

An Adaptive Fuzzy C- Means Algorithm for the Color Feature Extraction in Remote Sensing Images

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Abstract

Pictures are the source of information emission. As human beings many information can be interpreted by our brain for the effective extraction of constructive data. For efficient information various features are being analyzed. In image processing feature extraction is an important technique.. There are three main visual features namely color, texture and shape. Color histogram is the most common method used to extract the color features. In order to extract theses features various techniques are used in image processing. Image clustering is a technique that identifies the data distribution and patterns in the image. The main goal of clustering technique is to identify both the dense and the space regions in the image. Color features are subjected to precise color space namely RGB, LUV, HSV and HMMD. Color features are easily extracted from the remote sensing images as the color space is specified. Here in this work we have used the Adaptive Fuzzy C- means algorithm in the clustering technique for the effective feature extraction.

Keywords

Adaptive Fuzzy C-means, RGB, Color histogram, Image Processing, remote Sensing

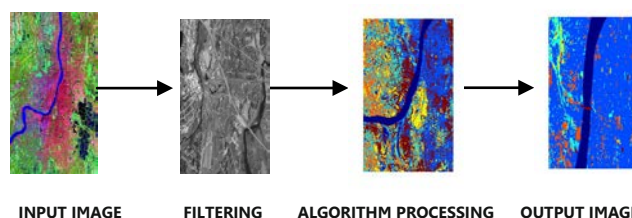
1. Introduction

Images are the exact copy of the genuine instance. The way to acquire information is to process the image by means of Image Processing and image analysis for getting more related data. It takes input as an image and processes the image as a result produced output is also an image. Therefore growth of an effective automatic technique for image sets association and organization is obligatory so that one can search, retrieval and sort the images more expedient. Feature extraction is the basis of these automatic techniques. Color, texture and shape are the most common visually features. These features are independent of unambiguous domain and can used in method of retrieval images.

The color feature is the most widely used for visual features in image. The most significant advantages of color feature extraction are having high power of demonstrating visual content of images. Extracting color information of images are high competence, relatively power in separating images from each other, relatively robust to background complication and independent of image size and orientation.

2. System Model

Methodology is the main process where it plays an important role in finding the process of proposed work.



3. Previous Work

Many researchers have done their research based on this proposed work. Many classification algorithms have been used to successfully classify the color in the images.

Various Clustering algorithms have also been utilized to group similar characteristics in the image. Fuzzy C- Means clustering algorithm, K-Means and numerous algorithms are used to classify the color in the images.

4. Proposed Methodology

ADAPTIVE FUZZY C-MEANS CLUSTERING ALGORITHM

The adaptive fuzzy C-Means (AFCM) clustering algorithm is to improve the fuzzy C-Means which needs a priori information about the number of classes. This clustering algorithm combines the capability of fuzzy mathematics and adaptation. Unlike most of the fuzzy clustering algorithms require a priori knowledge about the number of classes in the dataset, and can learn the number of classes dynamically. This adaptive capability is achieved by using the mechanism of splitting and merging for forming the clusters. It determines the splitting by averaging the cluster memberships that weigh the cohesion degree; and decides the merging by the number of samples in both clusters that weigh independency degree. This clustering algorithm arbitrarily chooses initial cluster centers. Therefore, the AFCM provides a statistical method based on the sample space density to initialize the number of clusters and cluster centers, so that the adaptive capability of the algorithm can be enhanced. The steps are given below

GAUSSIAN FILTER

Gaussian filter is windowed filter of linear class; by its nature is calculating weighted mean. It has property of have no overshoot to a step function input while minimizing the rise and fall time. This performance is intimately connected to the fact that the Gaussian filter has the minimum possible group delay. This filter is used because Smooth (infinitely differentiable), Decay to zero rapidly, Simple analytic formula, Separable: multidimensional Gaussian = product of Gaussians in each dimension.

Algorithmic steps for Adaptive Fuzzy C-Means clustering

Step 1: Provide initial values for centroids, v_k , $k = 1, 2, \dots, C$ and set u_k equal to one for all (i, j) .

Step 2: Compute membership as follows,

$$u_k(i, j) = \frac{\|y(i, j) - m(i, j)v_k\|^{-2}}{\sum_{i=1}^C \|y(i, j) - m(i, j)v_k\|^{-2}}$$

For all (i, j) and $K = 1 \dots C$

Step 3: compute new centroids as follows

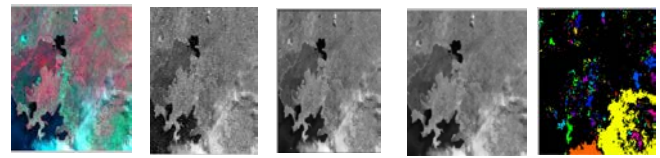
$$v_k = \frac{\sum_{i,j} u_k(i, j)^2 m(i, j) y(i, j)}{\sum_{i,j} u_k(i, j)^2 m(i, j)^2}$$

For all $K = 1 \dots C$

Step 4: If the algorithm is converged then quit, otherwise go to step 2;

5. Experimental Results

In the experimental results remote sensing image is taken as input where the image is made to go for preprocessing techniques. The noise is removed using the Gaussian filter where it reduces the maximum number of noise in the image. Basically Gaussian filter plays a vital role in successful implementation of noise removal. Finally the adaptive fuzzy C-Means (AFCM) clustering algorithm is introduced so as to extract the colors in the Image. This color feature extraction is done by using the Adaptive Fuzzy C-means algorithm.



(I) Input Image (II) Noise Removal (III) Filtering (IV) AFCM
(V) Output Image

Towards the end of using the above said algorithm color feature is extracted and the result shows that the proposed algorithm gives better result when compared with other algorithms.

6. Conclusion

Remote sensing images like Multispectral and Hyper spectral are the two remote sensing images are taken as input image. Filtering techniques are like median, Gaussian is applied for Multispectral image. Color feature has been extracted and various parameter metrics has been calculated for Multispectral image. Initial step is pedestal on the pre-processing method which is based on noise removal with Gaussian filter. Third step k-means is used to acquire color extraction. The color extraction is performed passably by using Adaptive Fuzzy C-Means means algorithm which shows an effectual color extraction method.

7. Future Scopes

In future this color feature extraction is tested with well defined Fuzzy logic operations. The results will be tested with various statistical measures to prove the accuracy if the proposed algorithm.

8. References

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