An Automatic Identification of Location, Size and Shape of the Tumor in Brain MR Images

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***Abstract*— This paper provides an automatically identifies the tumor location in brain and its size in Brain MR Images. Here the input of the method is patient study image which consists of a set of MR images. The output of the method is also a corresponding set of the slices or an image with the tumor contains the Parallel axis boxing around the tumor with exact location name and the size of the tumor. The proposed method is highly based on the identification and quantification that having most no similar region between the left and the right side of the brain in an axial location view in MR images. The detection process is done by using the digital image processing based algorithms such as, Parallel axis method can be used for provide the box on the tumor and Shifting method based on the mean value in the images and Bhattacharya coefficient also used to provide gray level intensity histograms. Boxing and mean shift clustering algorithm is used to provide a box for the entire tumor. The Colour mapping technique is used for differentiating between normal and abnormal cell. Then Block Matching Algorithm is used to locate the position of abnormal region in the pre-processed image. After determining the location, k-mean clustering technique is used for separating the normal and abnormal region. Finally, Watershed Algorithm is used for bringing out the shape of abnormal region and based on that size of tumor is determined. This method shows good results in complex situation.**

Keywords*— *Brain Tumor, MR images, Watershed method, Boxing and Mean shift clustering, Bhattacharya Coefficient, Clustering method

I. INTRODUCTION

A brain tumor is an abnormal growth of cells within the brain or spinal canal in centre. Nowadays brain tumor is a deadly disease in the world. Detection of brain tumor is always done by biopsy, human inspection referred by using MR images or CT images. MRI is a stand for Magnetic Resonance Imaging is seriously used in the medical field to detect and analyse fine details in the internal structure of the body.

MRI uses strong magnetic field for align the nuclear magnetization this can be used to detected by the scanner. The signal must be processed to provide the extra information of the internal body. In general there are many different types of brain tumors have makes decision very complicated. This identification process leads to take right decision in right time and provide good result.

This project deals with only aiding the doctors by reducing the consulting time and not by finally judging the region found is tumor, since the authority completely lies with the doctors themselves. But still the project give complete assurance that the regions that are abnormal in the brain will be found without any error. The doctor need not have to linger on the MRI image in search of abnormal region (tumor) as the project take care of that efficiently.
In general the treatment for the tumor may different for each type of the patients and usually determined by:

Type and Location
Size of the tumor

A. Magnetic Resonance Imaging (MRI):

MRI is highly used in the biomedical for identify and detect the internal part of the body. In this method can be used to detect and differences in the tissues which have a far technique as compared with the Computerised Tomography ie., CT method. This technique is one of the special for brain tumor detection and cancer imaging.

B. Literature Survey:

The size can be achieved by using MR image database are high, it is also important for indexed the content very effectively. The images are typically based on the patient identifies, name, date of admission, keywords, patient ID, and manual significance, But this does not allows to retrieve the similar meaningful images.

In existing systems, Discrete Cosine Transform and Probabilistic Neural Networks are been used, but the major drawbacks of this system is time taken for segment the images. The thresholding and morphological operators, it is a pre or post processing method for bordered the enhancing or non enhanced images that are tumor having very few bright pixels. In many papers, the researchers are using Markovin Random Field (MRF) process, but this method is not provide a pixel ranges in the tumor and also the MRF method having limited region consistency for the neighborhoods pixels.

C. Block Diagram:

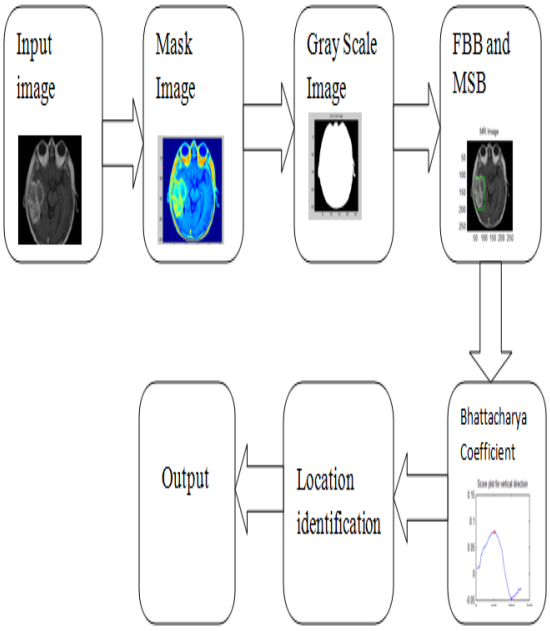


Figure 1: Block diagram for location identification

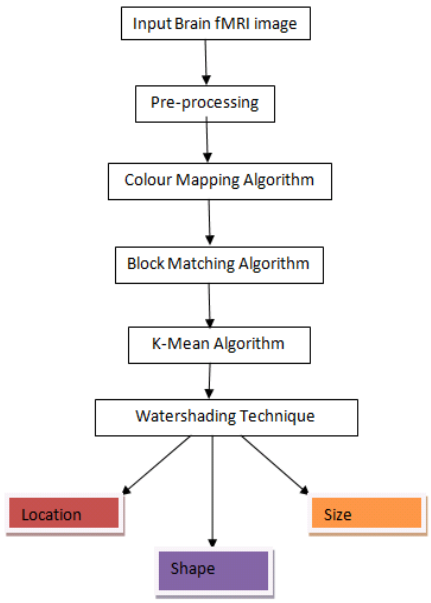


Figure 2: Block diagram for clustering method

The input of this method is set of MR images for single patient study. The output is a also slices of images which contains tumor location and also the location name and also the size of the tumor. Here the size can be calculated in percentage. The tumor location must be covered by the box, that box having a parallel line which creates the box on the tumor.

Here some novel based algorithms are used, they are

Parallel Bounding box method
Mean shift boxing method
Bhattacharya efficient method
Colour mapping algorithm
K – Means clustering
Fuzzy Means clustering
Watershed algorithm

D. PBB (Parallel Bounding Box method):

The each input MR images, PBB first locates the right – left axis of the symmetry of the brain.

PBB operates in two methods:

First, the input of the 2D or 3D MR images are processes to determine the axis – parallel square or rectangles or depends on the tumor shape. Next, the box are clustered to above the image which the pixel having different value in the image, the box will not create exactly above the tumor, this process will be done by using MSB method.

E. Mean Shift Boxing method:

The mean shift boxing method is one of the non – parametric space analysis technique, so it is also called as the seeking mood algorithm and also called as Mean shift clustering method.

The MSB can be used to provide the box on the exact location of the tumor, which depends on the pixel values on the images. For Example, the tumor contained location having a pixel value 1 and the absence of tumor contained location having a pixel value 0. Depends on this pixel value the location can be identified and provide the Parallel box on the tumor.

F. Bhattacharya Efficient Method:

The Bhattacharya efficient method can be used to measures the similarity of the two discrete or continues probability distributions. This is closely related to the amount overlapping between the two samples. The calculations involved integration of overlap of the two signals or samples. This can be used in each partition of the following formula,

$$\mathbf{BC} = \sum_{i=1}^{n} \sqrt{(\Sigma \mathbf{a}_i \cdot \Sigma \mathbf{b}_i)}$$

Which denotes the two normalized histogram a_i and b_i

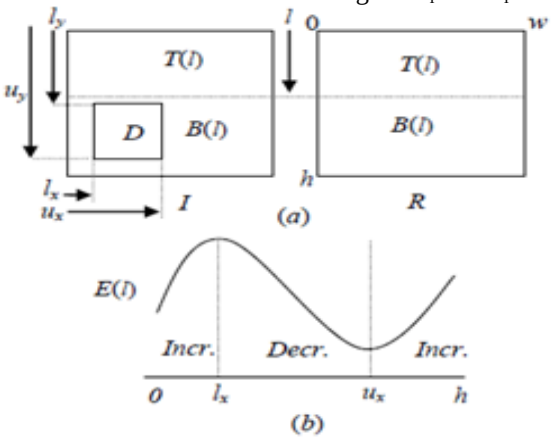


Figure 3: Tumor identified using PBB, MSB and BE

G. Location Identification:

The efficient methods are present in diagnosis are human inspection, biopsy and experts opinion etc. In general, biopsy method takes around ten to fifteen days of time to take result about the tumor. The human prediction is always not at all correct so it becomes wrong but the computer cannot do. The experts cannot be take own decision himself he again refers another experts opinion, this process continues for long time. In this proposed method the exact location and name of the location for the better recognition about tumor. Location of tumor is found by using the Block Matching Algorithm. This Algorithm finds the four coordinates vertical and horizontal (maximum and minimum) to draw the shape of the abnormal position.

H. Determining Location and Side where the tumor is Present:

Color mapping algorithm maps each pixels of the input image to the gray scale chart and compares the pixel values. The abnormal region shows great variation in the pixel value. Thus, the particular region showing the great variation in pixel identified as abnormal region. Gray Scale Chart contains the Combined RGB of different intensity. The Block Matching Algorithm is used for obtaining four co-ordinates value namely two horizontal co-ordinates and two vertical co-ordinates of the identified abnormal region. Finally, the four co-ordinates is joined and box is drawn around the abnormal region. Thus, based on co-ordinates the location of the abnormal region (tumor) is identified. The input image after colour mapping identify the abnormal portion of the brain and that particular region is located using the block matching algorithm where all four co-ordinates is obtained and location of the abnormality is identified.

I. Clustering To Differentiate the Pixels:

The K-mean algorithm and Fuzzy means algorithm is clustering algorithm which initially group random pixels into 'n' number of cluster. The cluster then iterated every time where the centroid value of the cluster is computed. Then, Euclidian distance between centroid and neighboring pixel is computed. The pixels with minimum Euclidean distance are grouped together and the cluster undergoes adjustment process. At every iteration, mean square value is computed and the iteration continues until the mean square value gets converged. And finally cluster containing pixels of inter similarity is grouped together. Using this algorithm we can group normal region pixels into single cluster and abnormal region cluster into single cluster.

J. Determining the Shape and Size of Tumor:

A set of markers, pixels where the flooding shall start, are chosen. Each is given a different label.

The neighbouring pixels of each marked area are inserted into a priority queue with a priority level corresponding to the gray level of the pixel. The pixel with the highest priority level is extracted from the priority queue. If the neighbours of the extracted pixel that have already been labelled all have the same label, then the pixel is labelled with their label. All non-marked neighbours that are not yet in the priority queue are put into the priority queue. Redo step 3 until the priority queue is empty.

Figure 4: Tumor location in brain

K. Clustering Technique:

Clustering technique is used group the normal and abnormal pixel in the image. The clustering technique used is K-means. K-mean takes any three centroid from that point they start to group the pixel after grouping the normal and abnormal pixels are separated.

L. Finding Size of Tumor:

Watershed Algorithm is used to find the exact outline of the tumor. Watershed algorithm uses the clusters grouped by the previous algorithm to find the precise shape of the tumor in the tumor. Clustering technique for finding the location ,size and side of brain tumor location in the brain. The input given as fMRI image. To increase the standard of the image pre –processing is done . Image is converted into gray-scale image then by using the color mapping technique finding odd pixel from the image. Abnormal pixel grouped and form the block using the Block Matching Algorithm. K-Mean and Fuzzy means algorithm is used find the normal and abnormal pixel from the image. Water shed Algorithm find the outline of the tumor from that we can find the size of the tumor.

II. EXPERIMENTAL RESULTS:

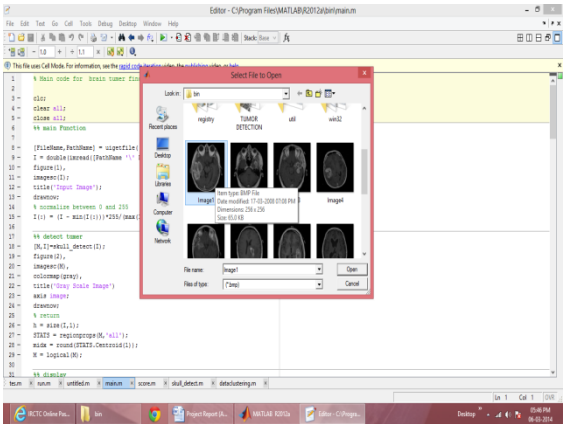


Figure 5(a): Input Image

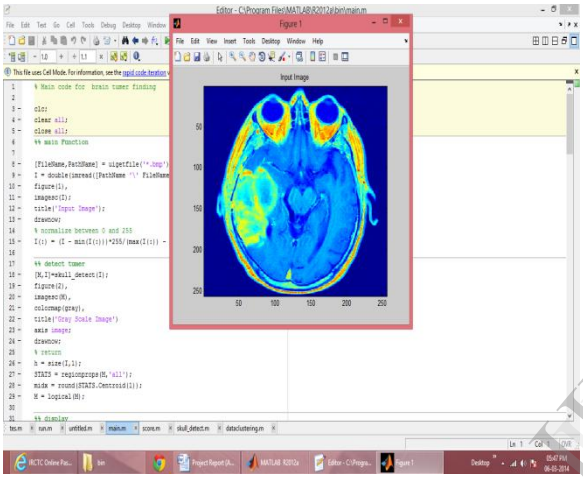


Figure 5(b): Input Mask Image

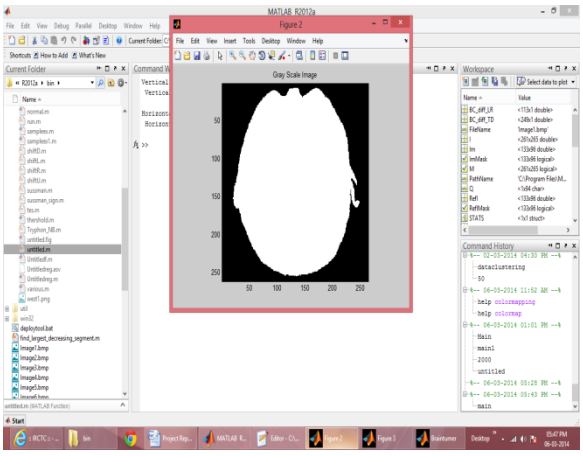


Figure 5(c): Gray scale image

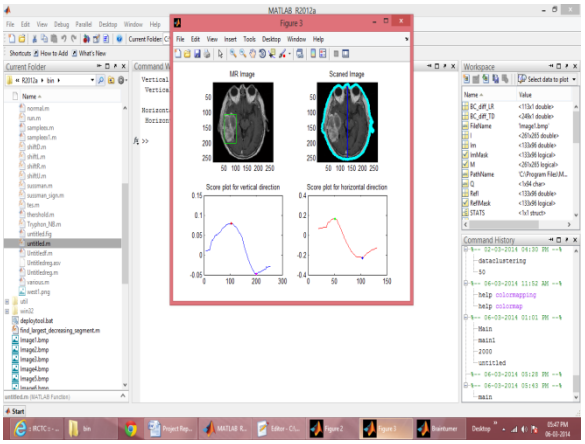
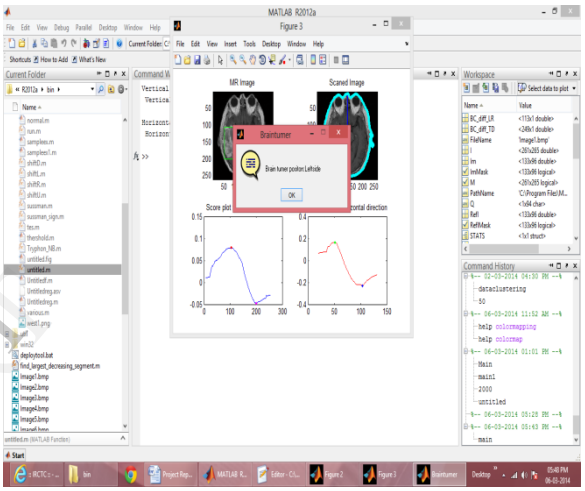


Figure 5(d): Tumor will be detected using PBB, MSB and BE



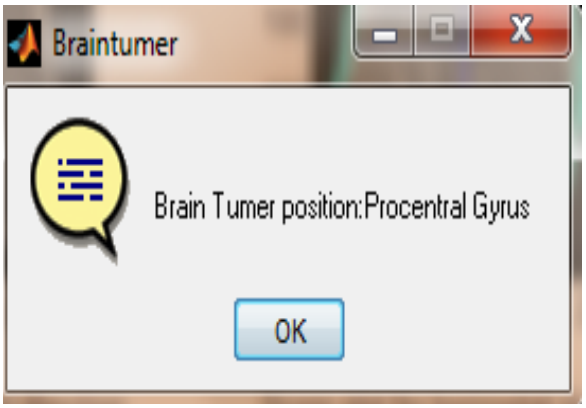


Figure 5(e): Brain tumor Position name

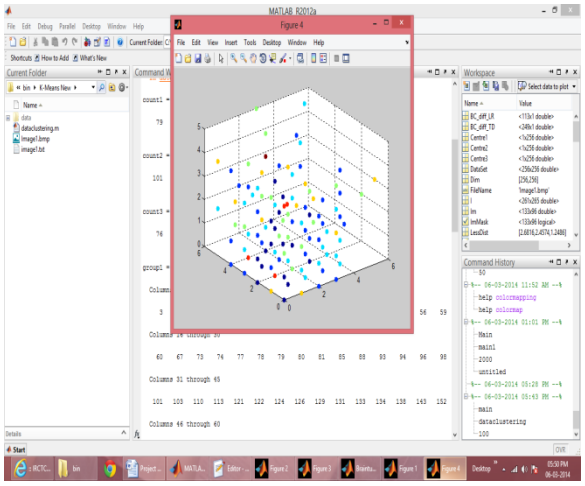


Figure 5(f): Clustering Output

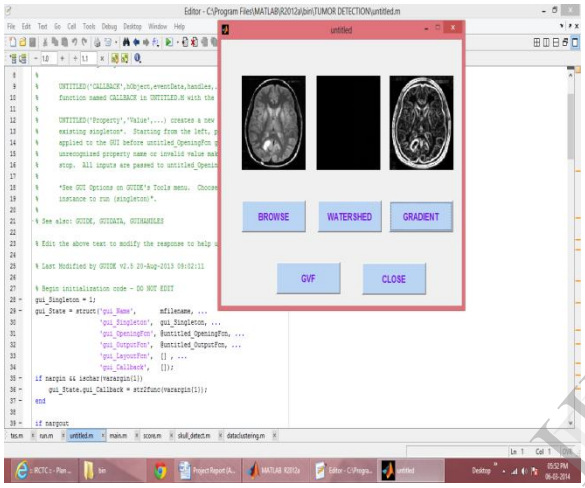


Figure 5(g): Watershed Method Output

III. CONCLUSION:

This method is efficient for analyse the tumor identification for doctors and pathologist. This process makes right decision on right time. The autonomous brain tumour detection not only detects the location of tumour but also reveals the size of tumour. Based on the size of tumour doctor can detect the stage of tumour.

Thus, this automatic tumour detection technique is optimal and simple.

IV. FUTURE ENHANCEMENT:

In future planned to works with large number of brain structures.

The Future work for our project focuses on use of Classifier algorithm because in present work the number of iteration should be mentioned explicitly.

In order to overcome this, classifier algorithm should be used where the algorithm automatically helps to decide the iteration for every given input.

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