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Detection of Possibility of Brain Tumor Using Image Segmentation

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ABSTRACT: This approach consist of the implementation of Simple Algorithm for detection of range and shape of tumor in brain part with the help of MRI images. Tumor is vast growth of tissues in any part of the body. Tumor area can be distinguished according to its characteristics. According to the type of tumor patient need to get treatment. so, brain tumor is very serious disease, because it will grow in limited space inside the skull. It need to be recognized at early stages because it may lead to death. In our project we are using segmentation technique to detect tumor. Our innovative work is 3D visualization of tumor area.

KEYWORDS: Magnetic Resonance Imaging (MRI); Brain tumor; preprocessing Fuzzy C means; 3D.

I. INTRODUCTION

The tumors are the growth of cells which are abnormal in their nature that may differ from the normal cells by their uncontrolled characteristics of the tissue grows in brain. We can see the tumor in the radiological image format like X-ray, MRI ,CT scan. There are various methods for brain tumor segmentation. In our project we are using normalization and various preprocessing techniques. In segmentation process we can specify the tumor very comfortably and easily.
In this search we present technique for the detection of tumor in brain using segmentation clustering. The proposed method can be successfully applied to detect the contour of the tumor and its geometrical 3 dimension. This technique can be proved to be handy tool for the practitioners especially the physicians engaged in this field.

II. RELATED WORK

In [2] authors The noise free image is given as a input to the k-means and tumor is extracted from the MRI image.And then segmentation using Fuzzy C means for accurate tumor shape extraction of malignant tumor and thresholding of output in feature extraction. based on mathematical morphology, wavelet transform and K-means technique was introduced The algorithm reduces the extraction steps through enhancement the contrast in tumor image by processing the mathematical morphology in [1]. In [3] Author presents a novel technique for the detection of tumor in brain using segmentation and histogram thresholding. The proposed method can be successfully applied to detect the contour of the tumor and its geometrical dimension. In [5] a technique to detect presence of brain based on thresholding technique has been developed. Enhanced thresholding algorithm is modified form of standard thresholding algorithm . The application of different methods on brain MR image segmentation is presented in this [4][6] study. The proposed Fuzzy C-means algorithm yield relatively accurate result.

III. METHODOLOGY

The algorithm has two stages, first is pre-processing of given MRI image and after that segmentation and then performs analytical operations. Steps of algorithm are as following:-

Step 1: Give MRI image of brain as input.
Step 2: Convert it to gray scale image.
Step 3: Apply threshold to enhance the quality of image.
Step 4: Apply sobel edge detection to separate skull part.
Step 5: Compute Fuzzy C mean segmentation.

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Step 6: Calculate the number of white points In the image.
Step 7: Calculate the blocks of the less severe and Tumor.
Step 8: Display stage of tumor.
All above steps are explained here in detail.

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A. Gray Scale Image.

The purpose of these steps basically involves removing low-frequency background noise, normalizing the intensity of the individual particles images, removing reflections and masking portions of images. This will convert RGB image in gray scale image

B. Throsholding

A grayscale image is turned into a binary (black and white) image by first choosing a grey level **T** in the original image, and then turning every pixel black or white according to whether its grey value is greater than or less than T:

A Pixel becomes $\begin{cases} \text{White if is} > T \\ \text{Black if is} \leq T \end{cases}$

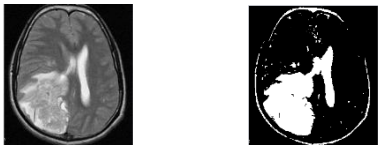

Fig 1. a. Input b. output .

C. Edge Detection

The Sobel operator is used in image processing, particularly within edge detection algorithms. Technically, it is a discrete differentiation operator, computing an approximation of the gradient of the image intensity function

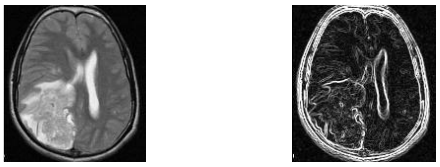

Fig. 2 a. Input b. Output

D. Segmentation

Fuzzy C-means is an overlapping clustering technique. One pixel value depending on two or more clusters centers. It is also called soft clustering method. One of the most widely used fuzzy clustering algorithms is the Fuzzy C-means (FCM) algorithm The FCM algorithm is partition of n element X={x1,…,xn} into a collection of c fuzzy clusters with respect to below given criteria. It is based on minimization of the following objective function:

$J= \Sigma^{N}_{i=1} \ \Sigma^{C}_{j=1} \ U^{m}_{ij} |x_i - y_j|^2$ Where,

m = level of fuzziness and real number greater than 1.
uij= degree of membership of xi in the cluster cj
x = data value
units in parentheses.

In 2012, J. Selvakumar, A, Lakshmi and T. Arivoli [2] proposed a technique for brain tumor segmentation using k-means and fuzzy c-means algorithm. Its use preprocessing step for filtering noise and other artefacts in image and apply K-means and fuzzy c-mean algorithm. This purposed algorithm, fuzzy c-mean is slower than Kmeans in efficiency but gives accurate prediction of tumor cells which are not predicted by K-means algorithm

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The algorithm contain following steps:

1) Initialize $M=[M_{ij}]$ matrix,M^0

2) At k-step: calculate the centers vectors $R^{(k)}=[R_j]$

$$R= \frac{\sum^{N}_{i=1} X_i . M^{m}_{ij}}{\sum^{N}_{i=1} M^{m}_{ij}}$$

3) Update U^k, $U^{(k+1)}$

$$M_{ij=} \frac{1}{\sum^{c}_{k=1} \left[\frac{X_i - C_i}{X_i - C_i} \right] 2/m-1}$$

4) If $|| M^{(k+1)} - M^{(k)} || < €$ then STOP otherwise return to Step 2

IV. SIMULATION RESULTS

The simulation studies involve thresholding of MRI grayscale image as shown in Fig.1. The proposed threshloding and other efficient algorithms are implemented with JAVA. A grayscale image is given as input to the thresholing module. It will convert grayscale image to binary image i.e. it will remove noise efficiently. Threshold value can be manual also. Fig.2 shows edge detection module which is also a preprocessing part. It will detect all the edges present in the brain and will help to consider only important are.

The tumor detection shows in Fig. 3 is able to detect mass tumor efficiently. It will shows dangerous area by color red and less effected by yellow. Output will be on grid for more effective analysis. Our results show that fuzzy c mean is more accurate than others. 3D visualization is shown in fig.4. This will help to see tumor area with 3 dimensional views.

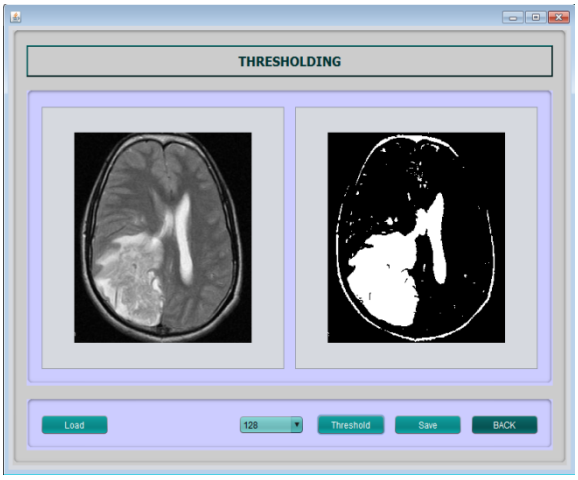

Fig.1. Image Thresholding

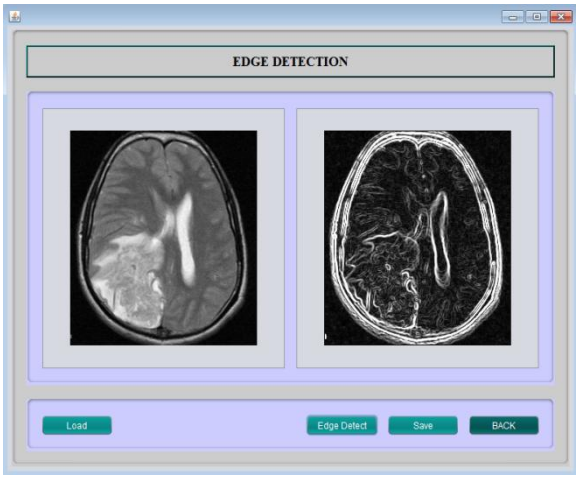

Fig. 2. Edge Detection

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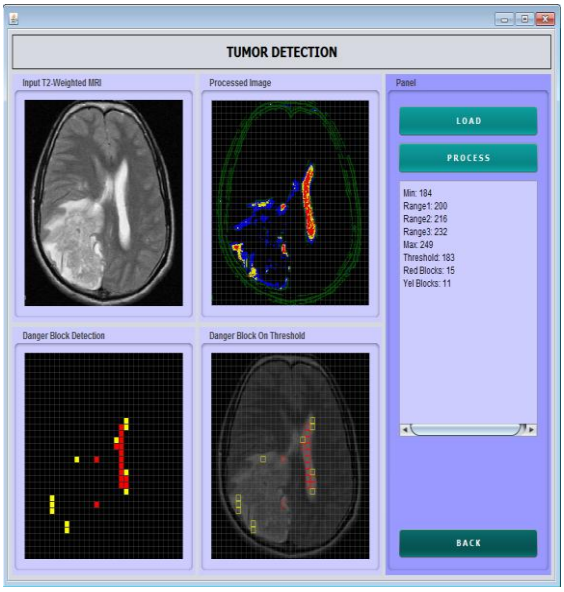

Fig. 3. Tumor Detection

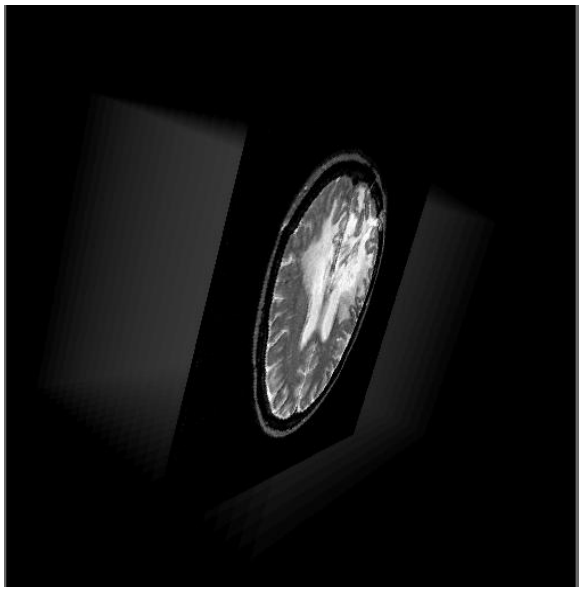

Fig 4. 3D visualization

V. CONCLUSION AND FUTURE WORK

There are different types of tumors are available. They may be as mass in brain or malignant over the brain. Suppose if it is a mass then Fuzzy C means algorithm is enough to extract it from the brain cells. If there is any noise are present in the MR image it is removed before the C Means process. The noise free image is given as a input to the C-means and tumor is extracted from the MRI image. And then segmentation using Fuzzy C means for accurate tumor shape extraction of malignant tumor and thresholding of output in feature extraction. Finally approximate reasoning for calculating tumor blocks and position calculation. The experimental results are compared with other algorithms. 3D visualization helps user for better analysis

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