An Improved Way of Segmentation and Classification of Remote Sensing Images using Kernel Induced Possiblistic C-Means Clustering Algorithm with Statistical Measures

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***Abstract*—** The Ultimate significance of Images lies in processing the digital image which stems from two principal application areas: Advances of pictorial information for human interpretation; and dispensation of image data for storage, communication, and illustration for self-sufficient machine perception. The objective of this research work is to define the meaning and possibility of image segmentation based on remote sensing images which are successively classified with statistical measures. In this paper kernel induced Possiblistic C-means clustering algorithm has been implemented for classifying remote sensing image data with image features. As a final point of the proposed work is to point out that this algorithm works well for segmenting and classifying the image with better accuracy with statistical metrices.

Key words: Image Processing, Image analysis, Statistical Measures, Image Features

I. INTRODUCTION

An image can be defined as a two dimensional function in spatial co-ordinates then its intensity or grey level of the image at that point will be the amplitude f of the image at that any pair of coordinates (x, y).when the coordinates pairs x, y values and amplitude f values are finite, discrete quantities then the image is known as digital image. Digital images are being processed using the digital computers this field of processing is called Digital Image processing. Digital image is the collection of finite digits of elements, where each element has a position and value. These elements are called as pixels [5]. When the similar attributes in the image are segmented into regions the process is known as Segmentation. The extraction of important features from image data for better interpretation and description of the data is the reason of applying image processing in various fields. Processing of remote sensing images is an important task for the researchers but a time consuming mission to be performed. The organization of this paper is part II deals with the remote sensing image segmentation analysis. Part III discusses about the related work. Part IV illustrates the methodology while part V focuses on the result and discussion and part VI deals with conclusion of the paper.

II. RELATED WORK

A new algorithm is presented by Anjan Goswami, Ruoming Jin, Gagan Agrawal where a few passes are only required for the entire dataset to produce the same K-means algorithm cluster centres. Initial clustering centres are based on the sampling and to adjust cluster centres it takes one or more passes for the whole dataset. Provides Theoretical analyses of the clusters being computed are similar to the original K-means algorithm. The results of real and synthetic datasets are compared to K-means.

Herschel Boosting-Clustering algorithm is being used to boost up the K-means algorithm for using it in the remote sensing classification for acquiring better results. There are two main objectives of this method 1) Choosing a set of effectual features that is easily discriminated in feature space. 2) Enhancing the performance of classifier for classification. There are certain problems in the multi clustering solution. An index is allotted to each category to define the each iteration partitions and with the previous iterations this indexing must be consistent. While running the clustering based on the RGB value a rough training set is being employed.

Leonardo Sant'anna Bins,Leila M. Garcia Fonseca, Guaraci José Erthal, Fernando Mitsuo Ii Presented region growing based segmentation which was implemented in Geographic Information and Image Processing (SPRING) which was developed by INPE. This approach is mainly used in the assessment of land use changes in Amazon region by segmenting the images. Landsat_TM images are used in illustrating this technique.

Preetha, M.M.S.J., Suresh, L.P., Bosco, M.J Image segmentation takes place when salient image regions are clustered based on the pixels in which the regions corresponds to the individual surfaces, natural parts of objects or objects. In Image analysis and computer vision applications segmentation process plays a very important role. Various algorithms and techniques are developed in image segmentation. Still Segmentation algorithm has not satisfied the global application because when the region of interest is segmented from the input image the segmentation process is being stopped. So segmentation process still is a challenging area for the researchers. This paper presents a comparison of reviews based on colour image segmentation is based on the region growing and merging algorithm. Finally for segmenting of the colour images an automatic seeded egion growing algorithm is being proposed.

III. FEATURE EXTRACTION

An object is uniquely identified by the features where this identification is used in vision application to differentiate one object and another object. The identification and comparison process becomes ease by using the feature. Colour, Shape and texture are the three basic features of segmentation measurements [6]. This paper compares two algorithms with the colour features. One of the most visually used features is the colour feature. Colours are described in a particular colour space [11]. Colour space is nearer to the

observation and is used in RBIR which includes RGB, LUV, LAB, and HSV (HSL). Based on the segmentation results the colour features are selected. The quality of visual diffusion is enabled when the colour space is converted from RGB colour to L*a*b [12]. Using the CIEXYZ tri stimulus the L*a*b is derived. L*a*b denotes L for luminance, a for colours in red-green axis and b for colours in blue-yellow axis. The difference between the colours is measured using the Euclidean distance.

IV. METHODOLOGY

The Methodology diagram of the proposed work is shown in the figure1.

Input image (Landsat image, Quick Bird, Aster, Modis) dataset is taken. Input image is Pre processed with Image pre processing techniques which is a necessary one to get better accuracy. After Pre processing techniques the image has been inducted for Feature Extraction where the features are segmented using this method. Main objective of this research work is to classify the image based on basic features and Modified Fuzzy Possiblistic C-means clustering (KIPCM) is presented in this part.

Figure 1. Shows the present system in image classification. This algorithm works well for the input image and it performs well for Classification also.

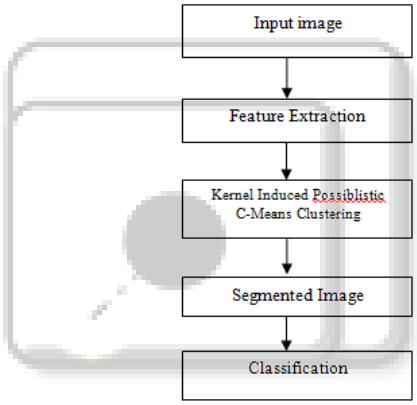

Fig.1: System Architecture

The proposed System architecture as in fig 1. Performs the above function in the way to extract the feature so as to classify the image through effective segmentation using Kernel Induced Possiblistic C-Means Algorithm.

V. KERNEL INDUCED POSSIBLISTIC C-MEANS CLUSTERING ALGORITHM (KIPCM)

To convert the patterns to higher feature space the kernel function is being used. This transforming allows the partitioning of the distributed groupings more efficiently. The transforming function specified need not be explicit when the clustering is done based on the kernel. When the dot product of two values is acquired by transforming function into input space is known as the Kernel Function [1]. The algorithm is described below

Algorithm:

STEP: 1 Initialization of memberships

Initialize fuzzier m, stopping criterion £, k=0;

Set initial uij (0) with memberships resulting from KIPCM

Set initial σ^2 resulting from KIPCM;

STEP: 2 Minimization of objective function

REPEAT k← k+1

Compute d2 (xi, vj) using the equation

$$k(xk, xk) - 2\frac{\sum_{j=1}^{N} u_{ij}^{m}}{\sum_{j=1}^{n} u_{ij}^{m}} + \frac{\sum_{j=1}^{n}\sum_{i=1}^{n} u_{ij}^{m}}{\sum_{j=1}^{n} u_{n}^{m}}$$

Compute n_{ij} and u_{ij} (k)

UNTIL

$$\left\| u_{ij(k)-} u_{ij(k)-} \right\| <€$$

VI. RESULTS AND DISCUSSION

Remote sensing image dataset has been used in this paper to compute the basic image features by using various techniques. The input image is given below

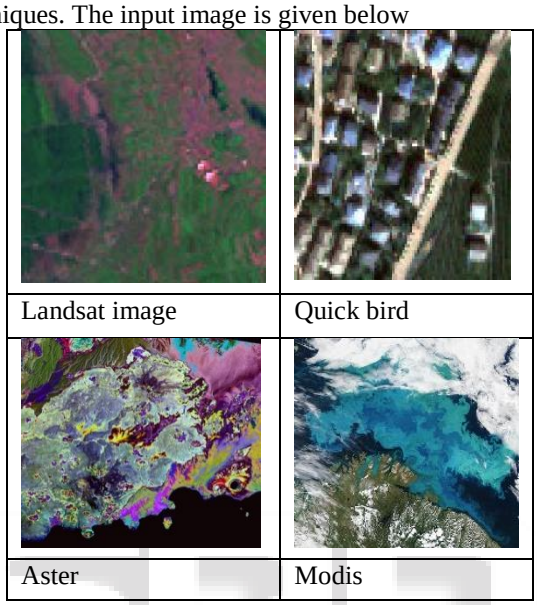

Fig.2: Remote Sensing Image Data Set

For this dataset green colour represents the vegetation, dry land is represented by dark area, slightly darker green represents the grass land and paddy field is represented by deep darker colour. The degree of class mixture is high in the vegetation area.

Exposed land is represented by brown colour. Slightly brown colour represents the dry salt flats which is a blocked by forest land and dry land which highly mixed. This denotes the difficulty level of land cover clustering. These images represent the image classification results after using the proposed algorithm.

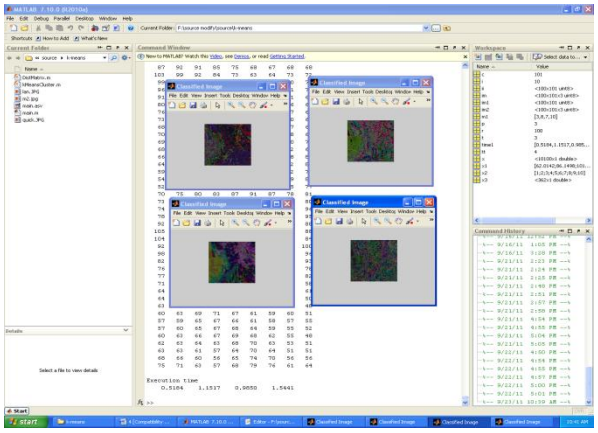

Fig.3: Result of KIPCM Using Landsat Dataset

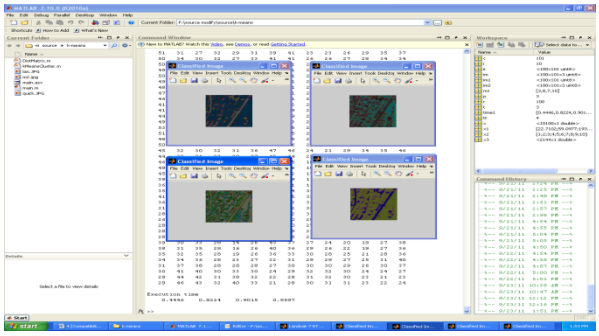

Fig. 4: Result of KIPCM using Quick Bird Dataset

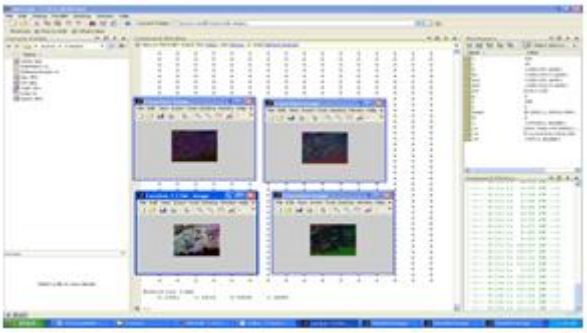

Fig. 5: Results of KIPCM Using MODIS Dataset

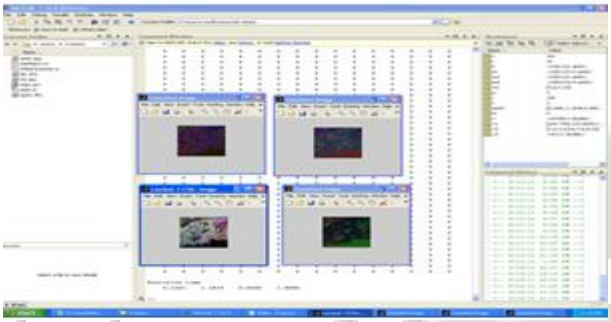

Fig. 6: Results in KIPCM using Aster Dataset

S.NO	IMAGE NAME	TIME	ACCURACY (%)
1.	ASTER	0.55	83
2.	LANDSAT DATASET	0.45	86
3.	MODIS	0.54	78
4.	QUICK BIRD	0.38	79

Table 1: Performance analysis of KIPCM Algorithm

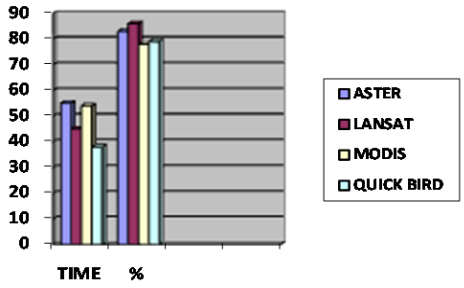

Fig.7: Graph Analysis for KIPCM

VII. CONCLUSION

Image Classification and Segmentation is an important arena in the field of Image Processing where numerous information is hidden in Images. In this research work Kernel Induced Possiblistic C-Means (KIPCM) clustering algorithm is used to Segment and Classify the Remote Sensing Images. Various remote sensing images have been taken as input so as to perform segmentation and Classification. Two parameters time and accuracy is measured for the remote sensing image datasets. These experimental results are carried out with different remote sensing images, with Kernel Induced Possiblistic C-Means (KIPCM) clustering algorithm which produces better results in terms of time and accuracy. As a future work the Plan is to improve the accuracy by combining clustering algorithms with optimization techniques.

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