

An Approach to Brain Tumor Detection Using Modified TKM and FCM Clustering Algorithm

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ABSTRACT: Image Segmentation is most essential and crucial process for facilitating the delineation, characterization, and visualization of region of interest in any medical image. Medical image plays a significant role in the detection of brain tumor, where medical resonance image (MRI) has good contrast value over different techniques and better clarity. This paper presents modified Template based K-means (TKM) and Fuzzy Cmeans (FCM) clustering algorithm. In this method, based on convolution between gray level intensity in minimal area of brain image and brain tumor image, a template is selected. These methods provides efficient results for classification and detection of brain tumor by improving the segmentation quality and accuracy in less computational time.

KEYWORD: Template based K-means (TKM), Fuzzy C-means (FCM), Template.

I. INTRODUCTION

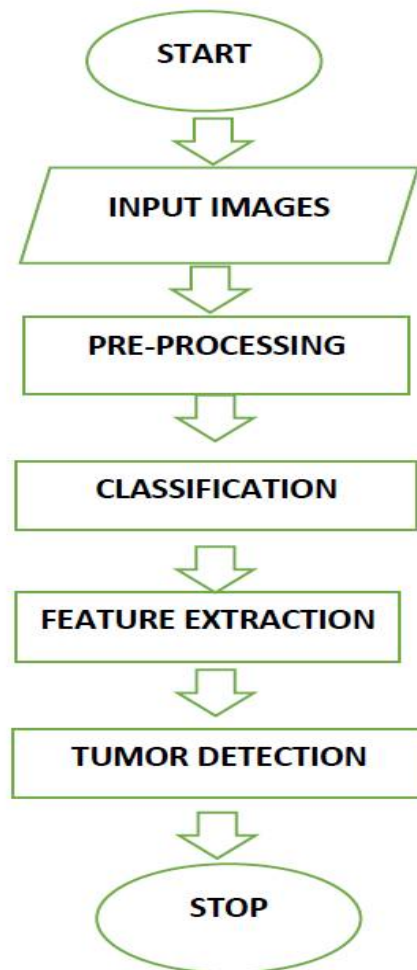
This paper presents the detection of brain tumor using modified clustering algorithms. Brain tumor is a uncontrolled growth of tissues with the limited space in the intracranial cavity of the brain. It is inherently a very serious and life threatening disease due to its different characteristics. Most of the research in developed countries have shown that people who died due to brain tumor is a actual fact that, inaccurate detection of tumor in the brain. Despite intensive research, segmentation remains a challenging problem due to the diverse image content, occlusion, image noise, non-uniform object texture, cluttered objects and other factors, In order to overcome these drawbacks of segmentation ,a robust segmentation method is introduced, where it is a integration of Template based K-means and modified Fuzzy C-means clustering algorithm . In this method, based on convolution between gray level intensity in small portion of brain image and brain tumor image, a template is selected. The proposed technique can get benefits of modified K- means clustering for image segmentation in the aspects of minimal computational time. In addition it can get the advantages of the Fuzzy C-means in the aspects of accuracy. These both clustering algorithms reduces operator and equipment error. The performance of the proposed approach is evaluated by comparing it with some state of image segmentation algorithm in case of accuracy, processing time, and performance. The accuracy is evaluated by comparing the results with ground truth of each processed image.

II. LITERATURE SURVEY

Support vector machine and Fuzzy C –means are used by many researchers as shown in [2-3]. Rajeev kumar and Dr. K. James Mathai [1] worked on KM, EM, FCM and KIFCM: a comparative study and proposed the Modified K-mean with Morphology (MKM) that shows better result of area calculation of tumor. Dipali B. Bimale et al. [2] worked on detection of brain tumor which consists of a set of stages starting from attainment of brain MRI images to SVM classifiers. After these set of stages, features like intensity, texture and shape of the tumor is extracted. M. Mahadeshwaran and D. Anto Sahaya Dhas [3] enhanced brain tumor classification using association of kernels along with support vector machine. The Gaussian radial basis function (GRBF) kernel with SVM classifiers produces classification accuracy of 98%.

A. Harshavardhan, et al. [4] proposed a novel method to figure out possible pitfalls in the existing systems. This method involves four phase namely pre-processing, feature extraction, classification and diagnosis which localizes the tumor in the brain images.

IV. PROPOSED SYSTEM



There are four different phases in the system.

1. Preprocessing
2. Classification
3. Feature extraction
4. Diagnosis.

1. PRE PROCESSING

Initially we have two steps in preprocessing.

Acquire data images: First we have to take MRI image of the brain from the hospitals and is processed using MATLAB software.

Image Enhancement: Here the information of the image is improved and the RGB images into gray scale image and sharpening the images or increasing the brightness helps for better results and display.

13th-14th March 2018

Organized by

Departments of Computer Science & Information Science Engineering, Sri Krishna Institute of Technology, Bangalore, India

2. CLASSIFICATION

We have four steps in classification.

Template Window Selection: When we acquire MRI images it consists of many noises like Gaussian noise, salt and pepper noise etc. In order to remove the noise, we would be using one of the nonlinear filter ie. Median filter for preserving the edges while removing noise. So, removing of noise in the presence of edge is known as template window selection.

K-means gray level segmentation: The output of the template window selection is passed through kmeans gray level segmentation .Here, the image is segmented into clusters. The distance is calculated between each pixel and clusters and the points are distributed between the data points among k clusters.

Modified fuzzy C-means: This algorithm works by assigning membership to each data point corresponding to each cluster center on the basis of distance between the cluster center and the data point .FCM clustering is used for the segmentation of image to detect the suspicious region where the tumor is present.

Extracting last cluster (ROI): Finally from the modified fuzzy C-means, we extract the last cluster which describes salient image regions to obtain region of interest such as legions, tumors, edema and necrotic tissues in brain image.

3. FEATURE EXTRACTION

Here, we are extracting the features from the last clusters such as intensity, entropy, contrast, and homogeneity of the MRI brain image.

4. TUMOR

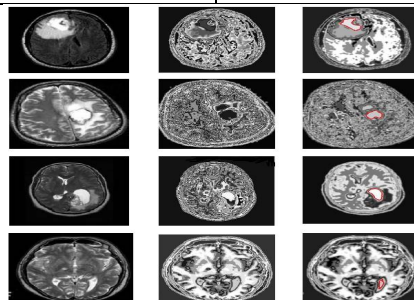
The tumor is detected and is marked with a red sharp segmented outline which achieves effective performance in terms of accuracy, specificity and sensitivity.

V. RESULTS

The proposed system using brain MRI images is used for segmentation and classification of images. Initially using TKM, image is divided into specified number of clusters, similarities between the clusters based on shape, size, and texture is identified. Finally using FCM, brain tumor is detected in more efficient manner when compared to previous conventional methods. The proposed technique is designed for supporting the tumor detection in brain images with tumor and without tumor.

Table 1: Comparison of TKFCM and Previous Conventional Methods.

Algorithm	Accuracy	Specificity	Sensitivity
K-Means	80	93.12	83.3
Conventional FCM	96	93.3	86.6
Thresh-holding	84	80	83.3
Region Growing	88.46	75	86.7
TKFCM	96.67	100	97.1



VI. CONCLUSION

In this paper, modified approach namely Template based k-means and modified fuzzy C-means is proposed. A sharp segmented image is acquired along with tumor, based on updated membership and automatic selected cluster. The tumor which is segmented using TKFCM is marked in red with their position detected properly. Selection of template or gray level image and noise sensitivity accumulated in FCM region is reduced. With comparison to the conventional k-means and FCM algorithm, our method achieves a effective performance in terms of accuracy, specificity and sensitivity with less computational time.

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