An Automatic and Accurate Segmentation for High Resolution Satellite Image

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ABSTRACT: Satellite images need to be classified for surveillance purposes. The image obtained from the satellite should be classified properly in order to obtain the fine details of the image. Two method of image classification techniques are available they are supervised image classification and unsupervised image classification. Partitioning satellite image into meaningful regions has played an important role in recent years. The combination of topic models and random fields has been successfully applied to image classification because of their complementary effect. The supervised image classification needs manual interpretation with plentiful and expensive human effort. We proposed an efficient unsupervised image classification method for the classification of satellite images. The methods used are Latent Dirichlet Allocation and Markov Random field .The classification or segmentation obtained from the Latent Dirichlet Allocation method is more reliant on content coherence. The annotation performance of large satellite images is the benefit obtained from the topic models. The Markov Random Field method is used to obtain the spatial information between the neighbouring regions in the image. The combined models are complementary and the segmentation accuracy is improved. The iterative algorithm is proposed to make the number of classes finally be converged to appropriate levels. This is based on label cost and Bayesian information criterion .The whole process works automatically instead of assuming it beforehand as a constant.

KEYWORDS: Latent Dirichlet Allocation (LDA), Unsupervised image classification, Markov Random Field

I. INTRODUCTION

Remote sensing is the acquisition of information about the object without making physical contact with the object. The term generally refers to the use of aerial senor technologies to detect and classify object on the earth by means of propagated signals such as electromagnetic radiated emission from the satellite remote sensing makes it possible to collect data on dangerous or inaccessible areas.

The process of remote sensing is also helpful for city planning, archaeological investigations, military observation and geomorphologic surveying Partitioning satellite image into meaningful region has played an important role in recent years. The supervised classification method includes manual interpretation which needs plentiful and expensive human effort. One of the most challenging problems in remote sensing application is an automatic and efficient method for image semantic extraction. In order to achieve an efficient content extraction of satellite images, many clustering algorithms directly based on image features have been proposed the intent of the classification process is to categorize all pixels in a digital image into one of several land cover classes or themes. This categorized data may then be used to produce thematic maps of the land cover present in an image.

The objective of image classification is to identify and portray, as a unique gray level, the features occurring in an image in terms of the object or type of land cover these features actually represent on the ground. Two main classification methods are Supervised Classification and Unsupervised Classification.

Supervised classification method includes manual interpretation which needs plentiful and expensive human effort. One of the most challenging problems in remote sensing application is an automatic and efficient method for image semantic extraction. In order to achieve an efficient content extraction of satellite images, many clustering algorithms directly based on image features have been proposed.

Unsupervised classification is a method which examines a large number of unknown pixels and divides into a number of classed based on natural groupings present in the image values. Unlike supervised classification, unsupervised classification does not require analyst-specified training data For questions on paper guidelines, please

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II. RELATED WORK

Classification of remotely sensed data is used to assign corresponding levels with respect to groups with homogenous characteristics. The aim of discriminating multiple objects from each other with in the image The different methods are used to achieve this. In [1] the combined spatial and aspect model significantly improves the region level classification accuracy. In [2] the concept used is maximum likelihood method in order to efficiently handle the tasks of image analysis related to content information of remote sensing many techniques based on clustering is used. In [3] the application of alpha expansion algorithm in minimizing the energy is extended so that it can simultaneously optimize label costs. In [4] weakly supervised classification method is used for a large PolSAR imagery using multimodal markov aspect model, In [5] Probabilistic Latent Semantic Analysis (pLSA) method which was originally used for text analysis is extended to images. Like a document contains topics images contains objects. This was the analogy used for extension of PLSA algorithm from text to images. In [6] the visual vocabulary is an intermediate level representation which has been proved to be very powerful for addressing object categorization problems. It is here to embed the visual vocabulary creation within the object model construction, allowing to make it more suited for object class discrimination and therefore for object categorization. In [7] statistical pattern recognition is integrated with geosciences a new method ISODATA-Geosciences Imagery Classification method is used. In [8] ISODATA method was executed in parallel using map reduce method thus execution time is considerably reduced. In [9] a new method is for the subpixelic land cover classification using both high resolution structural information and coarse resolution temporal information. In [10] an object oriented semantic clustering algorithm for high spatial resolution remote sensing images using the probabilistic latent semantic analysis model coupled with neighbourhood spatial information.

III. PROPOSED SYSTEM

The main objective is to obtain accurate segmentation results which can be obtained only by including spatial information between pixels for calculation. Latent Dirichlet Allocation (LDA) method can do better segmentation but it lacks spatial information. We propose a Segmentation method by combining LDA with Markov Random fields (MRF) to for accurate segmentation results.
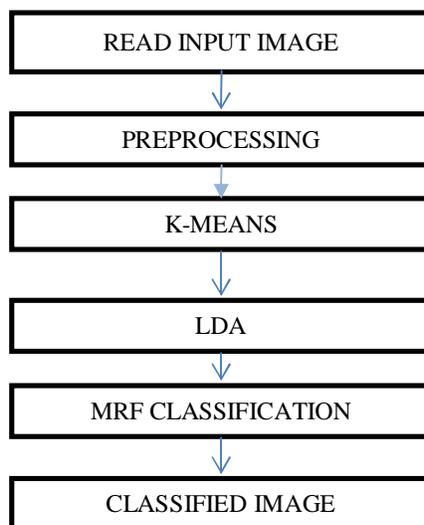
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┌─────────────────────────┐
│    READ INPUT IMAGE     │
└─────────────────────────┘
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│      PREPROCESSING      │
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Fig. 1 System Architecture

IV. MODULE DESCRIPTION

Read Input Image: Input image is obtained from Google Earth

Preprocessing: In pre-processing two steps can be performed. The first step is the input image is resized and in the second step the resized image is converted division of blocks. To extract the features we use Scale Invariant Features transform (SIFT).

K-Means Quantization: The extracted features in the scale invariant features transform is then grouped using the k-means quantization. The k-means algorithm takes as input the number of clusters to generate k, and a set of observation vectors to cluster. It returns a set of centroids, one for each of the k clusters. An observation vector is classified with the cluster number or centroid index of the centroid closest to it. The result of k-means, a set of centroids, can be used to quantize vectors. Quantization aims to find an encoding of vectors that reduces the expected distortion.

Latent Dirichlet Allocation: LDA allows sets of observations to be explained by unobserved groups that explain why some parts of the data are similar. LDA is used to assign regions to pixels.

Markov Random Field: MRF which is undirected and cyclic is used to add spatial information for accurate segmentation

V. RESULT

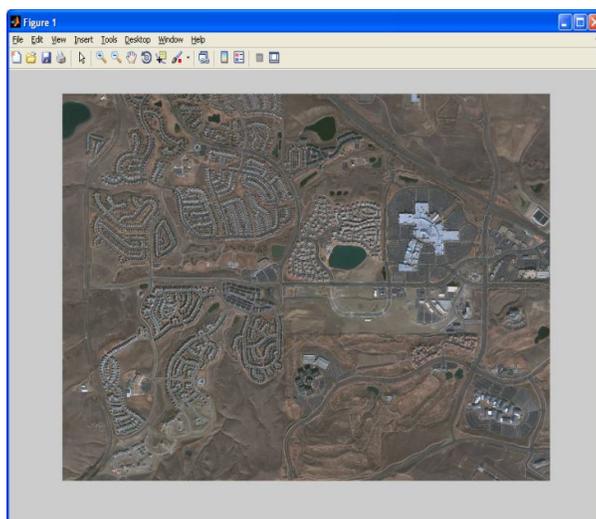*INPUT IMAGE:* The scene of input satellite image is derived from the Google Earth.

Fig. 2 Input Image

FEATURE BASED SEGMENTATION: The input image obtained from the satellite is segmented based on the features. The input image obtained from the satellite are segmented based on the features .first the input image is resized and then the resized image is converted into division of blocks. To extract the features the Scale Invariant Feature Transform is used. It is an algorithm used to detect and describe local features in an image
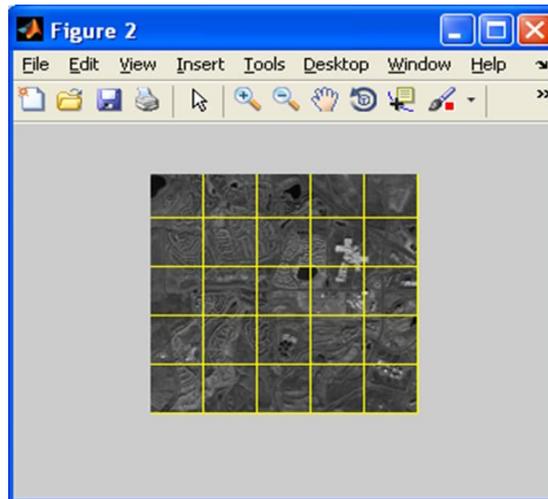
Fig. 3 Scale Invariant Transform

EDGE DETECTION:

The output of edge detection is sown in fig 4 .The edge is detected using the canny edge detection method. It is a multistage algorithm to detect various edges in an image.
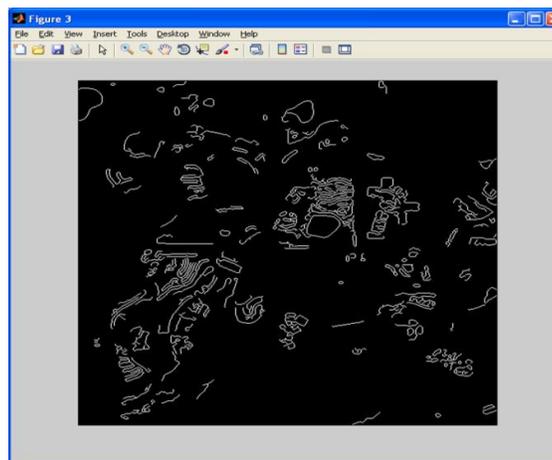

Fig. 4. Edge Detection

LDA Classification(Existing):

The image is classified based on Latent Dirichlet Allocation method. The accurate segmentation of image is not done in LDA. The disadvantage is lack of spatial correlation .To overcome this disadvantage we are going for combined method classification called LDA and MRF classification
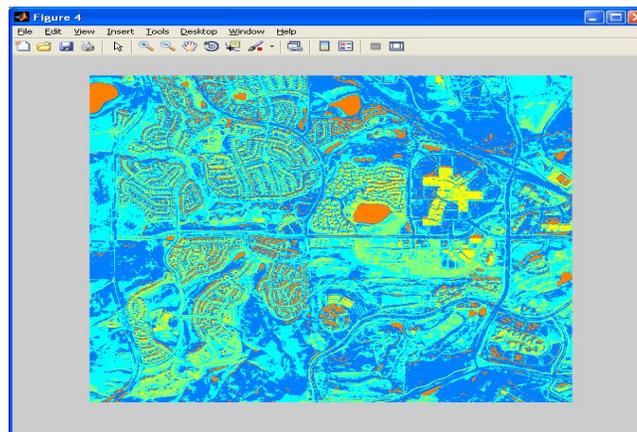
Fig. 5 Output of LDA Classification

LDA-MRF Classification:

This is the result obtained for LDA-MRF classification. The disadvantages of LDA MRF model were overcome by capturing the local correlation between all spatially adjacent neighbors. It is an effective way to solve lack of spatial information. Combining topic model with MRF is to compensate the loss of contextual information
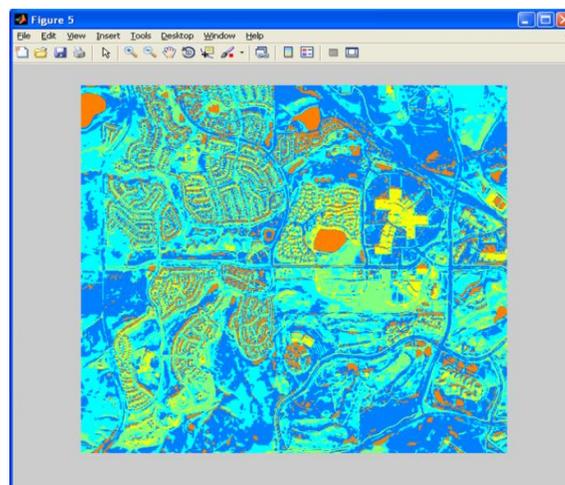

Fig 6. Output of LDA-MRF Classification

VI. CONCLUSION

Thus the proposed LDA-MRF based Satellite Image Classification obtains images with high segmentation accuracy and less computational complexity. Image Classification is done for LDA-MRF Method, In Future this Image Classification can be done using support vector machine with radial basis function kernel method.

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BIOGRAPHY

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