ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

IMAGE SEGMENTATION BASED ON TINT USING DATA MINING TECHNIQUES

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ABSTRACT

Segment-based image analysis techniques are becoming increasingly crucial for creating and updating geographical information, mostly due to advancements in satellite imagery's spatial resolution. This paper provides a unique unsupervised K-means clustering approach for segmenting images based on colour data. We didn't utilize any training data in this. Two stages make up the overall project. Before the areas are classified into a set of five classes using the k-means clustering technique, the colour separation of the satellite picture is first improved using de-correlation stretching. By skipping feature calculation for each pixel in the picture, the computational cost of this two-step procedure can be decreased. Despite not being often utilised for picture segmentation, the colour contributes gives a high discriminative power of regions present in the image.

Keywords: *Resolution, Image Segmentation, Data Mining, Cluster, Color*

1 INTRODUCTION:

In remote sensing, the process of image segmentation is defined as: ―the search for homogenous regions in an image and later the classification of these regions‖. It also means the partitioning of an image into meaningful regions based on homogeneity or heterogeneity criteria. Image segmentation techniques can be differentiated into the following basic concepts: pixel oriented Contour-oriented, region-oriented, model- oriented, color oriented and hybrid. Color segmentation of image is a crucial operation in image analysis and in many computer vision, image interpretation, and Pattern recognition system, with applications in scientific and industrial field(s) such as medicine, Remote Sensing, Microscopy, content-based image and video retrieval, document analysis, industrial automation and quality control. The performance of color segmentation may significantly affect the quality of an image understanding system. The most common features used in image segmentation include texture, shape, grey level intensity, and color. The constitution of the right data space is a common problem in connection with segmentation or classification. [1]

In order to construct realistic classifiers, the features that are sufficiently representative of the physical process must be searched. In the literature, it is observed that different transforms are used to extract desired information from remote- sensing images or biomedical images**.** Segmentation evaluation techniques can be generally divided into two categories (supervised and unsupervised). The first category is not applicable to remote sensing because an optimum segmentation (ground truth segmentation) is difficult to obtain. Moreover, available [2]

Segmentation evaluation techniques have not been thoroughly tested for remotely sensed data. Therefore, for comparison purposes, it is possible to proceed with the classification process and then indirectly assess the segmentation process through the produced classification accuracies. For image segment based classification, the images that need to be classified are segmented into many homogeneous areas with similar spectrum information firstly, and the image segments 'features are extracted based on the specific requirements of ground features classification. The color homogeneity is based on the standard deviation of the spectral colors, while the shape homogeneity is based on the compactness and smoothness of shape. There are two principles in the iteration of parameters:1) In addition to necessary fineness, we should choose a scale value as large as possible to distinguish different regions; 2) we should use the color criterion where possible. Because the spectral information is the most important in imagery data, the quality of segmentation would be reduced in high weightiness of shape criterion.[3]

This work presents a novel image segmentation based on color features from the images. In this we did not used any training data and the work is divided into two stages. First enhancing color separation of satellite image using de-correlation stretching is carried out and then the regions are grouped into a set of five classes using K-means clustering algorithm. Using this two-step process, it is possible to reduce the computational cost avoiding feature calculation for every pixel in the image. Although the color is not frequently used for image segmentation, it gives a high discriminative power of regions present in the image. [4]

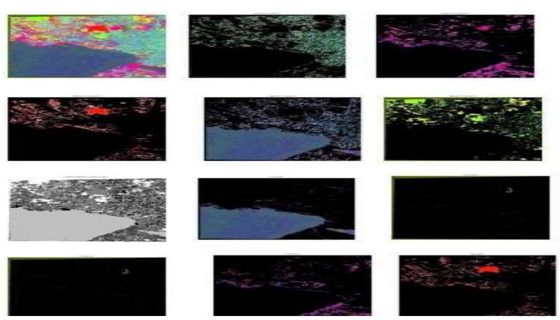

Fig 1.1: De-correlation Stretch image, 2.c.Object in Cluster one, 2.d. Object in Cluster two, 2.e.Object in Cluster three, 2.f. Object in Cluster four, 2.g. Object in Cluster five, 2.h. Clustered index image, 2.i. Nuclei of cluster one, 2.j. Nuclei of cluster two,2.k. Nuclei of cluster three, 2.l. Nuclei of cluster four,2.m. Nuclei of cluster five

2. LITERATURE SURVEY

Chi zhang, P. Wang in 2002, described the concept based on K-means algorithm in HSI space and has the advantage over those based on the RGB space. Both the hue and the intensity components are fully utilized.

In the process of hue clustering, the special cyclic property of the hue component is taken into consideration is present in A New Method of Color Image Segmentation Based on Intensity and Hue Clustering. The method of a color image segmentation system that performs color, clustering in a color space followed by color region segmentation in the image domain.[1]

The region segmentation algorithm merges clusters in the image domain based on color similarity and spatial adjacency is present in Color Image Segmentation in the Color and Spatial Domains. It was proposed by Tie Qi Chen', Yi L. Murphey', Robert Karlsen and Grant Gerhartd in 2002.Faguo Yang and Tianzi Jiang in 2003, described the concept of a novel pixon-based adaptive scale method for image segmentation. The key idea of our approach is that a pixon-based image model is combined with a Markov random field (MRF) model under a Bayesian framework is present in Pixon-Based Image Segmentation With Markov Random Fields.[2]

The method to split color information is the image to be segmented. Hence, this is a blind colour image segmentation method. It consists of four subsystems: pre-processing, cluster detection, cluster fusion and post-processing is present in A four-stage system for blind colour image segmentation. It was proposed by Ezequiel Lopez Rubio, José Muñoz- Pérez, José Antonio Gómez-Ruiz in 2003.[3]

Dmitriy Fradkin, Ilya Muchnik in 2004, described the concept to constructing hierarchical classifiers using cluster analysis and suggests new methods and improvements in each of these approaches. We also suggest a new method for constructing features that improve classification accuracy is present in A Study of K-Means Clustering for Improving Classification Accuracy of Multi-Class SVM. Cheolha Pedro Lee in 2005, described the concept based on the statistics of image intensity where the statistical information is represented as a mixture of probability density functions defined in a multi-dimensional image intensity space. Depending on the method to estimate the mixture density functions, three active contour models are proposed: unsupervised multi-dimensional histogram method, half-supervised multivariate Gaussian mixture density method, and supervised multivariate Gaussian mixture density method is present in Robust Image Segmentation using Active Contours.[4]

In 2007, Chris Vutsin as described the concept of Image Segmentation: K-Means and EM Algorithms. In this method, two algorithms for image segmentation are studied. K-means and an Expectation Maximization algorithm are each considered for their speed, complexity, and utility. Implementation of each algorithm is then discussed. Ahmed REKIK, Mourad Zribi, Ahmed Ben Hamida, Mohammed Benjelloun in 2007, described the concept of Image analysis, usually, refers to a process of images provided by a computer in order to find the objects within the image. It consists of subdividing an image into its constituent parts as well as extracting them, is present in the Review of satellite image segmentation for an optimal fusion system based on the edge and region approaches. In 2008, Milind M. Mushrifand Ajoy K. Ray introduced the method of a new color image segmentation algorithm using the concept of histon, based on Rough-set theory, is presented in Color image segmentation: Rough-set theoretic approach.[5]

The histon is an encrustation of histogram such that the elements in the histone are the set of all the pixels that can be classified as possibly belonging to the same segment. In rough-set theoretic sense, the histogram correlates with the lower approximation and the histon correlates with upper approximation. The concept of Fusion of multispectral image with a hyper spectral image generates a composite image which preserves the spatial quality from the high resolution(MS) data and the spectral characteristics from the hyper spectral data ,is presented in Performance analysis of high- resolution and hyper spectral data fusion for classification and linear feature extraction. It was proposed By Shashi Dobhal in 2008.[6]

Sheng-xian Tu, Su Zhang, Ya-zhu Chen, Chang-yan Xiao and Lei Zhang in 2008, a new hierarchical approach called bintree energy segmentation was presented for color image segmentation. The image features are extracted by adaptive clustering on multi-channel data at each level and used as the criteria to dynamically select the best chromatic channel, where the segmentation is carried out. In this approach, an extended direct energy computation method based on the Chan-Vese model was proposed to segment the selected channel, and the segmentation outputs are then fused with other channels into new images, from which a new channel with better features is selected for the second round segmentation. This procedure is repeated until the preset condition is met. Finally, a binary segmentation tree is formed, in which each leaf represents a class of objects with a distinctive color. A novel method of colour image segmentation based on fuzzy homogeneity and data fusion techniques is presented. The general idea of mass function estimation in the Dempsteri-Shafer evidence theory of the histogram is extended to the homogeneity domain[7]

The fuzzy homogeneity vector is used to determine the fuzzy region in each primitive colour, whereas, the evidence theory is employed to merge different data sources in order to increase the quality of the information and to obtain an optimal segmented image. Segmentation results from the proposed method are validated and the classification accuracy for the test data available is evaluated, and then a comparative study versus existing techniques is presented. It was described by Salim Ben Chaabane, MouniriSayadi, Farhat Fnaiech and Eric Brassart in 2009. Fahimeh Salimi, Mohammad T. Sadeghi in 2009, introduced a new histogram based lip segmentation technique is proposed considering local kernel histograms in different illumination invariant colour spaces. The histogram is computed in local areas using two Gaussian kernels; one in the colour space and the other in the spatial domain. Using the estimated histogram, the posterior probability associated to non-lip class is then computed for each pixel. This process is performed considering different colour spaces. A weighted averaging method is then used for fusing the posterior probability values. As the result a new score is obtained which is used for labeling the pixels as lip or non-lip. The advantage of the proposed method is that the segmentation process is totally unsupervised.[8]

In 2009, Damir Krstinic, Darko Stipanicev, Toni Jakovcevic described a pixel level analysis and segmentation of smoke colored pixels for the automated forest fire detection. Variations in the smoke color tones, environmental illumination, atmospheric conditions and low quality of the images of wide outdoor area make smoke detection a complex task. In order to find an efficient combination of a color space and pixel level smoke segmentation algorithm, several color space transformations are evaluated by measuring severability between smoke and non-smoke classes of pixels. [9]

The concept of a new color thresholding method for detecting and tracking multiple faces in video sequence. The proposed method calculates the color centroids of image in RGB color space and segments the cancroids region to get ideal binary image at first. Then analyze the facial features structure character of wait-face region to fix face

Journal of Theoretical and Applied Information Technology
31st May 2023. Vol.101. No 10

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

region. The novel contribution of this paper is creating the color triangle from RGB color space and analyzing the character of centroids region for color segmenting. It was proposed by Jun Zhang, Qieshi Zhang, and Jinglu Hu in 2009

3. PROPOSED METHOD

Primarily due to the progresses in spatial resolution of satellite imagery, the methods of segment-based image analysis for generating and updating geographical information are becoming more and more important. This work presents a novel image segmentation based on color features with K-means clustering unsupervised algorithm. In this we did not used any training data. The entire work is divided into two stages. First enhancement of color separation of satellite image using de-correlation stretching is carried out and then the regions are grouped into a set of five classes using K-means clustering algorithm. Using this two-step process, it is possible to reduce the computational cost avoiding feature calculation for every pixel in the image. Although the colour is not frequently used for image segmentation, it gives a high discriminative power of regions present in the image.

The basic aim is to segment colors in an automated fashion using the L*a*b* color space and K-means clustering. The entire process can be summarized in following steps:

Step1: Read the image

Read the image from mother source which is in .JPEG format, which is a fused image of part of Bhopal city of Madhya Pradesh, India with DWT fusion algorithm of Cartosat-1 and LISS-IV of Indian satellite IRS-P6 and IRS-1D.

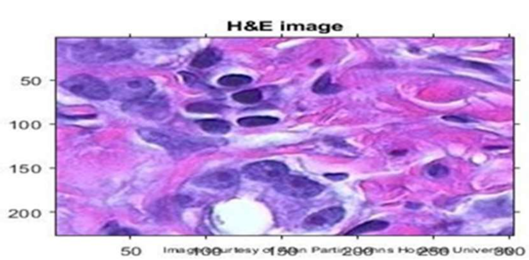

Fig 1.2: H&E Image

Step2: For color separation of an image apply the De-correlation stretching

Step3: Convert Image from RGB Color Space to L*a*b* Color Space.

- How many colors do we see in the image if we ignore variations in brightness? There are three colors: white, blue, and pink. We can easily visually distinguish these colors from one another. The L*a*b* color space (also known as CIELAB or CIEL*a*b*) enables us to quantify these visual differences. The L*a*b* color space is derived from the CIE XYZ tri-stimulus values. The L*a*b* space consists of a luminosity layer 'L*', chromaticity-layer 'a*' indicating where color falls along the red-green axis, and chromaticity-layer 'b*' indicating where the color falls along the blue-yellow axis. All of the color information is in the 'a*' and 'b*' layers. We can measure the difference between two colors using the Euclidean distance metric. Convert the image to L*a*b* color space.

Step4: Classify the Colors in 'a*b*' Space Using K-Means Clustering

Clustering is a way to separate groups of objects. K-means clustering treats each object as having a location in space. It finds partitions such that objects within each cluster are as close to each other as possible, and as far from objects in other clusters as possible. Since the color information exists in the 'a*b*' space, your objects are pixels with 'a*' and 'b*' values. Use K-means to cluster the objects into three clusters using the Euclidean distance metric

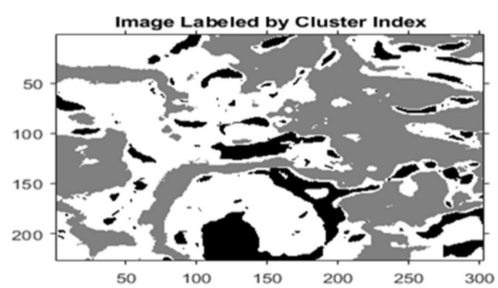

Fig 1.3: Labeled Image

Step5: Label Every Pixel in the Image Using the Results from K- MEANS.

For every object in our input, K-means returns an index corresponding to a cluster. Label every pixel in the image with its cluster index.

Step6: Create Images that Segment the Image by Color.

Using pixel labels, we have to separate

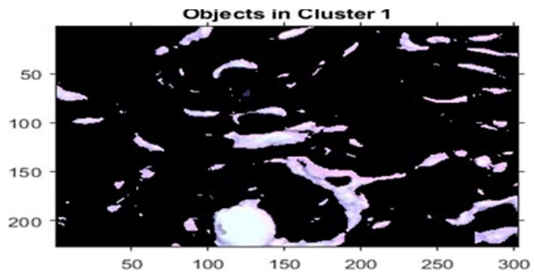

Figure 1.4 Image Clusters 2

Objects in image by color, which will result in five images

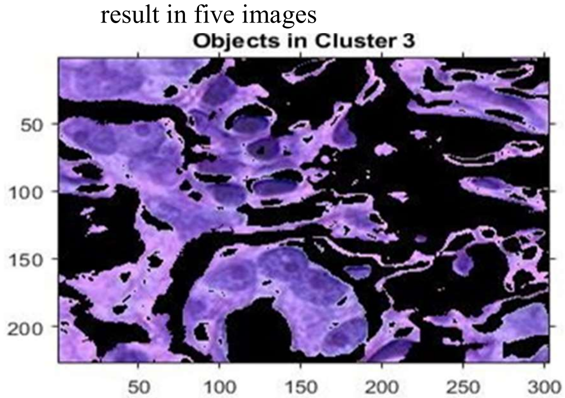

Fig 1.5: Image Cluster 3

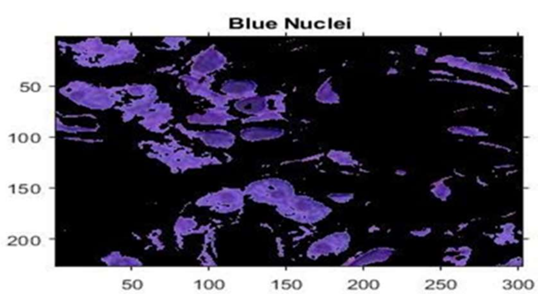

Fig 1.6: Blue Nuclei

Step7: Segment the Nuclei a Separate Image
Then programmatically determine the index of the cluster containing the blue objects because K means will not return the same cluster-idx value every time. We can do this using the cluster center value, which contains the mean 'a*' and 'b*' value for each cluster.

4. EXPERIMENTAL RESULTS

The various experiment carried out on the above said imagery in MATLAB v7.5. The complete process and the standard results are summarized in subsequent diagrams

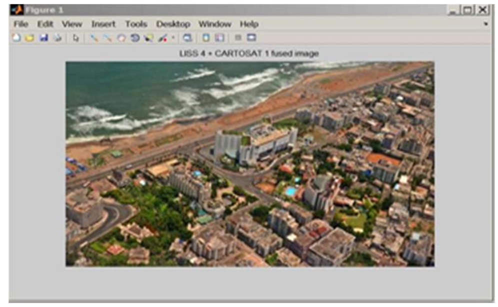

Fig A: Areal Image Of Vizag

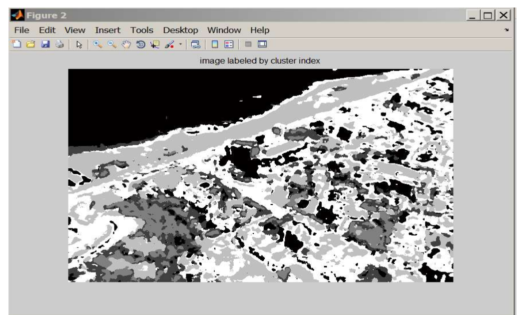

Fig B: De-Correlation Stretch Image

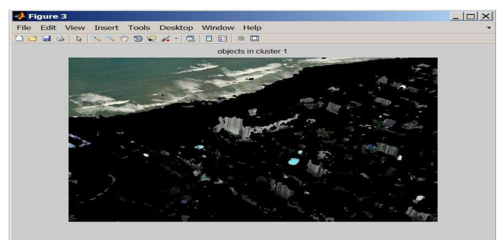

Fig C: Object In Cluster One

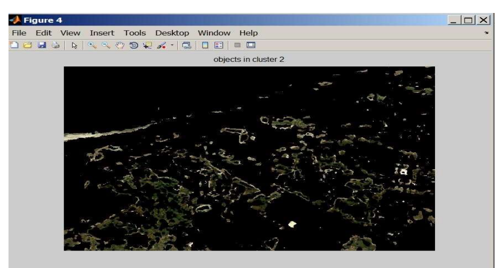

Fig D: Object In Cluster Two

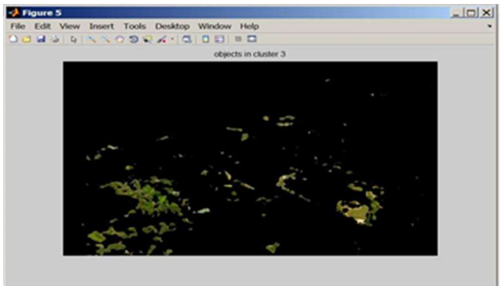

Fig E: Object In Cluster Three

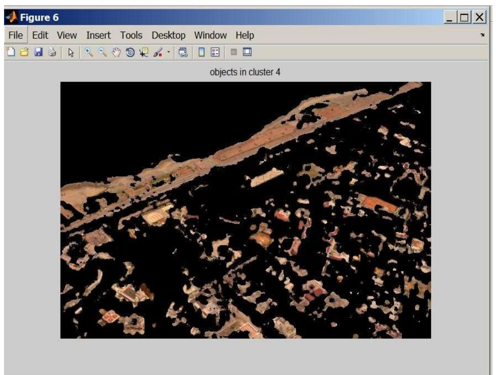

Fig E: Object In Cluster Four

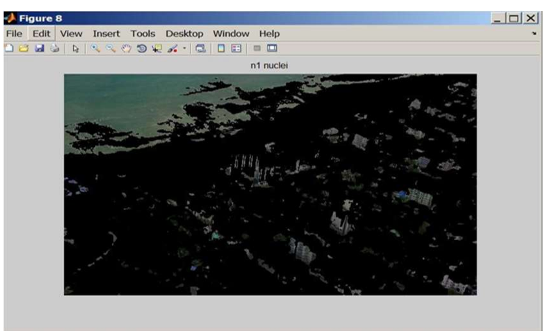

Fig F: Clustered Index Image

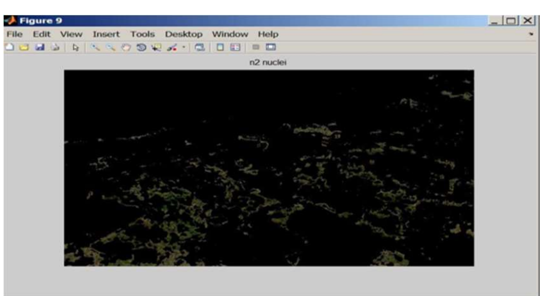

Fig G: Nuclei Of Cluster One

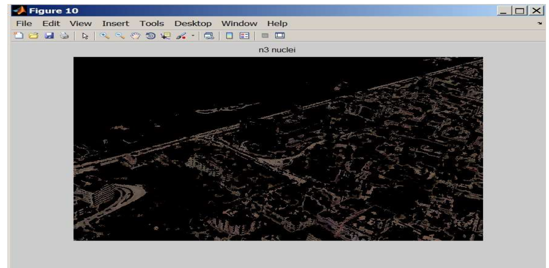

Fig H: Nuclei Of Cluster Two

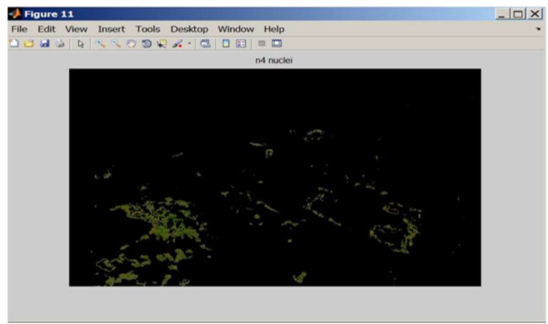

Fig I: Nuclei Of Cluster Three

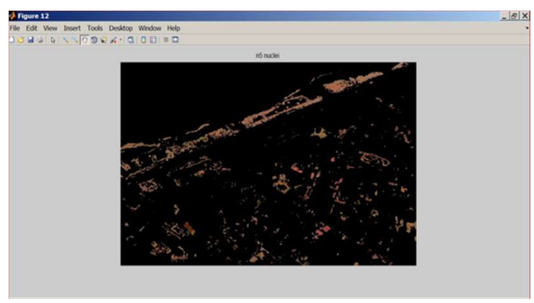

Fig J: Nuclei Of Cluster Three

5. CONCLUSION:

Using color based image segmentation; it is possible to reduce the computational cost avoiding feature calculation for every pixel in the image. Although the color is not frequently used for image segmentation, it gives a high discriminative power of regions present in the image. This kind of image segmentation may be used for mapping the changes in land use land cover taken over temporal period in general but not in particular. The entire work is divided into two stages. First enhancement of color separation of satellite image using de-correlation stretching is carried out and then the regions are grouped into a set of five classes using k-means clustering algorithm. Using this two-step process, it is possible to reduce the computational cost

ISSN: 1992-8645 www.jatit.org E-ISSN: 1817-3195

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