A Study on Multi- Spectral Satellite Image Enhancement Based on Histogram Equalization

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Abstract— The image enhancement techniques are applied either to single-band images or separately to the individual bands of a multi-band image set. Histogram modification is a one of classical method for image enhancement technique is histogram equalization. It is method of self-acting process since it does not request any information, just only the probability of each intensity level of satellite image. However, the enhanced satellite image is obtained by the global area histogram equalization will cause an effect of intensity saturation in some areas/features. This defeat is appeared because of the process attempted to merge the adjacent gray levels together in order to flatten the histogram. To reduce this defeat, a method of local area histogram equalization is suggested. Initially, the original image will be dived into small grid areas by using spatial re-sizing technique, since this technique gives high accurately boundaries of region. The histogram of all pixels in each grid will be equalized independently. The method of segmented grid histogram equalization will be applied to each scene of multi-spectral satellite imageries. The enhanced satellite image can be gives the good spatial and good spectral accuracy. The resultant image obtained from the proposed method is obviously more details compared to the normal method.

Key words: Re sampling, histogram equalization, segmentation, spatial resizing

I. INTRODUCTION

A histogram is a statistical graphical representation of the range of tones from dark to light and associated number of pixels for each tone for an image. A histogram can also describe the amount of contrast is a measure of the difference in brightness between light and dark areas in a satellite image. Broad band histograms reflect a scene with specific contrast, but the narrow band histograms reflect less contrast and may look like flat or dull. The enhancement techniques are employed in order to increase the contrast of an image. Therefore, the different of features in the satellite image can be easily identified by visualization technique. This will increase the efficiency of image classification. Normally an image can be displayed by spreading out the range of scene illumination. This procedure is called contrast stretch. Histogram equalization is a one of the method of self-acting process since it does not request any information, just only the probability of each intensity level of satellite image.

II. STUDY AREA

- Madurai city, Latitude: Longitude:

III. DATA USED/SOFTWARE USED

- Data: IRS P6 LISS IV
- Software: ENVI 4.3

IV. IMAGE REGISTRATION

Initially the LISS IV image is registered using Ground control points by the method of image to map registration technique using the ENVI software. Image registration is nothing but the fixing latitude and longitude with the specific projection system. In the image to map registration the toposheet is used for base map for image registration. The control points are collected using GPS from the study area.

V. HISTOGRAM EQUALIZATION

Contrast image enhancement techniques in the image processing is to modify the image through some pixel mapping, (ie) the histogram of the processed image is more distribution than that of the original image. Neighborhood pixel is obtained with the help of local mapping function. This method is used to determine the neighborhood pixel value; it will enhance the local contrast of the neighborhood pixel. One of the important contrast enhancement techniques is histogram equalization. The image histogram in the context of satellite image processing is the operation by which the occurrence of intensity value in the satellite image. The histogram is a graph showing the number of pixels in a satellite image at each different intensity value found in that image. In the 8-bit gray scale image there are 256 different possible intensities, and so the histogram will display 256 numbers showing the spread of pixels amongst those gray scale values. Histogram equalization assigns the intensity values of pixels in the input satellite image such that the output image contains a uniform distribution of pixel intensity values. It will increase the contrast and to obtain a uniformly distributed histogram. With the help of this adjustment, the intensities can be distributed on the histogram image. From this, it will allow for lower local contrast area to gain a higher contrast without affecting the global contrast of the image. Histogram equalization techniques accomplished by effectively spreading out the more frequent intensity values. This method is useful in images with backgrounds and foregrounds that are both bright or both dark visualization. Histogram equalization is a one of the histogram remapping spatial methods. This method used to adjust the image to make it easier to analyze or improve visual quality of the image. It will describe histogram equalization on an 8bit grey-scale image. It can also be used on color images by applying the same method separately to the Red, Green and Blue band components of the 24bit color BSQ values of the image. Applying the same method on the Red, Green, and Blue band components of a 24bit color image may give dramatic changes in the image's color balance since the relative distributions of the color channels change as a result of applying the equalization

algorithm. First the image is converted in to another color space, HSV/ HSL color space. Then the contrast algorithm can be applied to the value channel without changing the result of the image.

VI. HISTOGRAM EQUALIZATION LINEAR CONTRAST STRETCHES

To automatically scale the data to equalize the number of DNs in each histogram .From the Interactive Contrast Stretching dialog menu bar, select the linear contrast stretch Equalization. The input histogram shows the unmodified contrast of the input image. The output histogram of the image shows the equalization function as a red line, and the stretched data distribution is shown superimposed in white. Applying Arbitrary Contrast Stretching and Histogram Matching Use Arbitrary to draw any shape histogram on top of the Output Histogram or match a histogram from another image. Also use the Arbitrary Contrast Stretching function to match a histogram from one image to the histogram of another. Grab either the input or output histogram from one plot by selecting the Input Histogram or Output .The imported histogram is plotted in red and the output histogram is stretched to match the imported histogram. The minimum value in the histogram is 0 and the maximum value is 248.These levels occupy less than one third of the full 256 available levels. A linear stretch uniformly expands this small range to cover the full range of values from 0 to 255. Example for linear contrast stretch of LISS IV image is shown in the following plot.

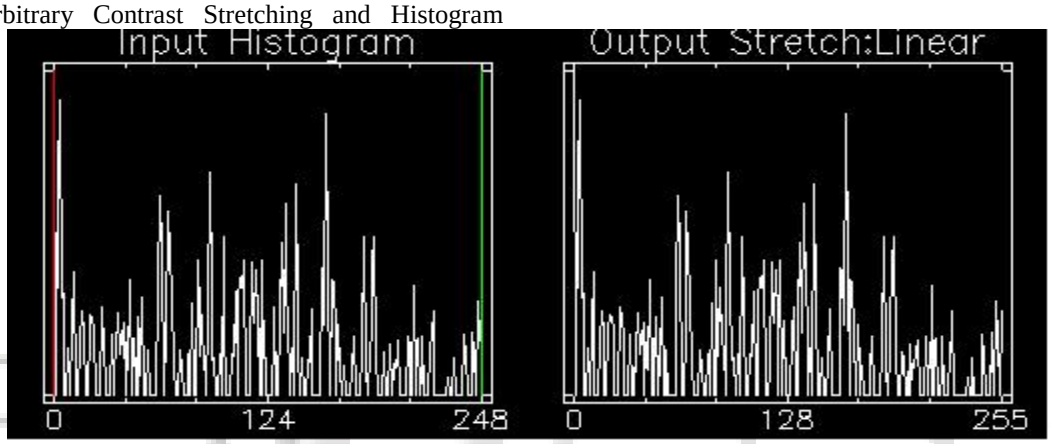

Fig. 1: Histogram Equalization Linear Contrast Stretches

The frequency distribution calculations give the cumulative percentage for each DN (digital number) in the image histogram. The dimensions of the resulting images are the number of bands of the input data. Eigenvectors are indicated with the rows in the output eigenvector image. Specify the factors to use for resizing the samples and the lines of the image while calculating the statistics in the Samples Resize Factor and Shape Resize Factor fields. Improving the performance for larger images, indicate the value of less than 1 to skip pixels.

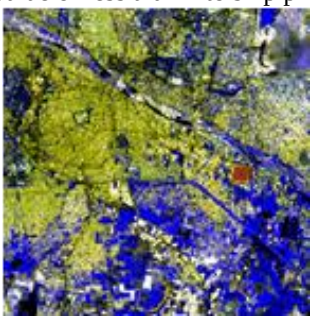

Fig (a)

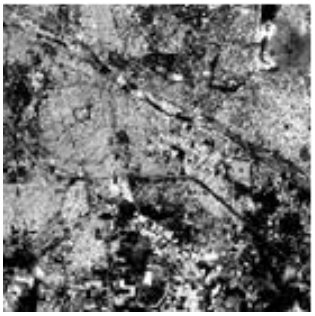

Fig (b)

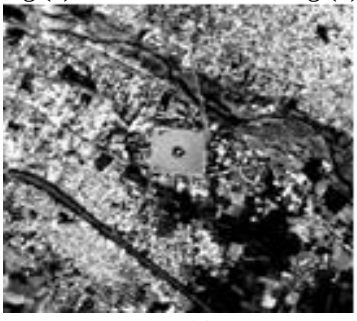

Fig (c)

VII. RESULT & DISCUSSION

The histogram of each segmented region will be equalized independently. By assigning the color red, green and blue to processed image. The result of color image enhancement is shown in Fig.(a). Histogram equalization is powerful method for increasing the contrast of single band image Fig.(b) and Fig (c). The enhanced image will give the full dynamic range of histogram values. The global histogram equalization technique tries to merge the adjacent gray levels together in order to force the uniformity of number of pixels in each appeared gray levels. Consequently, the intensity saturation will be presented in dark and white region. This improves the contrast in the image with light toned areas in the single band image appearing lighter and dark areas displays darker, making visual interpretation much easier. From the output single band image gives more information compared to the normal image. Output histogram image is more clarity, which is same like to that of multiband image. All the pixels are located in the border of two regions which are not too different in gray levels will be merging together. But we separate out these two regions first and then exploit the histogram equalization to each region independently. Therefore, the mentioned defects can be overcome.

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