Satellite Image Feature Extraction

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Abstract—Natural or man-made objects extracted from Google earth has been used for many different purpose, e.g. Military, map publishing, transportation, car navigation, etc. Automatic natural objects (road, building, forest, water body etc.) extractions are a challenging problem, and no existing software is able to perform the task reliably. Since manual extraction of natural objects from imagery is very time consuming, automatic method have the potential to improve the speed and utility for military and civil application and are therefore highly desirable. Google Earth is a virtual globe, map and geographic information program that were originally called Earth Viewer. In this paper we are presenting the image classification using decision tree. The image objects are given color code and after processing the image is colored according the objects present. There are four classes developed, water, forest, mangroves and settlement. Water includes the water bodies present in the region. Vegetation includes the trees, plantations, greenery. Others include the remaining land areas. And last class includes the manmade structures which cover all the structures such as buildings, roads, bridges, etc.

I. INTRODUCTION

Google Earth provides satellite images of any area. In this paper, Google earth's image is used for implementation of extraction natural or man-made object from satellite age. Simultaneously there is a new wide range of computational algorithms that have emerged from the behavior of social insects. Social insects are usually characterized by their self-organization and with the minimum communication or the absence of it. Every social insect individually is self-autonomous.

Classification of a remotely sensed (RS) image can be seen as an iterative process in which each of its pixels is assigned to one of the several predefined land cover classes to be mapped. The goal of image classification is to exploit the spectral, spatial and temporal resolution of data and other characteristics such as multi polarization, multi frequency and multi incident angle signature to make the classification more reliable and accurate.

Some of the methodologies are Artificial Neural Network (ANN), Support Vector Machine (SVM) and Decision Tree Classification (DTC). ANN and SVM exhibit higher accuracy, but they are relatively slow compared to that of Decision Tree Classifier (DTC). The training period increases as the size of the training data is increased. They have also concluded that training a decision tree classifier is much faster and are easy to analyze, than compared to other classifiers. In literatures it is found that Decision trees perform better than other classification algorithms.

II. DECISION TREE CLASSIFIER ALGORITHM

Decision tree (DT) is one of the inductive learning algorithms that generates classification tree using the training data/samples. It is based on the "divide and conquer" strategy. It is a non-parametric in nature hence independent of the properties of the distribution of data, thus suitable for incorporation of non-spectral data into classification procedure so improvement in class separability can be achieved.

The resulting decision tree provides a representation of the concept that appeal to human International Journal of Computer Applications (0975 – 8887).

Volume 23– No.3, June 2011 8 because it renders the classification process self-evident. It supports classification problems with more than two classes and can be modified to handle regression problems.

DT follows a hierarchical structure where at each level a test is applied to one or more attribute values that may have one of two outcomes. In order to classify an object, we start at the root of the tree, evaluate the test, and take the branch appropriate to the outcome. The process continues until a leaf is encountered, at which time the object is asserted whether it belongs to the class named by the leaf. Each final leaf will be the result of following set of mutually exclusive decision rules down the tree.

The tree is expanded until every training instance is correctly classified; over fitting of data is avoided by pruning the training dataset. Decision trees are sometimes more interpretable than other classifiers such as neural networks and support vector machines because they combine simple questions about the data in an understandable way. Decision tree approach has substantial Advantages for land use classification problems because of their flexibility and ability to handle non-linear relations between features and classes, hence improves the classification accuracy to a great extent. The major drawback of DTC technique is they are unstable when feature space and training areas are changed. A sample decision tree model is shown in the below figure.

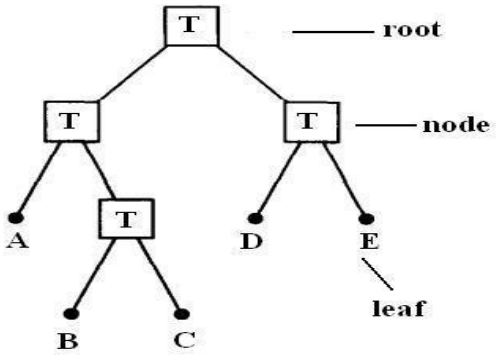

Fig. 1: Decision Tree

The generalized method for constructing a decision tree can be summarized as follows:

If there are k classes denoted {C1, C2... Ck}, and a training set, T, then _ If T contains one or more

Objects which all belong to a single class Cj, then the decision tree is a leaf identifying class Cj. If T contains no objects, the decision tree is a leaf determined from information other than T. If T contains objects that belong to a mixture of classes, then a test is chosen, based on a single attribute that has one or more mutually exclusive outcomes {O1, O2... On}. T is partitioned into subsets T1, T2,...,Tn, where Ti contains all the objects in T that have outcome Oi of the chosen test. The same method is applied recursively to each subset of training objects to build the decision.

III. RESULT

A. Description:

The image is fed into the application, it is the satellite image of the thane district. Maharashtra, India.

The image is processed by the classification algorithm and the first step decision tree is generated. Based on the decision tree output the image gets segmented and image objects are extracted and represented by different color.

There are four classes developed, water, forest ,mangroves and settlement.

Water includes the water bodies present in the region.

Vegetation includes the trees, plantations, greenery. Others include the remaining land areas.

And last class includes the Man-made structures which covers all the structures such as buildings, roads, bridges, etc.

The following image is the original satellite image.

– Original image

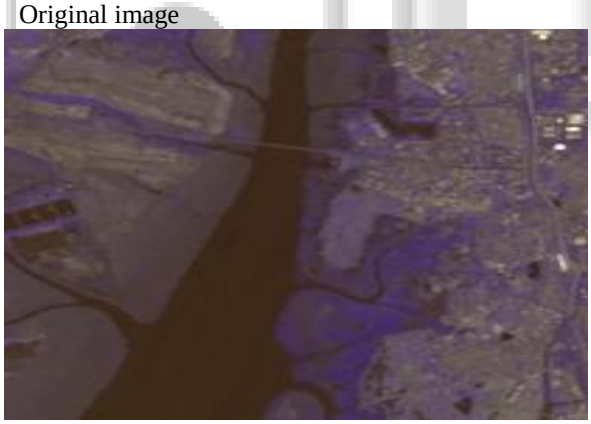

Fig. 2: Satellite Image

– Final Output of the classifier of image

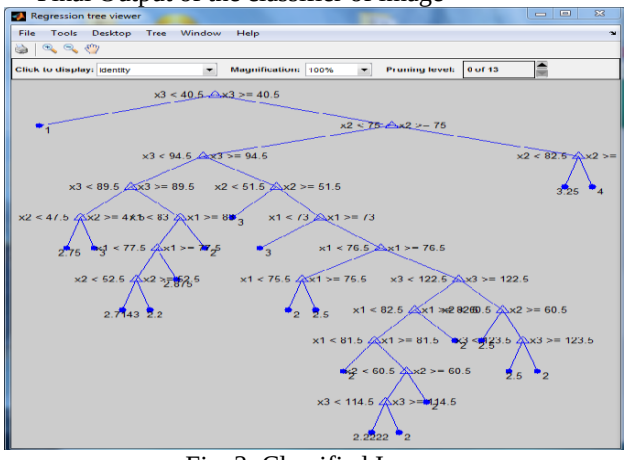

Fig. 3: Classified Image

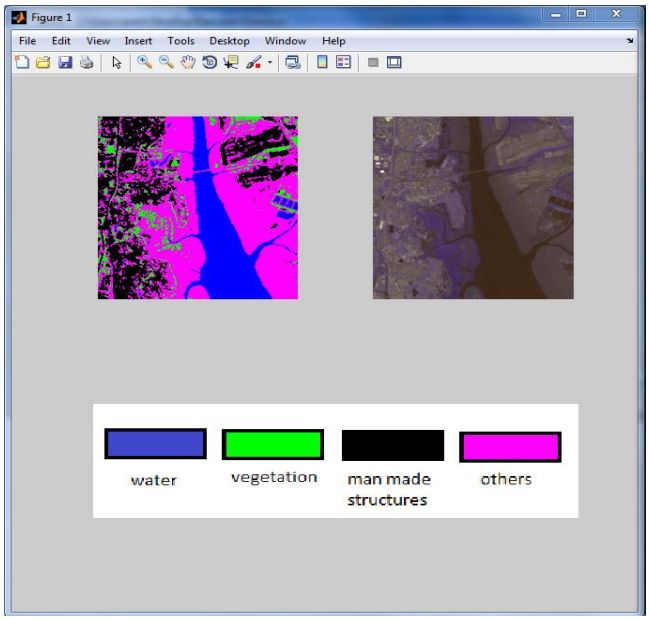

Fig. 4: Attribute Extracted Image

IV. CONCLUSION

The methodology enables extraction of boundaries of an object in a single step.

Based on the methodology, an interactive software application is developed. It incorporates object extraction from input images using color image segmentation.

Segmentation based on decision tree classification is used in this project. Decision tree (DT) is one of the inductive learning algorithms that generates classification tree using the training data/samples. It is based on the "divide and conquer" strategy

The user can load the satellite image then can make the image in processing after few minutes the ratio of the features of satellite has been generated in the graphical format.

The application helps identifying the objects of different classes.

The applicability of the methodology to colour images has been shown by extracting natural or artificial features from (satellite) images. Applicability of the developed methodology can be easily extended to natural colour satellite imagery to extract homogeneous features. Coastline delineation, snow cover mapping, cloud detection, and dense forest mapping are a few areas where satisfactory results can be obtained.

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