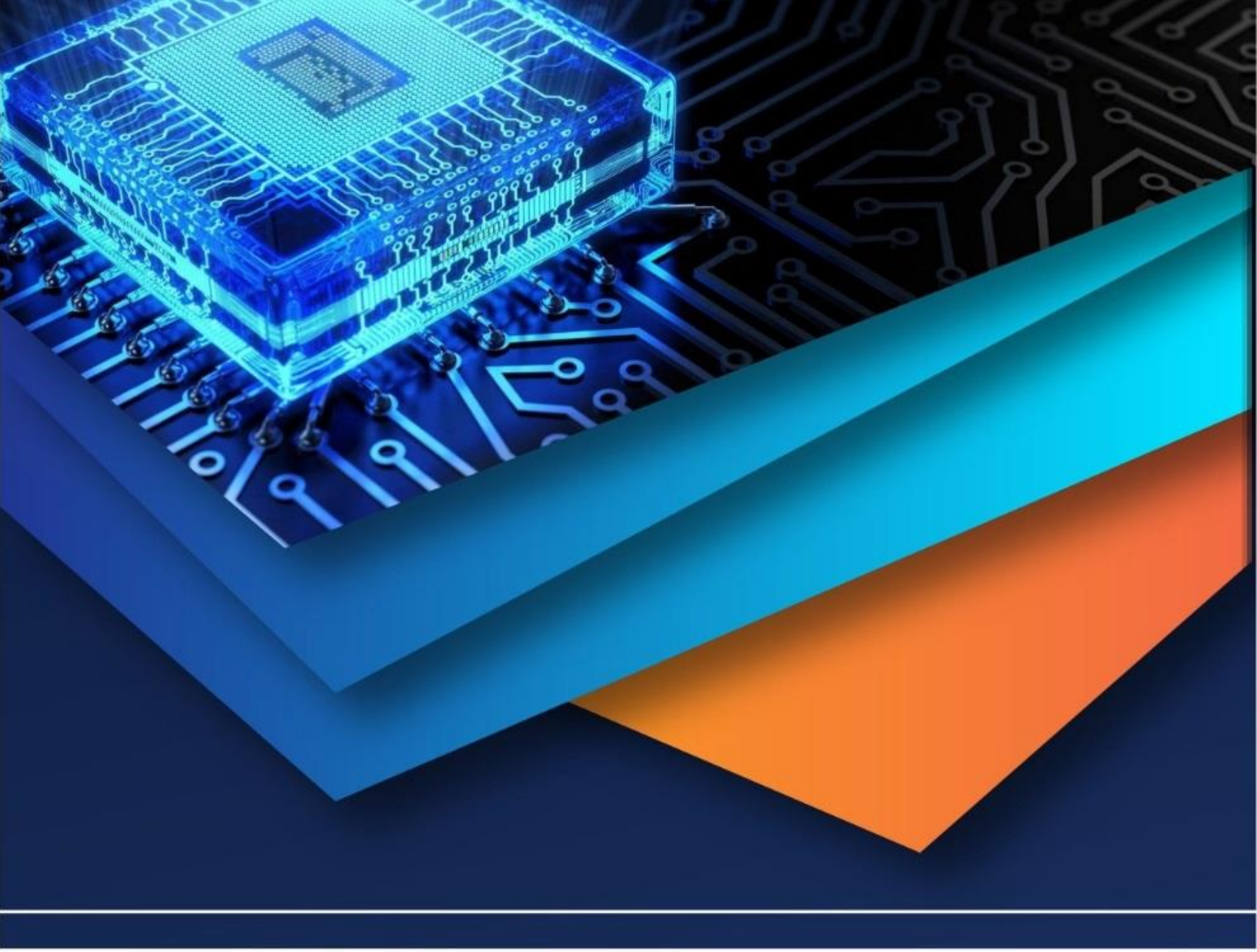

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