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A MODIFIED SEGMENTATION TECHNIQUE IN MRI IMAGES USING K INTEGRATED FUZZY-C MEANS AND MORPHOLOGICAL OPERATION RELATED TO HUMAN BRAIN

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Abstract- In recent years an image segmentation describe the process of split an image into equally restricted regions. It can be measured as the largest part of vital and key process for facilitating the demarcation, characterization, and hallucination of regions in many medical images. There are lots of techniques on hand for image segmentation but still it desires to expand well-organized and speedy techniques for medical image segmentation. A resourceful image segmentation technique introduced using K-means clustering technique integrated with Fuzzy C-means algorithm has been proposed here. To offer precise brain tumour discovery system a thresholding and level set segmentation stages has been introduced. By using this K-means clustering the computation time can be minimised. Subsequently a fuzzy -C means has been added to get the accurate result. The system performance has been evaluated through the comparative analysis of the proposed image segmentation approach with respect accuracy and processing time.

Keywords— k-means, FCM-Fuzzy _C means, KIFCM-K integrated fuzzy –C means, Morphological operation.

I INTRODUCTION

Image segmentation is the process of dividing a precious digital images to several regions. The objective of segmentation is to modify the sign of an image to be further significant and simple to analyse. It is used to identify the objects and boundaries of an images. The ultimate result of segmentation provides the different sets of regions that indicates the total image [1]. So the medical image segmentation acting as an important function in medical diagnosis. It is a tricky crisis since medical images usually have reduced contrasts, diverse types of noise, and absent boundaries [2].

The Magnetic Resonance Imaging (MRI) scan or Computed Tomography (CT) scan has to be used to scan the anatomy of the brain. The MRI scan is extra contented than CT scan for analysis. As it is not used any radiations the human physiological system may not be affected. It is entirely depends on the magnetic field and radio waves [3].

Brain tumour is a most afflicted problem for the peoples in the recent trend. It is facts that the possibility of continued existence can be improved if the tumour is predicted properly at it's near the beginning period. Therefore, discovery of the tumour is necessary for the healing. The life span of the human being who suffered by the brain tumour will increase if it is identified early [4].

Thus, there is a require for an well-organized medical image segmentation technique with a number of favourite properties such as smallest amount user communication, fast calculation, precise, and healthy segmentation results [5].Mainly two fundamental image intensity values like discontinuity and similarity are used in the image segmentation algorithms [6].

There are plenty of segmentation techniques which can be generally utilised in the recent trends, such as histogram methods, edge-based methods, artificial neural network based segmentation methods, physical model based approaches, region-based methods and clustering methods (Fuzzy C-means clustering, K-means clustering, Mean Shift, and Expectation Maximization) [7–9]. But finding a suitable technique for the selected image is some times teddies. Thus, there is no worldwide conventional technique for image segmentation. So, it remains a difficult crisis in image processing and computer image fields [10].

There are numerous clustering algorithms that can be used in image segmentation process, such as hard clustering or K-means clusters, and Fuzzy clustering [11]. It can be utilised as a additional instrument to increase insight into the distribution of data in diverse clusters for supplementary study. Cluster analysis serves as a pre-processing step for other algorithms, such as classification that would then operate on detected clusters [12]. A narrative image segmentation approach, called K-means integrated with Fuzzy C-means (KIFCM) has been developed for abnormal MRI images.

II THE PROPOSED MEDICAL IMAGE SEGMENTATION SYSTEM

The proposed technique includes the following steps

- Input Dataset
- Pre-processing
- K integrated Fuzzy-C means Clustering
- Morphological Filtering
- Binarization

A brain tumour discovery system based on MRI image as input has been proposed for our analysis. The Pre-processing is initially implemented in this MRI scanned image. Pre-processing includes 2 phases i.e. Grey scale image conversion and second one is use of median filter. The first footstep have to be the conversion of that image into Grey scale. A combination of black and white pixels will indicate the grey scale image. Pre-processing involves converting to greyscale image and enhancing the Image for the better visualization of the image. We have to enhance the image, it means we have to increase the intensity of the every pixel of the image for this in this proposed algorithm we are using the median filter to enhance the image . The main idea of the median filter is to run to each and every pixel of the image and replaces the each pixel by the median of all neighbouring pixels, so that every pixel will be enhanced by some value and hence the intensity distribution is done to each and every pixel. The main purpose of the median filter is to enhance the image.

The median filter plays an important roll to remove the noise from the converted images. After that an image segmentation has to be implemented to split the images into different segments. Then the innovative fuzzy clustering algorithm is imposed on that segments. This clustering algorithm is parallel to k-means clustering. But the precision of Fuzzy clustering algorithm is superior to k-means. In this algorithm diverse clusters are shaped and pixels with identical properties are gathered into clusters. All the pixels are converted into 0 and 1 format by using binary technique. Where 0 represents black pixie and 1 represents white pixel. Then the representation of white pixels indicates the tumour affected pixels. The misclusterd data's are removed by morphological filter. After the stage of filtering outstanding division will be treated as tumour affected area. The position of tumour and stages like normal, critical can be identified based on the final result.

III TECHNIQUES

The figures 1 and 2 shows the Flow chart of K-means clustering and Flow chart of Fuzzy-Cmeans clustering [13-15].

K-Means Segmentation

1. Initially various centroids has to be select unsystematic manner.
2. Then the image has to be spited within each cluster.
3. It detects that the pixels within each cluster are as close to each other as feasible, and as distance from substance in other clusters as feasible.

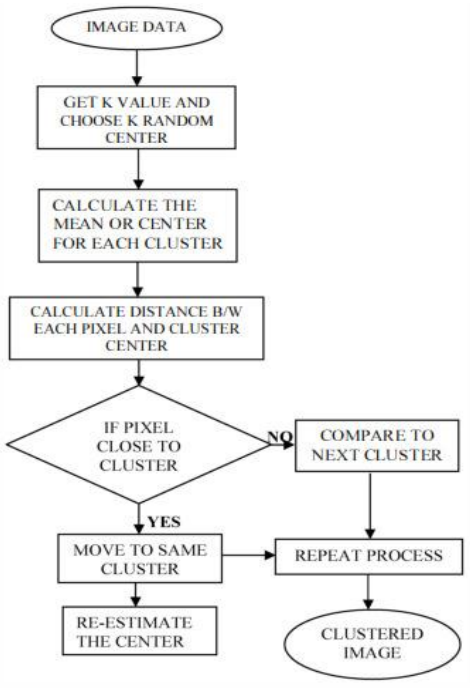


Figure 1: Flow chart of K-means clustering

4. The substance in the cluster are not calculated by measuring the remoteness between the cluster pixels. When the designed distance has minima value then the pixels will be grouped with the individual cluster.
5. Implement the same steps for left over clusters also. Then, we will catch three clusters with their related pixels.
6. Now, compute the mean of each cluster and restore the mean values with the centroids
7. The similar process will be repeated with these new centroids by give the numeral iterations as long as the convergence happening.

A. Fuzzy Clustering: The fuzzy logic will produce the required result by giving the partial membership value to each pixel in the given input image. The regular membership value of the fuzzy set is lies between 0 to 1. Fuzzy clustering is essentially a multi valued logic that allows midway values.

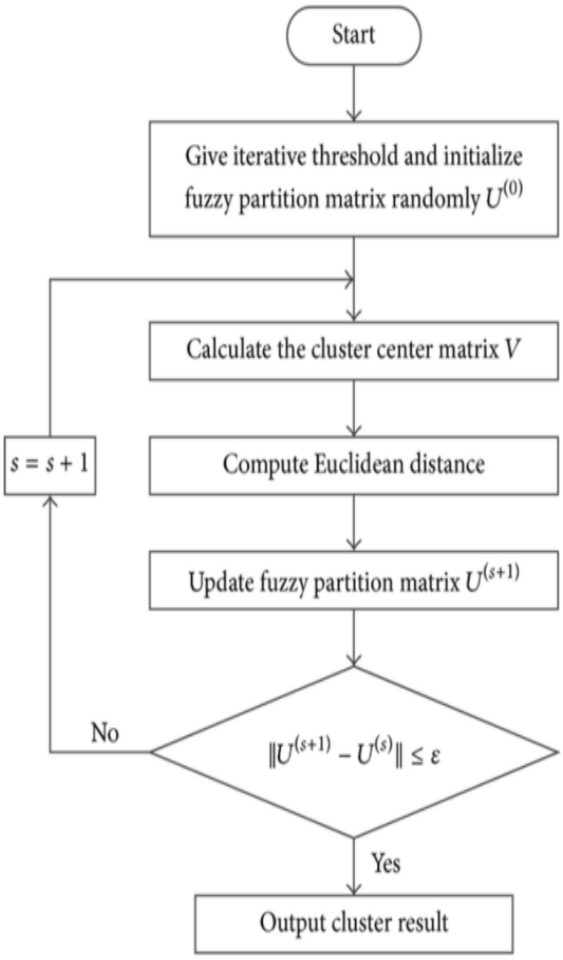


Figure 2: Flow chart of Fuzzy-C means clustering

IV RESULT AND DISCUSSION

Step 1 : Here in this step Enhancement is done by using the Median Filter which is shown in figure below. Salt and pepper noise is removed.

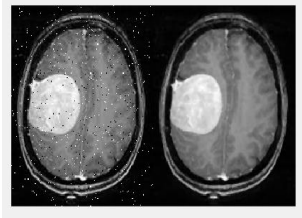


Figure 3 : Image after median filtering

Step 2: After performing the median filtering operation the image passes through Gaussian filter and output is shown in figure below

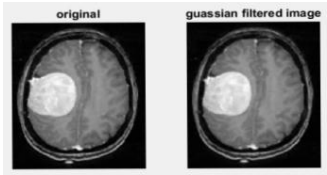


Figure 4: Image after Gaussian filtering

Step 3: k-means clustering operation performed on the pre-processed MRI image

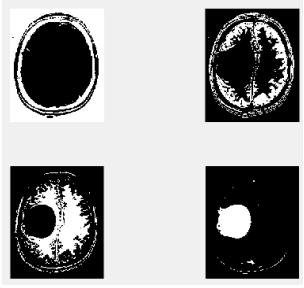


Figure 5: K-means clustering output

Step4: Fuzzy-c means operation performed on the MRI image.

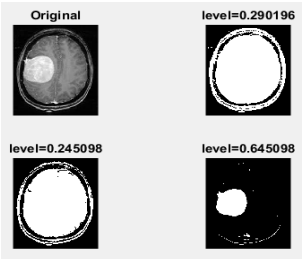


Figure 6: Fuzzy-C means clustering output

Step 5: In this step we go for morphological operation which consist of erosion, dilation, opening and closing process in order to get the tumour and also remove the skull in order to get better view of tumour size and is shown on figure below:

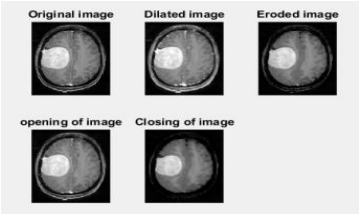


Figure 7: MRI Image undergoing morphological operation

Step 6 : After getting the tumour in the step 5 in order to visualize the tumour exactly the original is combined with the tumour detected image . The detected tumour is shown with a red boundary as shown in figure.

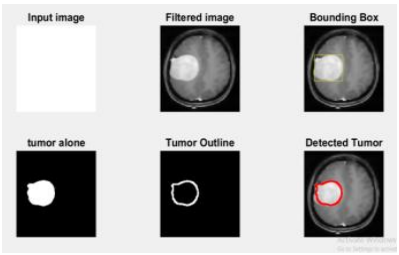
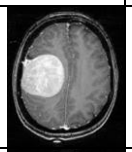
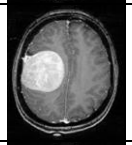
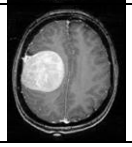


Figure 8 :Tumour detected image and its outline using binarization

Table 1:Comparative Performance Metrics of K-Means, FCM And KIFCM from MRI image

Methods	Original mri	Max precision	Mini precision	Threshold level	No. Of iteration	Execution time
K Means		159	30	0.1861	35	1.610
FCM		1.0000	0.00000379	0.3902	30	1.285
KIFCM		159	305	0.1861	12	0.940

In the table .1 the parameters of maximum precision, minimum precision, Threshold, no. of iteration, execution time are shown for MRI having benign tumour. The execution time is decreased in our proposed method and also the no. of iterations is decreased. The execution time is 0.8404 seconds in our proposed KIFCM method as compared to 1.5107 sec and 1.1858 sec. for K-means and Fuzzy-C means respectively. The no. of iterations in our proposed KIFCM is 11 as compared to 34 for K-means and 25 for Fuzzy-C means.

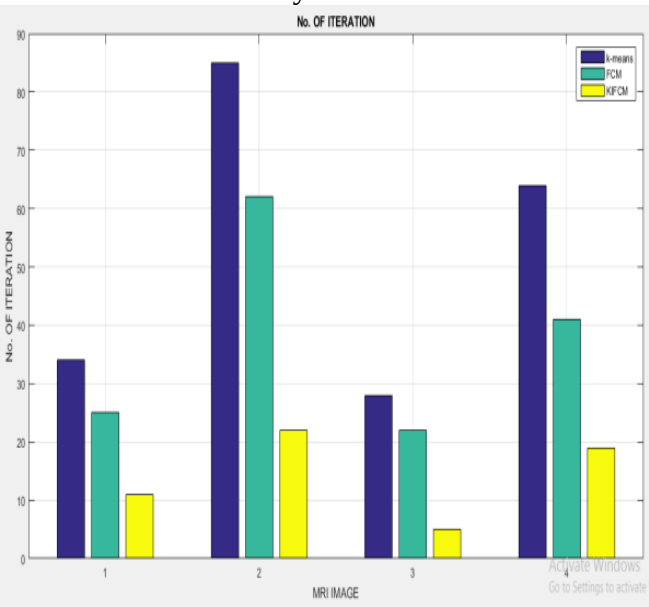


Figure 9 :The comparative barcode graph of no. of iterations for different segmentation methods.

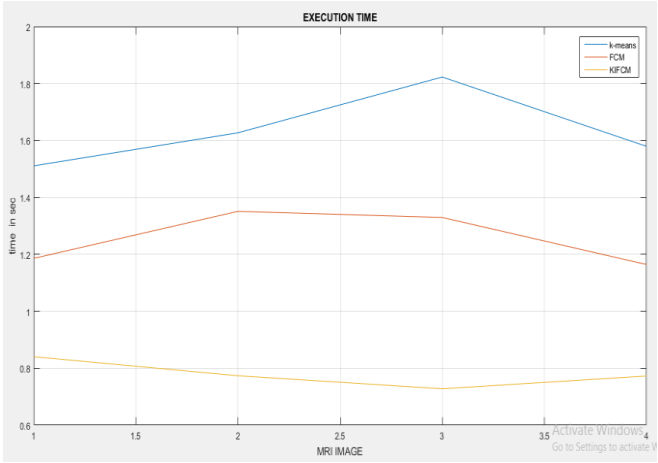


Figure 10 : The comparative analysis graph of execution time for segmentation methods

V. CONCLUSIONS

In this work, imaging is one of the important and essential aspects in the medical field. To analyze and diagnose any part of the human body one depends up on the machines such as CT scan, MRI scan, X-rays etc. which produces images. In this work, we proposed an efficient and simple algorithm for the detection of brain tumor and

analyzed the texture parameters for the normal MRI image and the tumor detected MRI image. This algorithm reduces the steps of the previously proposed algorithms for the brain tumor detection, gives good results for tumor detection. The analysis of texture parameters like contrast is increased in final tumor detected image for the proper visualization of tumor and the other parameters like correlation, homogeneity and energy are also improved, these parameters are useful for the Image classification. From the comparative performance analysis it is concluded that the proposed techniques are efficient to find the impact in the human brain.

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