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SEGMENTATION OF BRAIN TUMOUR IN BRAIN MR IMAGES AND ITS AREA CALCULATION USING WATERSHED SEGMENTATION AND FUZZY C-MEAN ALGORITHM

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ABSTRACT

An uncontrolled growth of tissues in any part of the body is known as Tumour. Brain Tumour is the growth of abnormal cells in the Brain. As we all know Brain Tumour is inherently serious and life threatening disease because of its character in the limited space of the intracranial cavity. So early detection and correct diagnosis will increase the lifetime of an individual. Anatomy of the Brain can be viewed by the use of CT scan or MR Imaging. This paper uses MR Images for the complete process. A comparison between two semi-automated segmentation techniques namely watershed segmentation and fuzzy C-mean segmentation techniques is undertaken here for evaluating their relative performance in segmentation of Tumour.

Keywords— Magnetic Resonance Imaging (MRI), Segmentation,Tumour,semi-automated.

I. INTRODUCTION

The works deals with the concept of semi-automatic brain tumor segmentation by using watershed segmentation and fuzzy C-means algorithm. A brain tumor is an abnormal growth of cells or tissues within the brain, which looks like a swelling. It may be cancerous or non-cancerous. The tumor may be primary or secondary if it is at the origin, then it is known as primary. If some part of the tumor is spread to another place and grown as its own then it is known as secondary. Normally brain tumor affects CSF and it causes for strokes. The physician gives the treatment for the strokes but not for the tumor. So early detection and correct treatment are important steps to improve disease outcome and it is obtained based on accurate diagnosis. Normally the anatomy of the Brain can be viewed by the MRI scan or CT scan, this type of scanned image is taken for the entire process. One of these imaging techniques used here is magnetic resonance imaging (MRI). The MRI scan is more comfortable than the CT scan for diagnosis because it does not affects the human body and doesn't use any radiations. The segmentation of Brain tumour is done by using watershed segmentation & FCM and carried for different samples of brain tumour images. The developing platform for detection is matlab because it is easy & convenient to develop and execute.

II. PROPOSED WORK

As we can see in the block diagram the first step is to take a proper MRI image as a input data source. According to the next level the preprocessing takes place which includes some conversions. In most of the

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segmentation techniques this preprocessing steps may be common. It includes taking an proper MRI image & making some conversions by which it can be used in MATLAB friendly environment. It performs grayscale conversion of the image. Histogram of the image is being plot as required by a particular segmentation technique. In the next step noise filtering takes place, the most commonly median filter is used for the noise removal. Noise occurrence may be small in nature as we all know that there are very less possibilities of noise in the MRI image. Once the preprocessing steps are done the segmentation techniques are being used which gives precise segmented output. And finally the classification involves labeling the images into normal and abnormal. The abnormal indicates the presence of tumour & the term normal indicates the normal condition.

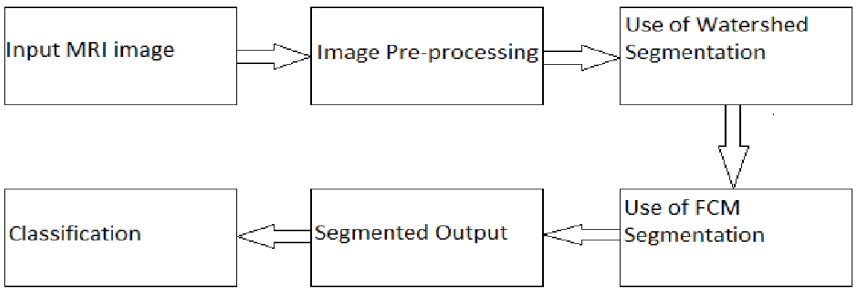

Figure.1:-Block Diagram of Proposed Work.

2.1 Watershed Segmentation

This method falls under edge-based segmentation technique. The watershed is one of the geographical term. The name refers to a line separating two catchment's basins. The water that falls on either side of the watershed line will flow into same reservoir of water. The above idea is being easily used in segmenting the digital images. The image gradient can be viewed as terrain. The unvarying regions in the image usually have low gradient values. Thus they represent hollow while the edges represents the pinnacle having high gradient values. The watershed transform is often used to divide the touching objects in an image. The watershed transform identifies the catchment's basins & watershed long raised border in an image by treating it as surface. This algorithm is well approved as an useful and concerned segmentation tool which has been widely used in a gray scale image processing and as a video processing tool.

2.2 Output screenshot of watershed segmentation

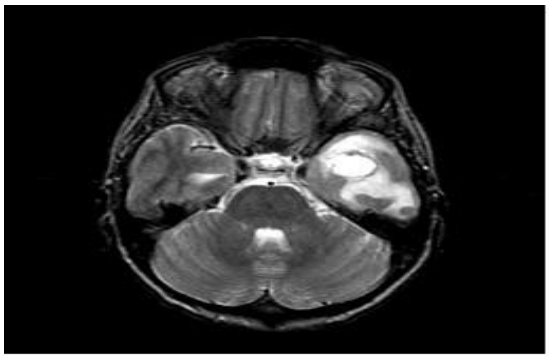

Figure.2:- Original Image

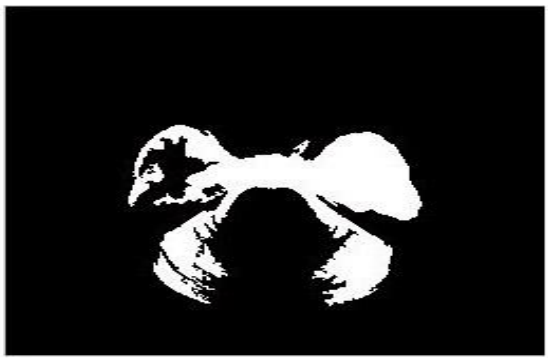

Figure.3:- Segmented Output

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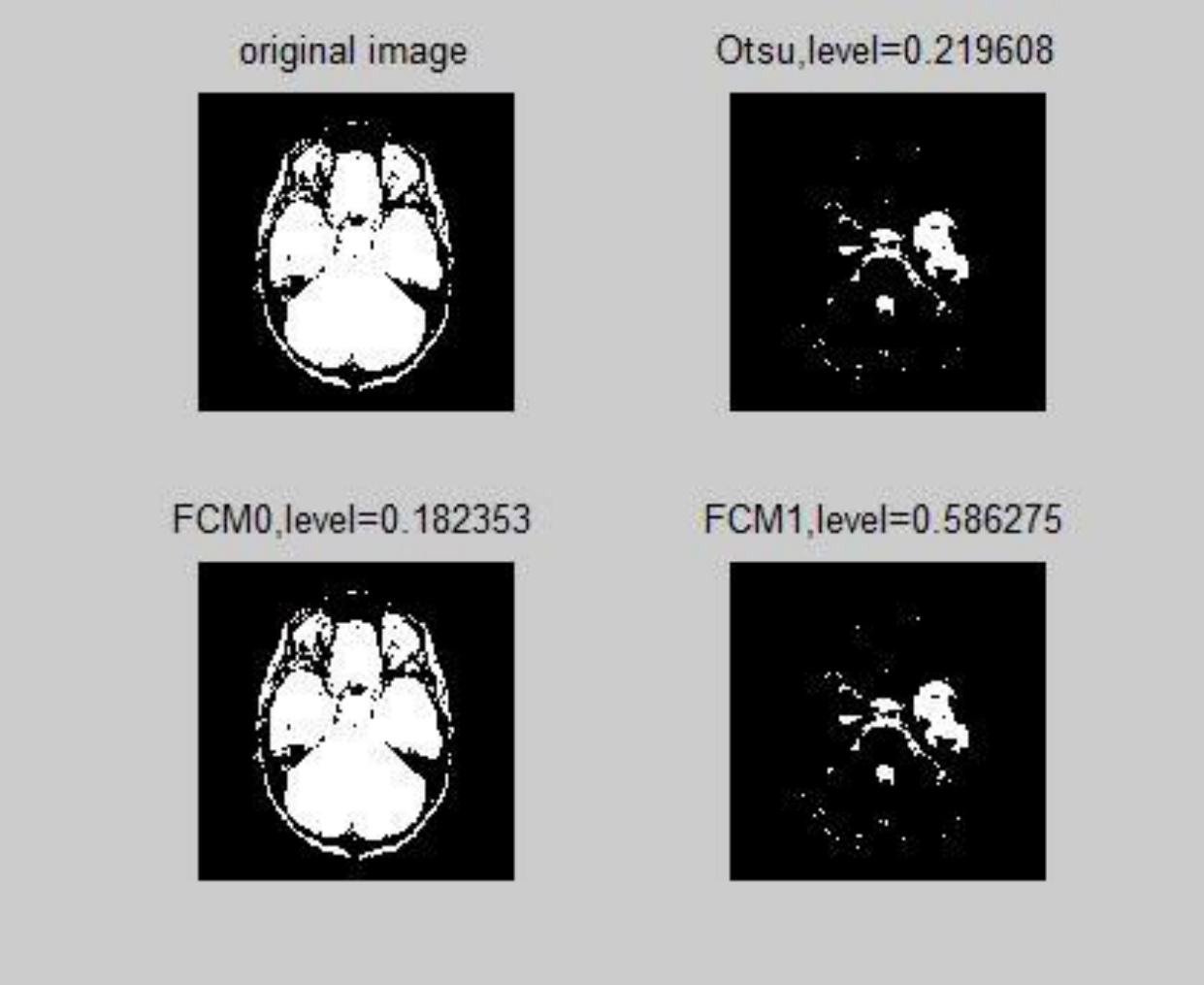
2.3 Fuzzy C-Means Clustering

The fuzzy logic is the way to process the image data by giving the fractional membership value to each pixel in the image. For example a certain datapoint that lies close to the center of a cluster will have the high degree of membership to that cluster and another datapoint that lies far away from the center of the cluster will have the low degree of membership to that cluster. The membership value of the fuzzy set has only digital values either 0 or 1. Certain important steps it follows are:

1. It starts with an initial guess for the center of cluster which are intended to mark the average location of each cluster. But the initial guess may not be fully correct.
2. In the next step FCM assigns every data point a membership value for each cluster.
3. In the subsequent step each data point iteratively update the cluster centers and the membership value is found, further FCM iteratively moves the cluster centers to correct location within the data set.

2.4 Output screenshot of FCM



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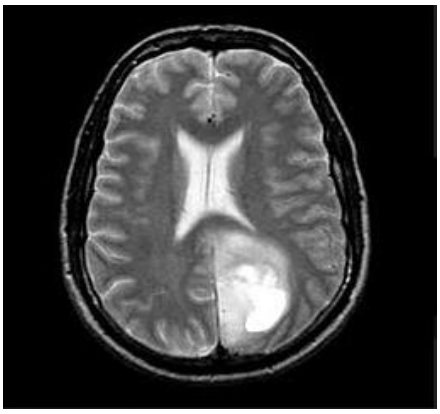
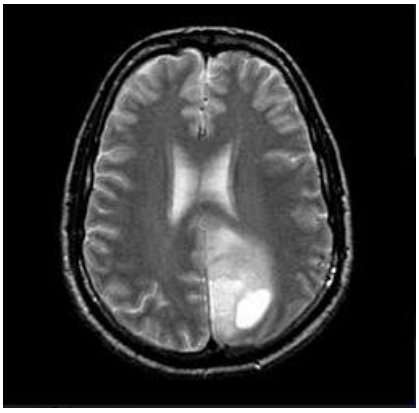
III. EXPERIMENTAL RESULTS

Sr.No	MR Image	Watershed Segmentation(Tumour area in mm^2)	FCM (Tumour area in mm^2)
1		12.72	20
2		13.37	21.78

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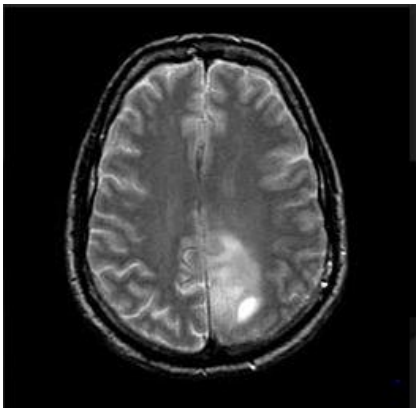
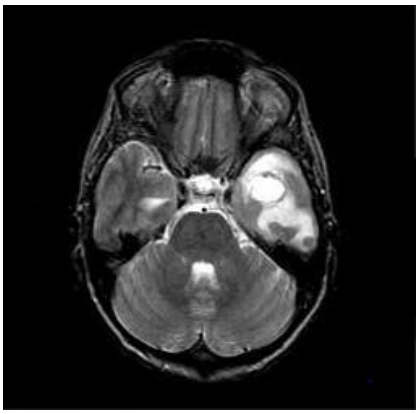
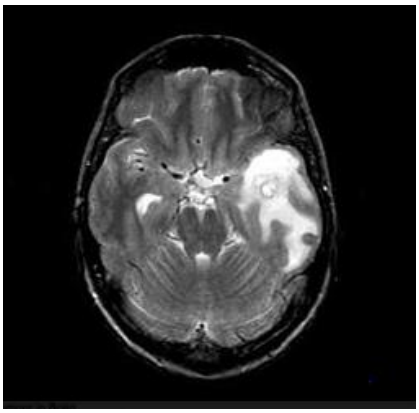
3		38.73	22.60
4		22.72	13.27
5		20.84	15.05

VI CONCLUSION

The measurement of the tumour area can lead to know the tumour stage for proper medical treatment. The manual measurement of tumour area is bit a difficult job, which in turn is done with ease by the help of above two segmentation techniques. As we can see in the experimental results both the methods gives good results.

Watershed segmentation requires less processing time than FCM. Two methods have been tested extensively & the results are validated numerically. Further work is in progress to test larger set of tumour dataset to improve the accuracy of these techniques.

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