

Identification of Mud Affected Area by using K-Means Clustering Approach in Nagapattinam Vedaranniyam Area

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Abstract— Segmentation is one of the most critical means of image processing and data analysis approach. The aim of segmentation is to classify an image into parts that have a strong correlation with objects in order to reflect the actual information collected from the real world. Clustering is a major global approach for segmentation and it relies on partition of images into a set of layers or regions for further analysis. The image segmentation by clustering basically refers to grouping similar data points into different clusters. In this article, an unsupervised clustering technology is proposed for processing large scale satellite images taken from remote celestial sites. As an effective approach, K-means clustering method requires that certain number of clusters for partitioning be specified and its distance metric be defined to quantify relative orientation of objects. Then image processing system forms clusters from input patterns. Diversified large scale image features are investigated using unsupervised methods. In the meanwhile, to limit computational complexity for the consideration of real time processing, a simple study is conducted in the satellite image of Nagapattinam-Vedaranniyam area, first classify the features in the image with the help of unsupervised classification then we apply the segmentation approach in the unsupervised classified image and find out the Mud affected area in these part using this approach.

Key words: K-Means Clustering, Mud Affected Area

I. INTRODUCTION

Segmentation is one of the most critical means of image processing and data analysis approach. The image segmentation by clustering basically refers to grouping similar data points into different clusters. Segmentation subdivides an image into its constituent regions or objects. The level to which the subdivision is carried depends on the problem being solved. That is, segmentation should stop when the objects of interest in an application have been isolated. Satellite image segmentation is often accomplished by clustering when ground truth is not available to provide samples to train a supervised classifier. In this technique an image is Segmented into unknown classes. It is the task of the user to label those classes afterwards. There is a great number of clustering methods. The usual approach is to focus on selecting the types of sensors most likely to enhance the objects of interest while diminishing the contribution of irrelevant image detail. A good example is the use of infrared imaging by the military to detect objects with strong heat signatures, such as equipment and troops in motion.

II. OBJECTIVE

The main objective of this project is to identify the Mud affected area in Nagapattinam – Vedaranniyam part of Tamilnadu coast using Unsupervised segmentation approach,

and also classify the features of this area using K-means clustering method.

III. STUDY AREA

Nagapattinam is situated in the middle of the Cauvery delta, a lowland area below sea level in parts and extending far inland. The area has been vulnerable to coastal flooding due to gentle slope of coastal land. Nagapattinam District lies on the shores of Bay of Bengal the district lies between 10.25° and 11.40° North Longitude and $76^{\circ} 49'$ and 80.01° East longitude. The total geographical area of the district is about 3536.38 Sq.km. The Vedaranyam salt swamp, south of Nagapattinam town is the largest swamp in Tamilnadu, running 7-8 kms. Wide and 48 kms. Along the coast from Point Calimere. It is one of the richest regions of biodiversity in the country.

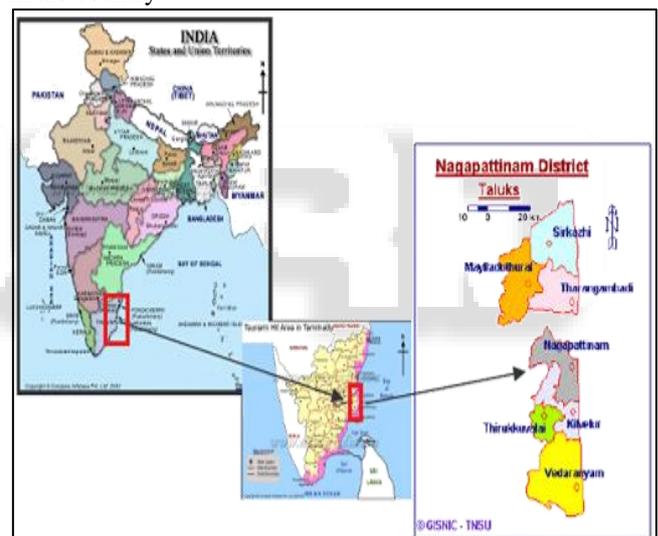


Fig. 1: Study Area: Nagapattinam

IV. ROLE OF SATELLITE IMAGE PROCESSING

Remote sensing and digital image processing are geo-spatial tools that can solve many environmental problems. Satellite image processing support to classify the images based on the supervised and unsupervised classification method and also segment the images, filtering the images, enhance the images. Satellite image processing fully based on satellite images. Various satellite image processing software's are there, (i.e) IDRISI, ENVI etc. In this project ENVI software is used for image analysis purpose.

V. METHODOLOGY

The present study seeks to objectively determine the Mud affected area for the Nagapattinam – Vedaranniyam part of Tamilnadu coast. First classify the satellite images based on the Unsupervised K- means clustering approach. This approach to classify the images based on earth surface

features. Secondly, Segmentation of classified images, then find out the Mud affected area. All this process is done with the help of ENVI satellite image processing software. Nagapattinam – Vedaranniyam area satellite image is used for this purpose.

A. K-Means Unsupervised Classification

K-means (Macqueen, 1967) 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,[8] one for each cluster. .K-Means unsupervised classification calculates initial class means evenly distributed in the data space then iteratively clusters the pixels into the nearest class using a minimum distance technique. Each iteration recalculates class means and reclassifies pixels with respect to the new means. All pixels are classified to the nearest class unless a standard deviation or distance threshold is specified, in which case some pixels may be unclassified if they do not meet the selected criteria. This process continues until the number of pixels in each class changes by less than the selected pixel change threshold or the maximum number of iterations is reached.

In this project, I select only few important features as a training set for K- means classifications, such as water body, beach ridges, mud, creek., deltaic plains, With the help of ENVI software the satellite image can be classified based on K- means clustering approach. The output of these classified images contains four classes. With the help of the classified image (fig .2) we can identify the beach ridges, water body, creek, mud. The following image is the one part of the classified image, it is in Vedaranniyam part. Vedaranniyam area is a most vulnerable area compared to Nagapattinam.

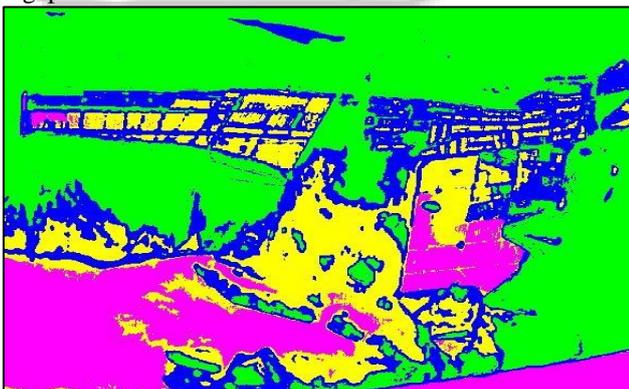


Fig. 2: Classified Image

COLOR	FEATURE
Yellow	Mud
Blue	Water body
Magenta	Creek
Green	Beach ridges

Table 1:

B. Image Segmentation

The aim of segmentation is to classify an image into parts that have a strong correlation with objects in order to reflect the actual information collected from the real world. Clustering

is a major global approach for segmentation and it relies on partition of images into a set of layers or regions for further analysis. The image segmentation by clustering basically refers to grouping similar data points into different clusters. After classifying the images we can apply the segmentation processes in the classified image. In the segmentation processes we can select only one class. The output of the segmentation process show only the brightness value of the mud. From the segmentation output we can identify the mud affected area, it is Vedaranniyam area. In the other features brightness value is zero. The segmentation output shown in the Fig.3.



Fig. 3: Segmented Image

VI. RESULT & DISCUSSION

Segmentation is one of the most critical means of image processing and data analysis approach. The image segmentation by clustering basically refers to grouping similar data points into different clusters. In the segmentation processes we can differentiate each feature in the image. With the help of the brightness value we can find out the feature in segmentation output. In this project, with the help of the image segmentation we can identify the mud affected area in Vedaranniyam part of Tamilnadu coast. This image segmentation is apply after the classified image. Based on these classified image the ENVI software can select particular class and segment the particular feature.

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