A Survey Paper Object based Unsupervised Classification of VHR Panchromatic and Multispectral Satellite images by Combining the HDP, IBP and k-mean on multiple scenes

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Abstract— **In this paper Bayesian hierarchical model (HDP_IBPs) to classify very high resolution panchromatic as well as multispectral satellite images in an unsupervised way, in which the hierarchical Dirichlet process (HDP) and Indian buffet process (IBP) are combined on multiple scenes. The main contribution of this paper is a novel application framework to solve the problems of traditional probabilistic topic models and achieve the effective unsupervised classification of very high resolution (VHR) panchromatic and multispectral satellite images. The hierarchical structure of our model transmits the spatial information from the original image to the scene layer implicitly and provides useful cues of classification by using clustering technique, clustering is a popular tool for exploratory data analysis, such as K-means clustering technique .Automatic determination of the initialization number of clusters in K-means clustering application is often needed in advance as an input parameter to the algorithm. K-mean clustering algorithm is used to partition and analyze the data which used the required cluster. Initially this number of clusters is taken as starting values. Sometime images which are captures are blur or unclear so they do not return proper return but now with the help of multiple satellite it captures the multiple satellite images and splits them separately.**

Index terms- **Unsupervised classification, K-means clustering technique, HDP, IBP.**

I. INTRODUCTION

The classification of images is becoming more and more important in many applications, the applications of images are divided into two approaches that is first one is the supervised method and unsupervised method. The supervised method requires the availability of a training set for learning the classifier. The supervised methods offer higher classification accuracy compared to the unsupervised ones, but in some applications, it is necessary to resort to unsupervised techniques because training information is not available and the unsupervised method known also as clustering methods,

perform classification just by exploiting information conveyed by the data, without requiring any training sample set. So the unsupervised method is better than the supervised method. In the paper we used the unsupervised method, to classify very high resolution panchromatic as well as multispectral satellite images in an unsupervised way, in which the hierarchical Dirichlet process (HDP) and Indian buffet process (IBP) are combined on multiple scenes. Object-based image analysis (OBIA) often consists of two steps: 1) image segmentation and 2) the classification of image objects using a classifier. The advantages of object based image analysis for analyzing high spatial resolution satellite images. And the object based has been applied successfully in land use and land cover classification. Object based images analysis of high resolution multispectral images however the classification accuracy highly depends on the quality of the image segmentation while both segmentation and classification are designed independently. The main contribution of the paper is a novel application framework to solve the problems of traditional probabilistic topic models and achieve the effective unsupervised classification of very high resolution (VHR) panchromatic and multispectral satellite images. The hierarchical structure of our model transmits the spatial information from the original image to the scene layer implicitly and provides useful cues of classification by using clustering technique, clustering is a popular tool for exploratory data analysis, such as K-means clustering technique. The k-mean clustering technique is used to apply for the segmentation. K-mean clustering algorithm is used to partition and analyze the data which used the required cluster. Initially this number of clusters is taken as starting values. Sometime images which are captures are blur or unclear so they do not return proper return but now with the help of multiple satellite it captures the multiple satellite images and splits them separately. The images are splitting or partitioning because of the avoiding the exceptions, exceptions that means large number of images is uploaded at a time then efficiency are less and time consuming is more to find actual areas. The HDP and IBP technique are used to decide the color for the

different areas after dividing the color performing the classifications by using support vector machine algorithm. Hierarchical dirichlet process very high resolution satellite image are divided into sub images. HDP is transmitting the spatial information from original image and provide the useful cues of classification. Indian buffet process specially defined the sparse binary metric with finite number of rows and unbounded number of columns. It is used to select subset of geo-object class to provide special regularizations. It receives geo-object and scene classification from VHR panchromatic image.

II. LITERATURE SURVEY

1. Object-Based Unsupervised Classification of VHR Panchromatic Satellite Images by Combining the HDP and IBP on Multiple Scenes [1]

In this paper, author proposed, a nonparametric Bayesian classification algorithm by combining the HDP and IBP technique. It is used to classify the panchromatic image automatically without the knowledge of the number of classes in an unsupervised way. The main contribution of this paper is a novel application framework to solve the problems of traditional probabilistic topic models and achieve the effective unsupervised classification of very high resolution (VHR) panchromatic satellite images.

2. Change detection model based on neighborhood correlation image analysis [2]

In This paper, it implements the change detection based on object correlation image and neighborhood correlation image. The object correlation images used multispectral and panchromatic images but neighborhood correlation image is used only multispectral images. This correlation images are based on brightness values from the same geographic area. It is used two classification algorithm i.e. machine learning decision tree and nearest neighbor classifier.

3. Classification of satellite images using new fuzzy cluster centroid for unsupervised classification algorithm [3]

In this paper, it included the several satellite image classification methods and technique. Satellite image classification methods are divided into three categories: automatic, manual and hybrid. In this paper is used to automated satellite image classification technique, it is divided into two categories: supervised and unsupervised.

4. Multi-scale latent Dirichlet allocation model for object oriented clustering [4]

In This paper, author proposed, the high resolution satellite images are divided into accurate segmentation. It is used the latent dirichlet allocation method but by using method does not give the accurate images. So it proposed the Markov Random field method. This method is used to add the spatial information for accurate segmentation.

5. Automatic detection of geospatial objects using multiple hierarchical segmentations [5].

In this paper, author proposed nova method for automatic object detection in high resolution images by combing spectral information. It use the morphological operations applied to individual spectral bands. This paper proposed object detection algorithm that formulated the detection process as an unsupervised grouping problem

6. Object based image analysis for remote sensing [6]

In this paper, author proposed; present a new method for segmenting remote sensing images based on spectral and texture feature. It uses the local spectral histogram representation which consists of histogram of filter responses in a local window. It provides an effective feature to capture both spectral and texture information. Disadvantages of this paper it does not make use of spatial information and the number of cluster cannot usually be obtained directly and automatically.

7. Stick-breaking construction for the Indian buffet process [14]

In this paper, author proposed to derive the stick-breaking representations for the IBP. It develops slice samplers for the IBP that are efficient, easy to implement. It develops the analogous to sethuramans seminal stick breaking representation for CPRs.

8. Entropy rate superpixel segmentation [15]

In this paper, author proposed, unsupervised image segmentations based on Bayesian network. Bayesian network is more used in many areas of decision support and image processing. There are two approaches operate in two phases: the first phase is to make an over segmentation which gives super pixels cards. And the second phase the super pixels by Bayesian network.

9. Object-oriented image analysis and scale space [7]

In this paper, author proposed, study of image descriptors for the classification and recognition of RSI. It included the 7 descriptors that encode texture information and 12 color descriptors that can be used to encode spectral information. It also proposed the methodology to evaluate image descriptor in classification problem by using KNN classifier.

10. Multiagent object-based classifier for high spatial resolution imagery [8]

In this paper, author proposed, the detail of preserving smoothing classifier random field. To apply the object oriented strategy in CRF classification framework. There are two main approaches are used to take the spatial contextual information Object oriented classification method which integrates the classification and segmentation algorithm and Random field method which is used the another useful classification on that can incorporate the spatial contextual information.

11. An object-oriented clustering algorithm for VHR panchromatic images using nonparametric latent Dirichlet allocation [10]

In this paper, author proposed LLDA model. The LLDA model handles the document clustering with labeled instance.

The document labels are obtained by the user's judgment or authentic resources

12. Probabilistic data association methods for tracking complex visual objects [9]

In this paper, author proposed, a multi-target tracking algorithm under dynamic background based on TLD and multithreading .Multithreading mechanism to expand the number of tracking target. By proposed algorithm not only the rigid object but also non rigid object can be tracked. Single target tracking as well as multiple moving targets is kept at the same time.

13. A Bayesian hierarchical model for learning natural scene categories [12]

In this paper, author proposed, compares the various techniques which retrieve the high resolution remote sensing images from large remote sensing. There are described two texture descriptor such as circular covariance histogram (CCH) and rotation invariant point triplets by using the mathematical morphological tool (RIPT).

14. Latent Dirichlet allocation with topic-inset knowledge [13]

In this paper, author proposed, an unsupervised model hrLDA for automatic terminological ontology learning. hrLDA is a domain independent self-learning model that means it is very promising for learning ontologies in new domain and thus can save significant time and effort in ontology.

III. COMPARATIVE STUDY OF LITERATURE SURVEY

Title	Author	Description
Object-Based Unsupervised Classification of VHR Panchromatic Satellite Images by Combining the HDP and IBP on Multiple Scenes	Yang Shu, Hong Tang, Jing Li, Ting Mao, Shi He, Adu Gong, Yunhao Chen, and Hongyue Du, November 2015	To solve the problems of traditional probabilistic topic models and achieve the effective unsupervised classification of very high resolution (VHR) panchromatic satellite images.
Change detection model based on neighborhood correlation image analysis	J. Im and J. R. Jensen Nov. 2005.	It implements the change detection based on object correlation image and neighborhood correlation image.
Classification of satellite images using new fuzzy cluster centroid for unsupervised classification algorithm	C. H. Genitha and K. Vani Jun. 30–Jul. 4,2013	It included the several satellite image classification methods and technique.
Multi-scale latent Dirichlet	H. Tang et al Mar. 2013.,	It proposed the Markov

Title	Author	Description
allocation model for object oriented clustering of VHR panchromatic satellite images		Random field method. This method is used to add the spatial information for accurate segmentation.
Automatic detection of geospatial objects using multiple hierarchical segmentations	H. G. Akcay and S. Aksoy Jul. 2008.	It proposed nova method for automatic object detection in high resolution images by combing spectral information
Object based image analysis for remote sensing	T. Blaschke, Jan. 2010	present a new method for segmenting remote sensing images based on spectral and texture feature
Stick-breaking construction for the Indian buffet process	Y. W. Teh, D. Görür, and Z. Ghahramani, Mar-2007	It develops the analogous to sethuramans seminal stick breaking representation for CPRs.

Title	Author	Description
Entropy rate superpixel segmentation	M.-Y. Liu, O. Tuzel, S. Ramalingam, and R. Chellappa Jun. 21–23, 2011,	It proposed unsupervised image segmentations based on Bayesian network
Object-oriented image analysis and scale space	T. Blaschke and G. J. Hay, Oct. 2001.	In this paper study of image descriptors for the classification and recognition of RSI.
Multiagent object-based classifier for high spatial resolution imagery	Y. F. Zhong, B. Zhao, and L. P. Zhang, Feb. 2014.	The detail of preserving smoothing classifier random field. To apply the object oriented strategy in CRF classification framework
An object-oriented clustering algorithm for VHR	Y. F. Qi et al, 2012	It proposed LLDA model. The LLDA model handles the document

panchromatic images using nonparametric latent Dirichlet allocation		clustering with labeled instance.
Probabilistic data association methods for tracking complex visual objects	C. Rasmussen and G. D. Hager, Jun. 2001.	a multi-target tracking algorithm under dynamic background based on TLD and multithreading
A Bayesian hierarchical model for learning natural scene categories	L. Fei-Fei and P. Perona, Jun. 20–25, 2005,	Compares the various techniques which retrieve the high resolution remote sensing images from large remote sensing.
Latent Dirichlet allocation with topic-inset knowledge	D. Andrzejewski and X. Zhu, Jun. 4, 2009,	In this paper, proposed an unsupervised model hrLDA for automatic terminological ontology learning.

IV. PROBLEN DEFINITION

In existing system having a problem is that it performs the operation only on panchromatic images. Panchromatic means combination of a Black and White. It returns the result only in a black and white form.HDP & IBP method are used in existing system with the bases of image HDP stand for Hierarchical Dirichlet processing. In Which VHR satellite image are divided into a Sub image. It transmits the spatial information from original image. IBP stand for Indian buffet process. It spatially defines the sparse binary metric with finite no of rows and column. It receives the object from VHR panchromatic satellite image.

V. OBJECTIVE

The main objectives of the study are listed below:
1. To implement Clustering Ensemble Strategy.
2. To implement Multiple Satellite Images.
3. To implement system which work with panchromatic and multispectral.

VI. PROPOSED SYSTEM

The proposed work is planned to be carried out in the following manner
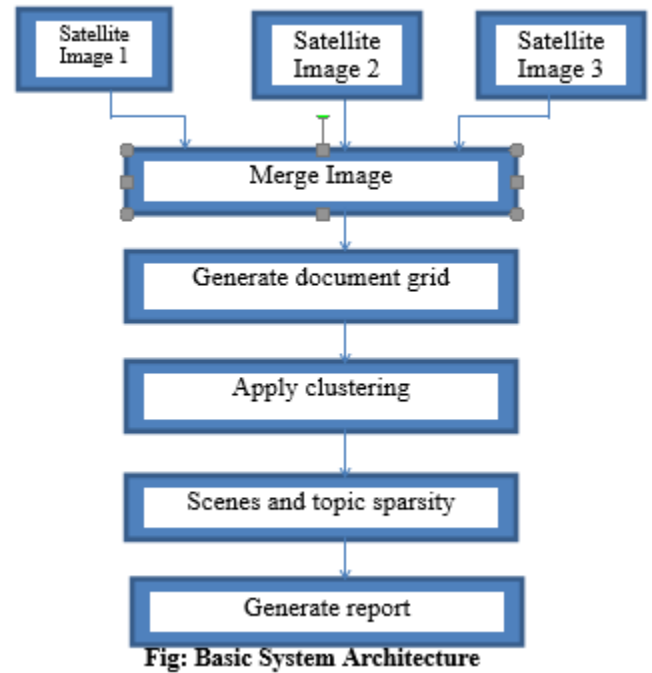

Fig: Basic System Architecture

Fig. shows the basic system architecture of proposed system, we have one or more images are uploaded, these images are panchromatic as well as multispectral then all images are merging by using multiple satellite images, with the help of multiple satellite images it captures the multiple number of images those images are sometimes blur or clear so it splits the images into clear images from data set. And then generate document grid, in document grid it store details about the merging images i.e. color, texture and pixels etc. After generation document grid we will apply clustering using k-mean clustering technique.

After applying clustering technique to decide the maximum color intensity images with the help of scenes and topic sparsity and then generate the report, in generate report we will store the images as well as calculation document.

Conclusion

In this paper it performs the operations of unsupervised classification in very high resolution panchromatic as well as multispectral satellite images by using the k-mean clustering algorithm, HDP and IBP on the multiple scenes. Unsupervised classification uses the clustering algorithm to group satellite image pixels into unlabeled cluster and this unsupervised satellite image classification is used support vector machine algorithm and later analyst assigns meaningful labels to the clusters and produces well classified satellite image.

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