Visualization of Color Based Texture Features of Cultivating and Non-Cultivating Area by Wavelet in Satellite Images

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Abstract: This paper represents unsupervised method of color based segmentation using clustering to classify agricultural and non-agricultural area in Satellite images. Texture segment-based image analysis for generating and updating geographical information are becoming more important because ofprogress in spatial resolution of satellite images. This work involves K-means clustering algorithm for Texture segmentation of satellite images with two approaches. First method proposes a segmentation of various clusters by Lab color space and Texture Features. The Second method proposes a texture segmentation of image by wavelet.

K-means Algorithm is verified for simulated images and applied for a selected satellite image processing. The basic tool involved in this project is LabVIEW (Laboratory Virtual Instrument Engineering Workbench), which is a graphical programming language that uses icons instead of lines of text to create applications. LabVIEW is a graphical programming environment based on the G programming language for data acquisition, control, data analysis and data presentation.

Keywords— Texture Segmentation, Lab colour space, K-Means, Wavelet, LabVIEW

I.INTRODUCTION:

With the use of wavelet transform approachthe accuracy of urban land use and land cover feature is improved in multispectral image .

Using region based method urban land use information is extracted by exploiting spatial metrics and texture measurements in high resolution satellite image. Geostatistical feature extraction set of intensity and texture feature are extracted for more accurate boundarylocalization in land cover areas from high resolution satellite image.

By use of the Transformed Divergence (TD) seperability measures land covers wereidentified and classify the urban areas from RADARSAT2 and with the decision treeclassifier accuracy of classification was able to increase in land cover areas. The wetland zone and agricultural zone are classified in land cover classification from IKONOS images. This project is implemented using LabVIEW on system specification.

II. LITERATURE SURVEY:

Princymol Joseph, Vishnukumar S [5] proposed a Study on wavelet Techniques. In this paper, a brief discussion on wavelet and survey on the methods is done. where wavelet is the process of hiding secret information inside a data source. It keeps not only the message, but also the existence of the message as a secret. It is mainly used in situations where the confidentiality of information is of prime importance in communication. In wavelet, information can be hidden in carrier as text files, images, audio and video. Based on factors such as carrying file, type of message to be embedded, methods of compression used etc., the technique used in wavelet can differ. With the growth of internet and its ease of access to everyone, the need for secured transmission of information has increased. So the importance of wavelet cannot be questioned.

Sabyasachi, Kamila Ratnakirti Roy, et.al [6] proposed A DWT based wavelet Scheme with Image Block Partitioning. In this paper, a new method for color image wavelet is proposed in frequency domain where Discrete Wavelet Transform (DWT) of the cover image is used to differentiate high frequency and low frequency information of each pixel of the image. This paper Proposed method hides secret bits in three higher frequency components making sure that the embedding impact on the cover image is minimum and not centralized in sensitivity domain. In this paper, a secure color image wavelet technique based on DWT is proposed which exhibits high fidelity data hiding in the frequency domain by embedding data in selected image blocks from DWT sub-bands.

Ali Al-Ataby1 and Fawzi Al-Naima [7] proposed A Modified High Capacity wavelet Technique Based on Wavelet Transform. This paper is to propose a modified high capacity wavelet technique that depends on wavelet transform with acceptable levels of imperceptibility and distortion in the cover image and high level of overall security.

Muhammet Baykar and Resul DAS [8] proposed A wavelet application for secure data communication. In this study, a wavelet application was developed to increase personal information security, this application is intended to provide more secure way of communication for emails which play an important role in personal data transfer. Thus, wavelet, which is one of the communication hiding techniques is used.

III. METHODOLOGY

Clustering can be considered the most important *unsupervised learning* problem; so, as every other problem of this kind, it dealswith finding a *structure* in a collection ofunlabeled data. simple definition ofclustering could be "the process of organizingobjects into groups whose members are similarin some or the other way".

A *cluster* is therefore a collection ofobjects which are "similar" between them and are "dissimilar" to the objects belonging to other clusters.

Types of Clustering:

1. ***Hierarchical algorithms***: These find successive clusters using previously established clusters.
   - ***Agglomerative ("bottom-up")***: Agglomerative algorithms begin with each element as a separate cluster and merge them into successively larger clusters.
   - ***Divisive ("top-down")***: Divisive algorithms begin with the whole set and proceed to divide it into successively smaller clusters.
2. ***Partitional clustering*:** Partitional algorithms determine all clusters at once. They include:

K-MEANS CLUSTERING

K-means is one of the simplest unsupervised learning algorithms that solve the well-known clustering problem. The procedure follows a simple and easy way to classify a given data set through a certain number of clusters (assume k clusters) fixed a priori. The main idea is to define k centroids, one for each cluster. These centroids should be placed in a cunning way because of different location causes different result. So, the better choice is to place them as much as possible far away from each other. The next step is to take each point belonging to a given data set andassociate it to the nearest centroid [3].

When no point is pending, the first step is completed and an early group age is done. At this point we need to re-calculate k new centroids as barycenters of the clusters resulting from the previous step. After we have these k new centroids, a new binding has to be done between the same data set points and the nearest new centroid. A loop has been generated. As a result of this loop we may

notice that the k centroids change their locationstep by step until no more changes are done. Inother words centroids do not move any more.Finally, this algorithm aims at minimizing an *objective function*, in this case a squared error function. The objective function

$$J = \sum_{j=1}^{k} \sum_{i=1}^{n} \left\| x_i^{(j)} - c_j \right\|^2$$

$$\left\| x_i^{(j)} - c_j \right\|^2$$

where $\left\| x_i^{(j)} - c_j \right\|^2$ is a chosen distance measurebetween a data point and the cluster center , is an indicator of the distance of the *n* datapoints from their respective cluster centers.

$x_i^{(j)}$

c_j

K-Mean Clustering algorithm

The algorithm is composed of the followingsteps:

1. *Place K points into the space represented bythe objects that are being clustered. These points represent initial group centroids.*
2. *Assign each object to the group that has the closest centroid.*
3. *When all objects have been assigned, recalculate the positions of the K centroids.*
4. *Repeat Steps 2 and 3 until the centroids no longer move. This produces a separation of the objects into groups from which the metric to be minimized can be calculated.*

Although it can be proved that the procedure will always terminate, the k-means algorithm does not necessarily find the most optimal configuration, corresponding to the global objective function minimum. The algorithm is also significantly sensitive to the initial randomly selected cluster Centre's. The k-means algorithm can be run multiple times to reduce this effect.

K-means is a simple algorithm that has been adapted to many problem domains. As weare going to see, it is a good candidate forextension to work with fuzzy feature vectors.

Wavelet Based Segmentation

Image segmentation is an essential step in many advanced techniques of multi- dimensional signal processing and its applications. Texture analysis occupies an important place in many tasks such as scene classification, shape determination or image processing.

This technique describes the wavelet transform used for feature extraction associatedwith individual image pixels [4]. For the image decomposition and feature extraction the Haar transform has been applied as a basic tool used in the wavelet transform. Wavelets arefunctions generated from a single function byits dilations and translations. The Haar transform forms the simplest compression process of this kind. These operations correspond to the following filtering processes as shown in Fig. 1. This methodology is designed and developed in the LabVIEW [5].

Top left: 2-D low pass filter (Lo-Lo).

Top right: horizontal high pass and vertical low pass filter (Hi-Lo).

Lower left: horizontal low pass and vertical high pass filter (Lo-Hi).

Lower right: 2-D high pass filter (Hi-Hi).

IV.EXPERIMENTAL RESULTS;

In this paper, various satellite images can be taken to classify agricultural land, non-agricultural land and sea land. The Fig.2 shows the LabVIEW front panel view of Original Satellite image which consist of agricultural land, non-agricultural land and sea land. The Fig.3 shows the LabVIEW front panel view of agricultural land. The Fig.4 shows the LabVIEW front panel view of sea land. The Fig.5 shows the LabVIEW front panel view of non-agricultural land.

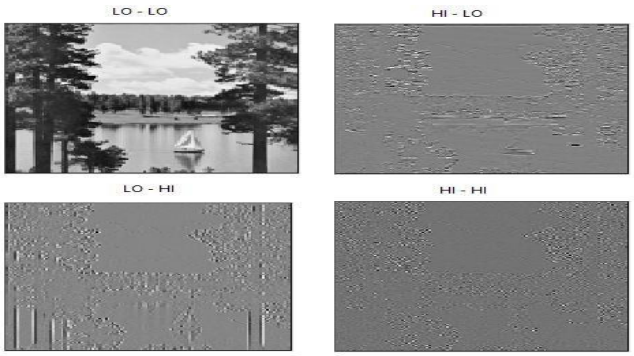

Fig.1 Decomposition of image into four sub images

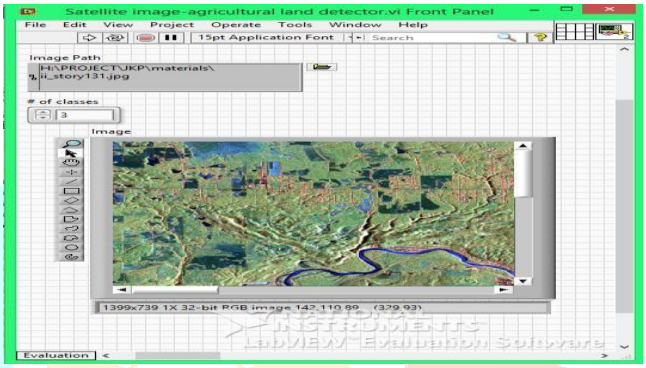

Fig.2 Front Panel of original Satellite image

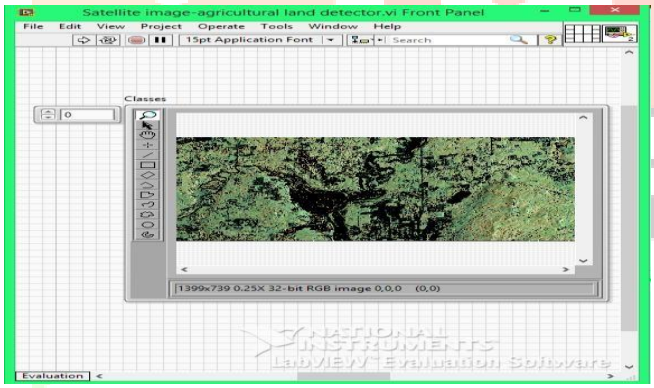

Fig.3 Front Panel segmented image 1

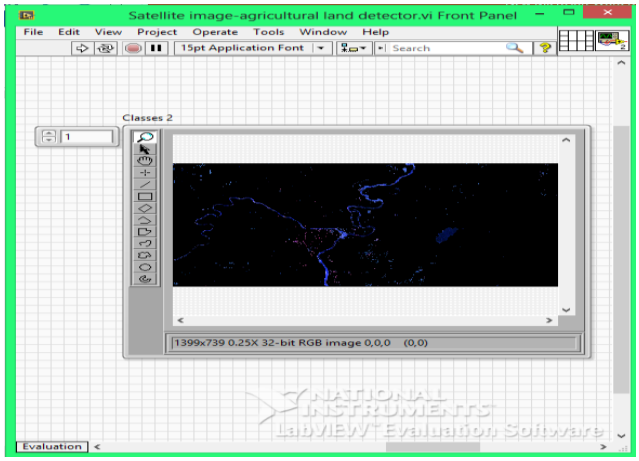

Fig.4 Front Panel segmented image 2

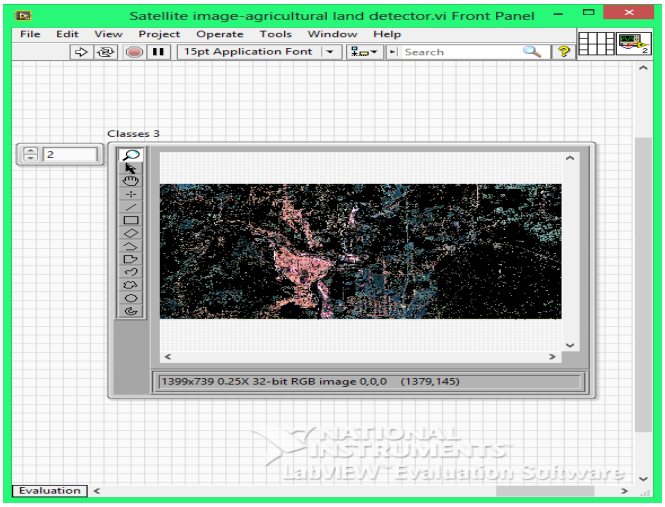

Fig.5 Front Panel segmented image

V.CONCLUSION

This method is implemented using LabVIEWon system Specification. Using wavelet-based color image segmentation; the image was classified as agricultural land, non-agricultural land and sea land. We are not still able to segment the plants properly whose colors are nearly same. In future the more texture property may be taken to segment the clusters perfectly. Hence we are trying to extend our approach on color images to segment images more precisely and try to compare the results to get the best from it.

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