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Analysis of Brain Tumor Images Using K-Mean Clustering Algorithm

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Abstract: - This paper deals with the implementation of K-mean clustering Algorithm. K-Means clustering is an unsupervised clustering technique that has been extensively used in image segmentation.Tumor is an uncontrolled development of tissues in any part of the body.Segmentation is the task of recognize objects in an image. There is not a single image segmentation algorithm which be able to give the best result for every image. According to the type of image a proper approach is to be select to achieve accurate segmentation.

Keywords: *k-Means clustering, MRI images, segmentation*

1. INTRODUCTION

Image segmentation is a challenging and important issue in image processing related applications.Most computer vision and image analysis problems require a segmentation stage in order to detect objects or divide the image into regions which Can be considered homogeneous. Image segmentation techniques are categorized into three classes: edge detection, Clustering and region growing .several popular clustering algorithms like k-means are often used in image segmentation.Clustering algorithms have been applied as a digital image segmentation technique in various fields and applications.

2. IMAGE SEGMENTATION BY CLUSTERING

The goal of a clustering analysis is to divide a given set of data or objects interested in a cluster, which represents subsets or a group. The objective of most clustering methods is to provide useful information by grouping unlabelled. Data in clusters; within each cluster the data exhibits similarity. Similarity is defined by aglobal objective functional and distance measure, or regional graph-theoretic criteria are optimized to find the optimal partitions of data.

Clustering is a classification technique. Given a vector of N measurements relating each pixel or group of pixels (i.e.,region) in an image, a similarity of the measurement vectors and so their clustering in the N-dimensional measurement space implies similarity of the corresponding pixels or pixel groups. For that reason, clustering in measurement space may be an indicator of similarity of image regions, and may be designed for segmentation purposes.

3. CLUSTERING TECHNIQUES

Different clustering methods include hierarchical clustering which builds a hierarchy of clusters from being elements. Because of its straightforwardness and efficiency. Natural images is one of the first techniques used for the segmentation of clustering approaches [4].In partition clustering; the goal is to create one set of clusters that partitions the data in to similar groups. Distance based is another methods for clustering according to which if two or more objects belonging to the same cluster are close according to a given distance, then it called distance is based clustering. In our work we have used K-means clustering approach for performing image segmentation using Matlab software. [1]

3.1 K-MEANS SEGMENTATION

A. K-Means Clustering Detail

K-means clustering is an iterative procedure. The K-means clustering algorithm clusters data by iteratively computing a mean intensity for each class and segmenting the image by classifying each pixel in the class with the closest mean [5].Cluster is a collection of objects which are similar between them and are dissimilar to the objects belonging to other clusters.

K-means clustering is an algorithm to group objects based on attributes/features into k number of groups where k is apositive integer. The grouping (clustering) is done by minimizing the Euclidean distance between the data and the corresponding cluster centroid. Thus the function of k-means clustering is to cluster the data.

K-Means is the one of the unsupervised learning algorithm for clusters. Clustering the image is group the pixels according to the some characteristics. In the k-means algorithm at first we have to define the number of clusters k. Then are chosen randomlyk-cluster center [7]. The distance between the every pixel to every cluster centers are calculated. The distance may be straightforward Euclidean function. All cluster centersis compare to Single pixel using the distance formula. Shortest distance among allthus pixel is

moved to particular cluster. After re-estimatedthe centroid. Again comparedeach pixel to all centroids. The procedure continuous until the center converges.

Step 3:-. Calculate mean or center of the cluster.
Step 4:- Calculate the distance b/w each pixel to each cluster centre.
Step 5:- If the distance is near to the center then move to that cluster.
Step 6:- Otherwise move to next cluster.
Step 7:- Re-estimate the center.
Step 8:- Repeat the process until the center doesn't move.

B. K–Means Algorithm Flowchart

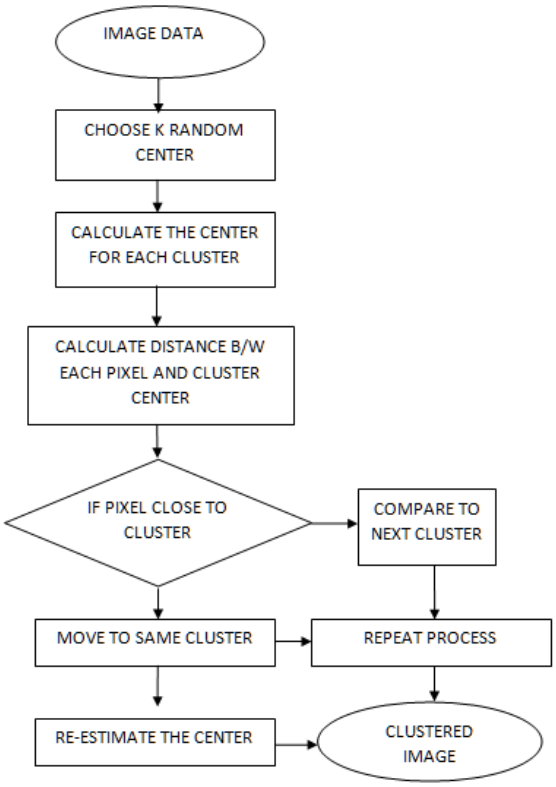

Figure 3: Flow chart for k-Means Algorithm

C. Mathematical Representation:

For a given image, compute the cluster means m

$$M = \frac{\sum_{i:c(I)=k} x_i}{N_k} \quad \text{.....(1)}$$

The distance between the cluster Centre to each PixelCalculate.

$$D(i) = \sum_{j=1}^{k} \sum_{i=1}^{n} \|X_i - c_j\|^2$$

i= 1..... ..... (2)

D. Algorithm:

Step 1:- . Give the no of cluster value as k.
Step 2:- . Randomly choose the k cluster centers

4. SIMULATION RESULTS

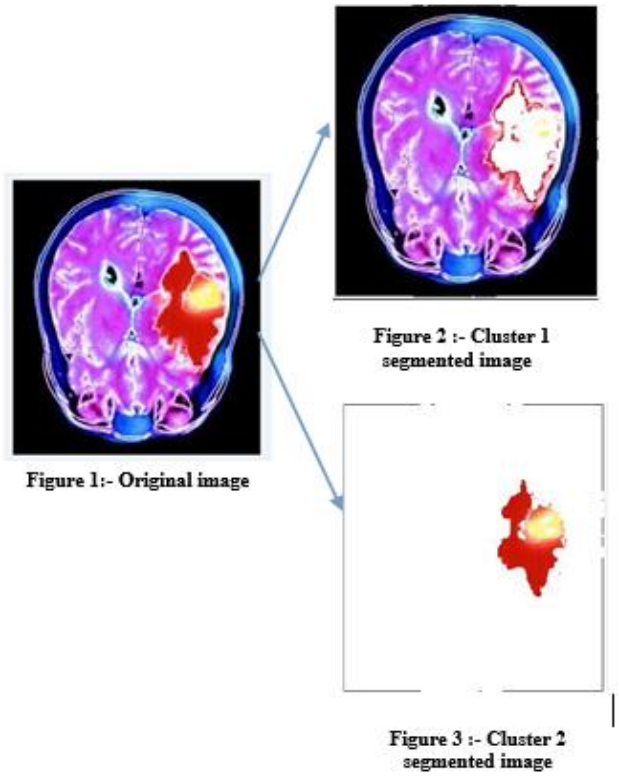

Figure 1:- Original image

Figure 2 :- Cluster 1 segmented image

Figure 3 :- Cluster 2 segmented image

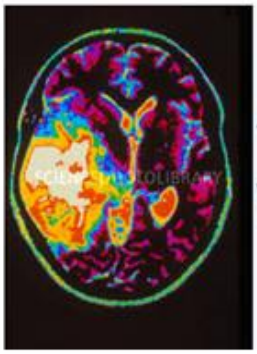

Figure 4:- Original Image

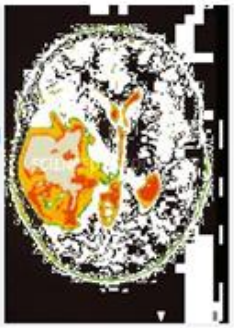

Figure 5 :- Cluster 1 segmented image

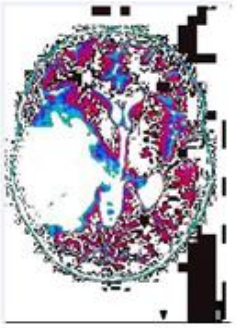

Figure 6 :- Cluster 2 segmented image

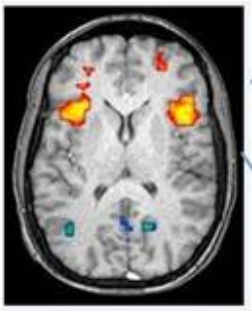

Figure 10:- Original Image

Figure 11 :- Cluster 1 segmented image

Figure 12 :- Cluster 2 segmented image

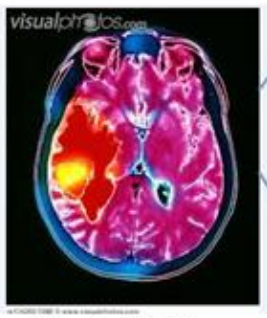

Figure 7:- Original Image

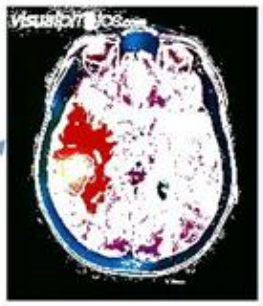

Figure 8 :- Cluster 1 segmented image

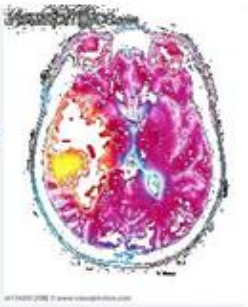

Figure 9 :- Cluster 2 segmented image

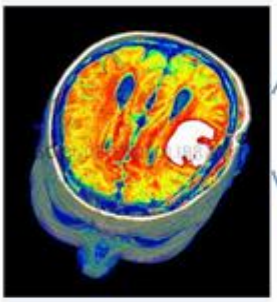

Figure 13:- Original Image

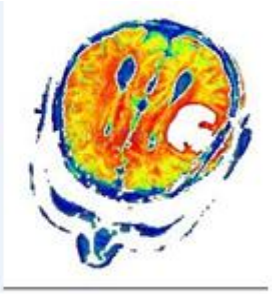

Figure 14 :- Cluster 1 segmented image

Figure 15 :- Cluster 2 segmented image

5. CONCLUSION

The result aim at developing an accurate and more reliable image which can be used in locating tumors, measure tissue volume, finger print recognition ,face recognition and in locating an object clearly from a satellite image and in more. There are different types of tumors are available.They may be malignant over the brain ormass in brain .Suppose if it is a mass then K- means algorithm is enoughto extract it from the brain cells. K-means process beforeremovednoise if any noise arepresent in the MR image. In input givennoise free image tothe k-means and tumor is extracted from the MRI image.

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