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Object Based Segmentation of Satellite Images for LC Type Monitoring using CA

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Clustering is one of the important statistical data mining techniques for discovering patterns. Large quantity of data is available from remote sensed images, but extracting the object and its features from satellite image is a difficult task. In this paper an efficient and robust object oriented segmentation technique using K-means, K-medoid and Fuzzy C-means clustering is proposed. Exact shape, texture and boundary of the object are extracted using the above techniques. Simulation results show that this technique gives better results than the earlier methods.

Keywords : Object Oriented Segmentation, Clustering, Remote Sensing, Spatial Data

1. INTRODUCTION

Segmentation is a process which extracts the outline of the objects by defining homogenous regions. Segmentation of a satellite image into different regions is a difficult problem; extracting objects from satellite image is even more difficult. Multi spectral segmentation is one of the important methods of extracting information. In classical image segmentation approach, the unit is a single pixel. In object-oriented analysis, the basic processing units are image objects. Object oriented approach takes the form, spectral and spatial information into account.

Clustering is a method for dividing scattered groups of data into several groups. It is commonly viewed as an instance of unsupervised learning. The grouping of the patterns is accomplished through clustering by defining and quantifying similarities between the individual data points or patterns. The patterns that are similiar to the highest extent are assigned to the same cluster. Clustering is a useful approach in image segmentation. K-means is one of the simplest and popular unsupervised learning algorithms that solve the well known clustering problem. This is a partition based approach and works well if the input set is normally distributed. K-means only works well with spherical clusters and splits clusters. This algorithm looks for a fixed number of clusters which are defined in terms of proximity of data points to each other. It is guaranteed to converge and achieve local optimal, not necessarily global optimal. K-means algorithm relies on finding cluster centers by trying to minimize a cost function of dissimilarity measure.

FCM clustering is a widely used algorithm of fuzzy classification. In this algorithm, each pixel does not belong exclusively to any one cluster but is represented by several memberships of each cluster instead. With FCM Clustering, the number of the sets obtained can be set and each fuzzy set contains the data which has different degree of membership. Fuzzy logic is an expanded form of conventional Boolean Logic and has property of Partial Truth which can be useful for the presence of uncertainty. By Partial Truth approach, instead of binary truth evaluation, there is a range of truth degrees between totally false and totally true. This approach is set by Dr. Lofti Zadeh in 1965. With FCM Clustering, the

Figure 23. Object 3

Table 7
K-Medoid Clustering Performance Result

No	Mean	SD	Var.	Area	obj
1	72.38	15.27	233.37	1279613	379
2	97.61	15.58	242.94	1258922	304
3	54.11	17.16	294.70	13281	42

Table 8
Fuzzy C-Means Clustering Performance Result

No	Mean	SD	Var.	Area	obj
1	103.33	13.50	182.37	1114136	156
2	37.36	14.24	2.02	2749.4	3
3	70.38	9.67	93.67	1434931	142

Table 9
Extracted Object's Statistical Values

Object	Mean	SD	Variance	Area
1	123.39	18.69	349.46	1235400
2	121.97	20.78	431.87	71997
3	125.18	20.20	408.05	23137

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