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A Survey on Automated System for Brain Tumor Detection and Segmentation

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ABSTRACT: Tumor is an uncontrolled growth of tissue in any part of the body. The tumor is of different types and they have different characteristics and different treatment. This paper is to implement of Simple Algorithm for detection of range and shape of tumor in brain MR Images. Normally the anatomy of the Brain can be viewed by the MRI scan or CT scan. MRI scanned image is used for the entire process. The MRI scan is more comfortable than any other scans for diagnosis. It will not affect the human body, because it doesn't practice any radiation. It is centered on the magnetic field and radio waves. There are dissimilar types of algorithm were developed for brain tumor detection. But they may have some drawback in detection and extraction. After the segmentation, which is done through k-means clustering and fuzzy c-means algorithms the brain tumor is detected and its exact location is identified. Comparing to the other algorithms the performance of fuzzy c-means plays a major role. The patient's stage is determined by this process, whether it can be cured with medicine or not.

KEYWORDS: Tumor, MRI Scan, CT scan, K-Means clustering, Fuzzy c-means

I. INTRODUCTION

This paper proposed concept for brain tumor segmentation and finally the detection of brain tumor. Normally the structure of the Brain can be viewed by the CT scan or MRI scan. In this paper the MRI scanned image is taken for the whole process. The MRI scan is more comfortable and suitable than CT scan for diagnosis. It is not affect the human body. Because of this method doesn't useany radiation. This process based on the magnetic field and radio waves. There are different types of algorithm were developed for brain tumor detection. But they may have some drawback in extraction and detection of brain tumor. In this paper, two algorithms are used for segmentation. K-means clustering algorithm and Fuzzy-C means algorithm. So it gives the accurate result for brain tumor segmentation. Tumor is due to the uncontrolled growth of the tissues in any part of our body. The tumor stage may be primary or secondary. If it is an origin, then it is known as primary stage. If the part of the tumor is spread to another place and grown as its own then it is known as secondary stage. Normally brain tumor affects CSF (Cerebral Spinal Fluid). It causes for strokes. The physician gives the treatment for the strokes rather than the treatment for tumor. So detection of tumor is important for that further treatment. The lifetime of the person who affected by the brain tumor will increase if it is detected at current stage correctly. That will increase the lifetime about 1 to 2 years. Normally tumor cells are of two types. They are Mass and Malignant tumor. The detection of the malignant tumor is difficult to mass tumor. In this paper we focused on detection of brain tumor with the help of Brain MRI images. The developing platform for the detection is java. Because it is easy to develop and execute.At the end, we are providing systems that detect the brain tumor and its shape.

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II. LITERATURE SURVEY

SN.	Author and Title	Proposed System	Implemented Concepts
1.	Samir Kumar Bandhyopadhyay, Tuhin Utsab Paul , **"Automatic Segmentation of Brain Tumor from Multiple Images of Brain MRI"**	This paper has proposed a system of image registration and data fusion theory adapted for the segmentation of MR images. This systemprovides an efficient and fast way for diagnosis of the brain tumor called K-means algorithm.	Implanting the K-mean algorithm which consists of multiple phases. First phaseconsists of registration of multiple MR images of the brain taken along adjacent layers of brain. In the second phase, theseregistered images are fused to produce high quality image for the segmentation. Finally, segmentation is done by improved K -means algorithm with dual localization methodology.
2.	A. Meena, K. Raja, **" Spatial Fuzzy C-Means PET Image Segmentation of Neurodegenerative Disorder"**	Meena and Rajaproposed an approach of Spatial Fuzzy C-means (PET-SFCM) clustering algorithm on Positron Emission Tomography (PET) scan image datasets.	The proposed FCM successful able to join the the spatial neighborhood information with classical FCM and updating the objective function of each cluster. It exploit the segmentation which used for quick bird view for any problem of K-means.
3	Suman Tatiraju, Avi Mehta**, " Image Segmentation using k-means clustering, EM and Normalized Cuts"**	In this project, we look at three algorithms namely K Meansclustering, Expectation Maximization and the Normalized cuts and compare them for image segmentation	The segmentation technique addresses the problem of segmenting an image into different regions. So the we can analyze both k-mean and C-mean algorithm in easy way.
4.	Ajala Funmilola, **" Fuzzy k-c-means Clustering Algorithm for Medical Image Segmentation"**	Funmilola et al proposed the Fuzzy K-C-means method, which carries more of Fuzzy C-means properties than that of K-means.	The F-K-C means focused attention on Clustering methods. These k-mean and C-mean algorithms were combined together to come up with another methodcalled fuzzy k-c-means clustering algorithm, which has a better result in terms of time utilization.
5.	Beshiba Wilson, Julia Punitha Malar Dhas, **" An Experimental Analysis of Fuzzy C-Means and K-Means Segmentation Algorithm for Iron Detection in Brain SWI using Matlab"**	Wilson and Dhas used K-means and Fuzzy C-means respectively to detect the iron in brain using SWI technique.	Susceptibility-weighted imaging (SWI) is a neuroimaging technique, which uses tissue magnetic susceptibility differences to generate a unique contrast. The extraction of the iron region in the brain is made by K-means and Fuzzy C-means clustering method.
6.	M.H. Fazel Zarandia, **"Systematic image processing for diagnosing brain tumors: A Type-II fuzzy expert system"**	This paper proposed a dip study of brain tumor. It describes different type of diagnosis approaches.	A brief knowledge about tumor like glial tumor which cover 30 % of all brain tumor.
7.	Samarjit Das , **"**	In the field of pattern recognition due	

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	Systematic image processing for diagnosing brain tumors: A Type-II fuzzy expert system approach"	to the fundamental involvement of human perception and inadequacy of standard Mathematics to deal with its complex and ambiguously defined system, different fuzzy techniques have been applied as an appropriate alternative	The proposed fuzzy c-means technique Euclidean distance has been used to obtain the membership values of the objects in different clusters; in our present work along with Euclidean distance we have used other distances like Canberra distance, Hamming distance to see the differences in outputs.
8.	Vignesh Rajesh, **" brain tumor segmentation and its area calculation in brain mr images using k-mean clustering and fuzzy cmean algorithm"**	This paper has suggested a synergistic and aneffective algorithm for the detection of brain tumors based onMedian filtering, K Means Segmentation, FCM Segmentation,and finally, threshold segmentation.	The implemented method enhance the quality of the tumor images acquired by the aid of MRI and then to detect the size of the tumors, approximate reasoning are applied.
9.	Krishna Kant Singh, **" A Study Of Image Segmentation Algorithms For Different Types Of Images"**	In this paper the author gives a study of the various algorithms that are available for color images, text and gray scale images.	Implementation of segmentation technique those are color-based-segmentation, pixel-based segmentation and edge-based segmentation.
10	payal mistry, shagun akhauri, sayali patil, s.p.tondare, **" segmentation of brain tumour and its area calculation in brain mr images using k-mean clustering and fuzzy c-mean algorithm"**	In this paper proposed k-means and C-mean to extract the features from the images.	K-Means and Fuzzy C- Means In this process the tumor is extractedfrom the MR image and its exact position and the shape also determined. The stage of the tumor is displayed based on the amount of area calculated from the cluster

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III. SYSTEM ARCHITECTURE

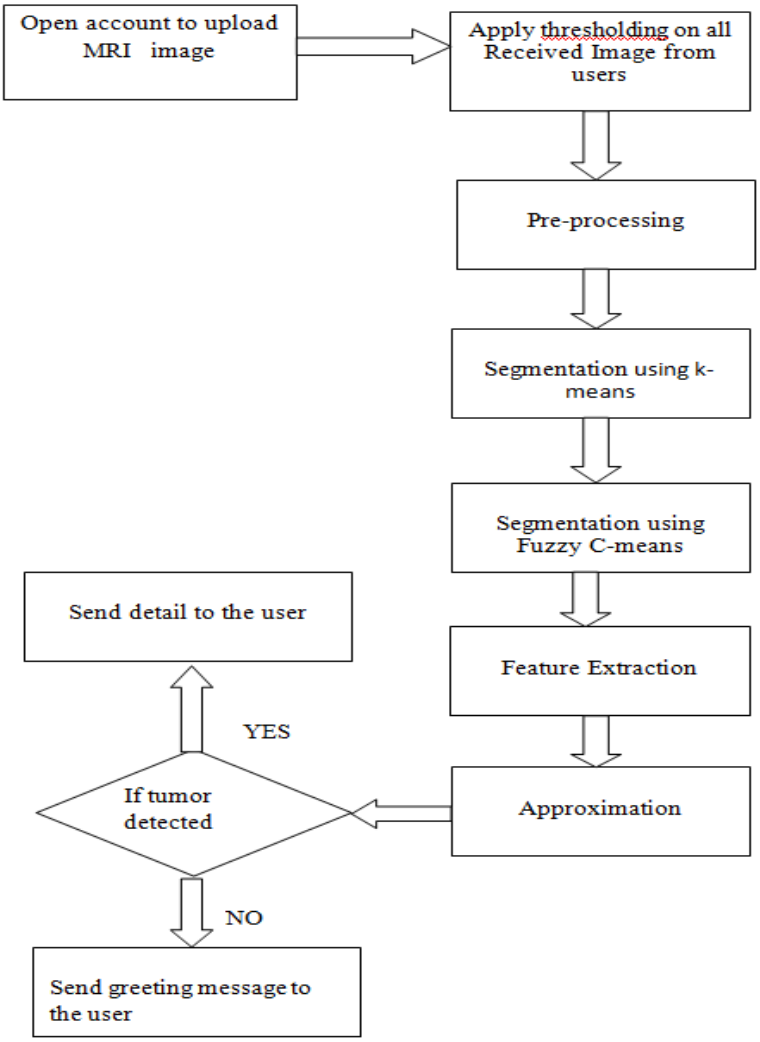

Fig 01 System Architecture

Explanation-

1. Pre-processing

According to the need of the next level the pre-processing step convert the image. It performs filtering ofnoise and other artifacts in the image and sharpening theedges in the image. RGB to grey conversion and Reshapingalso takes place here. It includes median filter fornoise removal. The possibilities of arrival of noise inmodern MRI scan are very less. It may arrive due to thethermal effect. The main aim of this paper is to detect andsegment the tumor cells. But for the complete system itneeds the process of noise removal.

1. Segmentation using K-means

Steps

1. Give the no of cluster value as k.
2. Randomly choose the k cluster centers
3. Calculate mean or center of the cluster
4. Calculate the distance b/w each pixel to each cluster center
5. If the distance is near to the center then move to thatcluster.

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6. Otherwise move to next cluster.
7. Re-estimate the center.
8. Repeat the process until the center doesn't move.

3. Segmentation using Fuzzy C means

The fuzzy logic is a way to processing the data bygiving the partial membership value to each pixel in theimage. The membership value of the fuzzy set is rangesfrom 0 to 1. Fuzzy clustering is basically a multi valuedlogic that allows intermediate values i.e., member of onefuzzy set can also be member of other fuzzy sets in thesame image. There is no abrupt transition between fullmembership and non membership. The membershipfunction defines the fuzziness of an image and also todefine the information contained in the image.

4. Feature Extraction

The feature extraction is extracting the cluster whichshows the predicted tumor at the FCM output. Theextracted cluster is given to the thresh holding process.Itapplies binary mask over the entire image. It makes thedark pixel become darker and white become brighter. Inthreshold coding, each transform coefficient is comparedwith a threshold. If it is less than the threshold value thenit is considered as zero.If it is larger than the threshold, itwill be considered as one. The thresholding method is anadaptive method where only those coefficients whosemagnitudes are above a threshold are retained within each block.

5. Approximate reasoning

In the approximate reasoning step the tumor area iscalculated using the binarization method. That is theimage having only two values either black or white (0 or1).

IV. CONCLUSION

There are different types of tumors available. They may be mass in the brain or malignant over the brain. Suppose if it is a mass, then K- means algorithm is enough to extract it from the brain cells. If there is any noise present in the MR image it is removed before the K-means process. The noise free image is given as input to the k-means and tumors are extracted from the MRI image. The performance of brain tumor segmentation is evaluated based on K-means clustering. Dataset consists of Magnetic Resonance Imaging (MRI) size of 181X272. The MRI image dataset that we have utilized in image segmentation technique is taken from the publicly available sources. This image dataset consists of 40 brain MRI images in which 20 brain images with tumor and remaining brain images without tumor. The brain image dataset is divided into two sets. Training dataset and testing dataset. Thus, the pre-processing is done by filtering. Segmentation is done by advanced K-means algorithm and fuzzy c means algorithm. Feature extractions is done by threading and finally, approximate reasoning method to recognize the tumor shape and position in MRI image using edge detection method. This method scans the RGB or gray scale, converts the image into binary image by binarization technique and detects the edge of tumor pixels in the binary image. Also, it calculates the size of the tumor by calculating the number of white pixels (digit 0) in binary image. The stage of the tumor is based on the area of tumor.

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