The Iterative Self-Organizing Data Analysis Technique (ISODATA) method is a modification of the k-means clustering algorithm (overcomes the disadvantages of k-means), and is very effective for unsupervised classification of multi-spectral images.

In each iteration, I recalculate means and reclassifies pixels with respect to the new means. Iterative cluster splitting and merging are done based on input threshold parameters. Clusters are merged if either the number of members (pixels) in a cluster is less than a certain threshold or if the centers of two clusters are closer than a certain threshold. Clusters are split into two different clusters if the cluster standard deviation exceeds a predefined value and the number of members (pixels) is twice the threshold for the minimum number of members.

The iteration continues until the number of pixels in each class changes by less than the selected pixel change threshold or the maximum number of iterations is reached. Many of the steps used in the algorithm are based on the experience obtained through experimentation.

Parameter Description

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| --- | --- | --- | --- |
| Data Type | Parameters | Default Value | Description |
| vector<BYTE \*> | m\_data |  | Input data |
| int | \*m\_ClassLabel |  | The label of cluster after classification |
| int | m\_n |  | The dimension of data(number of bands) |
| long | m\_N |  | The number of members(pixels) in a cluster |
| int | m\_cN | 100 | The minimum number of members(pixels) to form a cluster |
| double | m\_cS | 10 | The threshold of standard deviation of a cluster |
| double | m\_cC | 100 | The threshold of distance between cluster centers |
| int | m\_L | 2 | The maximum pairs of clusters that are allowed to be merged in each iteration |
| long | m\_I | 20 | The maximum number of iterations |
| double | m\_M |  | The coefficient for splitting |
| int | m\_K | 5 | The required number of clusters |
| vector<vector<double>> | m\_z |  | Cluster Center vector |
| vector<double> | m\_de |  | The vector of the average distance between all members(pixels) in a cluster and the cluster center |
| double | m\_dm |  | The average distance between all members(pixels) in a cluster and the cluster center |
| vector<vector<double>> | m\_s |  | The standard deviation vector of each cluster center |
| vector<long> | m\_Ne |  | The number of members(pixels) in each cluster |
| int | m\_initC | 1 | The initial number of clusters |