Brain Tumour Detection Using K-Means Clustering

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Abstract —

K means clustering is the simpler process of tumour identification. The system will be computerized and hence time consumption will be less. Segmentation is a process of partitioning the image into several objects. It plays a main role in many fields such as satellite, object identification, face tracking and most importantly in medical field. The main objective of paper focuses on a very new and very famous algorithm for brain tumour segmentation of MRI images by K-means algorithm to diagnose accurately the region of tumour because of it's simplicity and computational efficiency.

Keywords:

Tumor, Brain, Clustering, MRI image, identifying tumor, Segmentation

I.INTRODUCTION

Brain cancer is one of the leading causes of death from cancer. A diagnosis of brain cancer is gener-ally made by a specialist called a neurologist. Imaging tests that may be performed include MRI and/or CT scan which use computer technology to create detailed pictures of the brain. There are two classifications which exist to recognize a pattern, and they are supervised classification and unsupervised classification. A commonly used unsupervised classification method is a K Means algorithm [1].

From the past decades, there are so many approaches developed for the image segmentation. After FCM, the K-means algorithm has been proposed to reduce the computational complexity of FCM. Because of its ability to cluster huge data points very quickly, K-means has been widely used in many applications [9], [12], [13] and [14]. Later years the Hierarchical clustering is also widely applied for image segmentation [17], [18] and [19]. Then after, Gaussian Mixture Model has been used with its variant Expectation Maximization for segmenting the images [22] and [23].

This project shows is a colour-based segmentation technique that uses the K-means clustering method to find the effective objects in magnetic resonance (MR) brain images. The main concept in this colour-based segmentation algorithm with K-means is to change a given gray-level MR image into a colour space image(RGB) and then separate the position of tumour objects from other items of an MR image by using K-means clustering process and histogram-clustering. Experiments prove that the method can successfully accomplish segmentation for MR brain images to help find pathologists distinguish exact lesion size and region.

II.METHODOLOGY

The proposed segmentation of the brain MRI images for detection of tumours using K-Means clustering method. A cluster can be defined as a set of pixels where all the pixels in certain group defined by similar connection. Clustering is also unsubstantiated classification because the algorithm automatically classifies objects based on user given principles. Here K-Means clustering algorithm for segmentation of the image is used for tumour exposure from the brain MRI images. The projected block diagram is as shown.

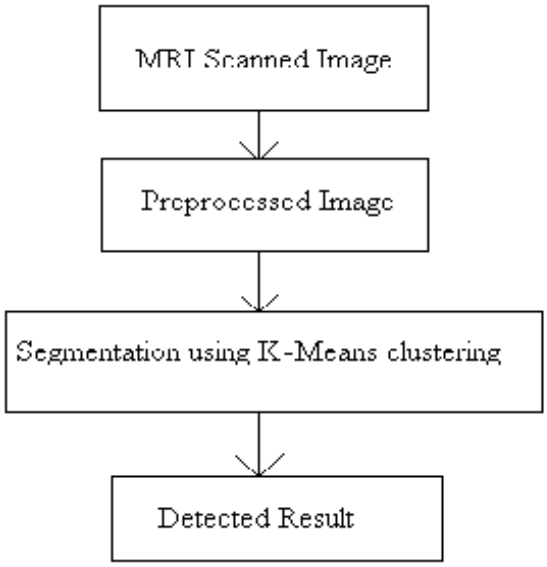


Fig:Proposed Block Diagram

MRI scans of the human brain forms from the input images for our system where the gray scale MRI input images are given as the input. The pre-processing stage will change the

RGB input image to gray scale. Noise present if any, will be removed using a median filter. The image is improved using Gaussian filtering mask. The pre-processed image is given for image segmentation using K-Means clustering algorithm.

1. Image Acquisition:

Images are obtained using MRI scan and these scanned images are displayed in a two dimensional matrices having pixels as its basics. These matrices are reliant on matrix size and its field of view. Images are stored in Image file and shown as a gray scale image. The entries of a gray scale image are ranging from 0 to 255, where 0 shows total black colour and 255 shows pure white colour. Entries between these ranges vary in intensity from black to white.

2. Pre-processing stage:

In this stage image is enhanced in the way that finer details are developed and noise is removed from the image. Most usually used enhancement and noise reduction techniques are executed that can give finest possible results. Enhancement will outcome in more prominent edges and a sharpened image is obtained, noise will be reduced thus dropping the blurring effect from the image. In addition to enhancement, image segmentation will likewise be applied. This developed and enhanced image will help in detecting edges and refining the superiority of the overall image. Edge discovery will lead to the discovery of the exact location of tumour.

2.1Image Sharpening:

Sharpening of the image can be completed by using different high pass filters. As now noise is being removed by using dissimilar low pass filters ,the image need to be sharpened because the image needs sharp edges because this will help to detect the boundary of the tumour. Gaussian high pass filter gives very high rated results and used very widely to enhance the finer details of the project.

3. Segmentation using K-Means clustering

Clustering is a process of partitioning or grouping a given sector unlabeled pattern into a number of clusters [2] such that similar patterns are assigned to a group, which is considered as a cluster [3]. Segmentation is an essential process to extract information from composite medical images. The main objective of the image segmentation is to segregate an image into commonly limited and exhausted regions such that each region of importance is spatially contiguous and the pixels within the region are homogeneous with esteem to a predefined standard. The Shows the steps for the proposed algorithm.

1. Let D be the data points in the given input image.
2. Partition the data points into k equal sets.
3. In each set, take the middle point as the initial centroid.
4. Compute the distance between each data point
   ($1 \le i \le n$) to all initial centroids ($1 \le j \le k$).
5. For each data point di, find the closest centroid $cj$and assign di to cluster j.
6. Set $clus[i] = j$.
7. Set $Neares[i] = (di, cj)$.
8. For every cluster ($1 \le j \le k$), recalculate the centroids.
9. For every data point di,
   (i) Compute its distance from the centroid of the present nearby cluster.
   (ii) If this distance is less than or equal to the current nearby distance, the data point stays in
   the same cluster. Otherwise compute the distance (di, cj) for every centroid ($1 \le j \le k$).
10. Repeat from steps 5 to 9 until convergence is met.

PROPOSED ALGORITHM:

Here in the proposed clustering algorithm, we optimized the k-means clustering by applying Fuzzy algorithm.

K-MEANS CLUSTERING:

K means is one of the famous clustering method because it is simpler and easier in computation [4]. It is the simplest unsupervised learning algorithms that solve the well known clustering problems. [1]

1. First we will select the number of centroids randomly i.e., depends on number of clusters
2. Now, partition the objects within each cluster.
3. It finds partitions such that pixels within each cluster are as near to each other as possible, and as far away from the objects in other clusters as possible.
4. The objects are in the cluster or not will be calculated by measuring the distance between the cluster pixels. When the calculated Euclidean distance has smallest value then the pixels will be clustered with the corresponding cluster.
5. Do the above process for remaining clusters also. Then, we will get three clusters with their similar pixels.
6. Now, calculate the mean of each cluster and replace the mean values with the centroids
7. Repeat the same process with these new centroids by giving the number of iterations until unless the convergence occurrence i.e., the mean value of clusters = cluster centroid value.

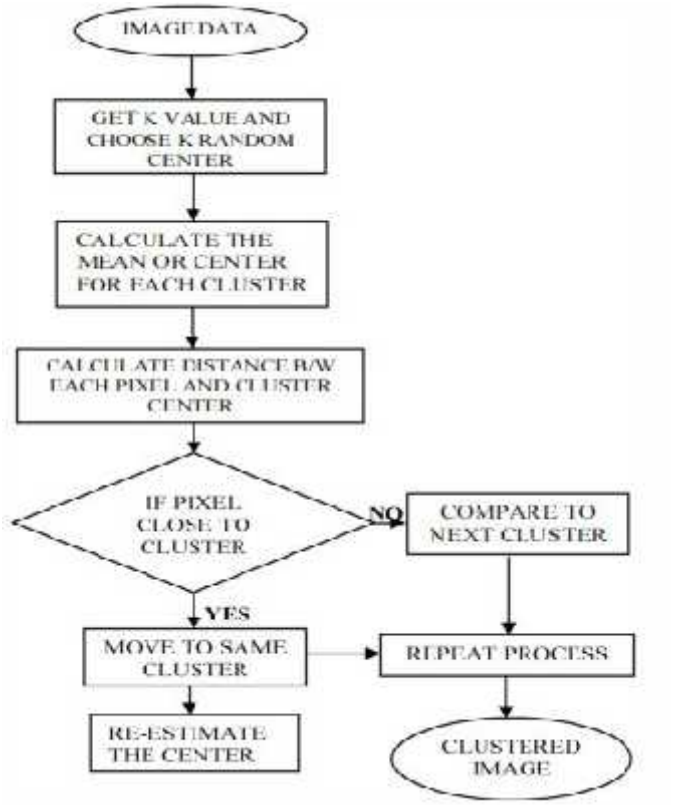
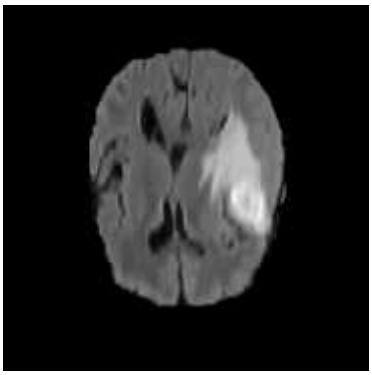


Fig: Flow Chart K-Means Clustering

III.RESULTS

In result, It shows with some gray-scale image, Which are affected with tumour and which are altered it into RGB image, by this it indicates which area is affected by tumour, as shown in below figure (2) the yellow portion is the affected area.



Fig(1)

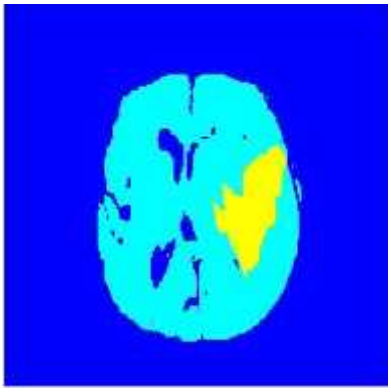


Fig:(2)

IV. FUTURE WORK

In future this programme can be done more advanced so that tumour can be classified according to it's type. Also tumour growth can be analysed by plotting graph which can be obtained by studying sequential images of tumour affected patient.

CONCLUSION

The "BRAIN TUMOUR IDENTIFICATION" has been developed to satisfy all proposed requirements. The system is highly scalable and user friendly. The system minimizes the problem arising in the existing manual system and it eliminates the human errors to zero level. We were able to segment tumour from different brain MR images from our database and are able to detect it is affected by tumor or not without any error factor.

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