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Tumor Detection and Measurement from MR Image using Segmentation

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Abstract—Tumor cancer is one of the dangerous cancer diseases and can cause a large amount of death every year all around the world. Normally tumor cells are of two different types, they are mass and malignant. Their detection is always requires special attention for the researchers in field of image processing. Image segmentation is one of most important and fundamental approaches of digital image processing and widely being used for the specific suppose of detecting and measuring the size of tumor in the human body. This paper represents the extensive Segmentation algorithm to tumor Detection and measuring from MR Image using segmentation. First, an input image is converted into fixed size then prepossed by Gaussion law pass filter which is improve the qulity of an image. Then the image is segmented using the thresholding method in which by selecting the threshold value an image is segmented. Then using region of interest the segmented image is cropped and then after measuring the size of segmentation image using pixels for the tretment planning. And also there is post processing for morphological operations. This algorithm is much simpler and less complex in the calculation.

Keywords--*Magnetic resonance Imaging, brain tumor, Area calculation, ROI, thresholding, Gaussian law pass filter, erosion and dilation.*

I. INTRODUCTION

This paper presenting review indented to give an overview of the state of the art in magnetic resonance imaging (MRI)-based medical image analysis for brain tumor detection and size measuring studies. Here a prevalence of 1<0% in the Indian population, brain tumors are not very common. Tumor is even and anon associated with a neoplasm, which is caused by uncontrolled cell proliferation. Brain tumor detection is very challenging problem due to complex structure of brain. The exact boundary should be detected for the proper treatment by segmenting enhanced cells.

Brain tumor Detection and Measuring can be done in different stages i.e.

1) Input Brain Image

In this, first Stage it start with the input brain image is using most commonly techniques like Computed Tomography

(CT), Magnetic Resonance imagining (MRI) [5] Positron emission tomography (PET) [12] and is used to locate brain tumor.

2) Preprocessing

Now this stage the preprocessing step converting the image, reduce the noise [4] and enhance the image for further processing [9].

3) Segmentation

After enhancing the brain CT, MRI or PET image, the next step of our proposed technique is to segment the brain region from brain image. This process in which the image is sub-divided into regions parts that are meaningful. The meaningful region can be complete or a part of the object [11].

4) ROI (Region of interest/ Crop the image [1]

Complete above all stage we get a one segmented image in which there is clearly able to see the detected tumor.

5) Post-processing

After completion of segmentation process several morphological operations are applied on the image to extract the brain image so that area of focus can be clearly highlighted and easy to measure the size of the segmented image.

Normally tumors cells are two types. There are Mass and Malignant. The detection of the malignant tumor is somewhat difficult to mass tumor [4].

The main objectives of Image segmentation are to detect the tumor after measuring the size of Segmented brain Image.

II. SEGMENTATION TECHNIQUES

The manual image segmentation of the tumor is very time consuming process, and hence we should concentrate on automatic and accurate segmentation image. Automatic localization of brain tumor that can be imaged by Magnetic Resonance Image (MRI) modality can be explored; such methodology could be based on Iterative closest point (ICP) matching technique by using axial MRI symmetry [2].

The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. The result of image segmentation is a set of segments that collectively cover the entire MRI brain image, or a set of contours extracted from the MRI brain image.

A. Thresholding

Thresholding techniques can be used for MRI brain tumor segmentation. According to intensity/brightness is a simple technique for images which contain solid objects on a background of different but uniform, brightness. Each pixel is compared to the threshold: if its value is higher than the threshold, the pixel is considered to be" foreground" and is set to white, and if it is less than or equal to the threshold it is a considered "background" and set to black [12].

Thresholding based segmentation the image is considered as having only two values either black or white. But the bit map image contains 0 to 255 gray scale values.

A grayscale image is turned into a binary (black and white) image by first choosing a gray level T in the original image. After completion of selecting a gray level image, turn every pixel black or white according to whether its grey value is greater than or less than T:

A Pixel becomes:

White if its grey level is > T,

Black if its grey level is<= T [12].

It will be transformed into image using "**imshow**" command as shown in below figure (2).

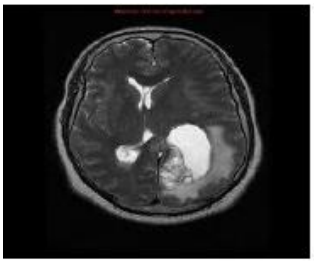


Fig. 1. Original image

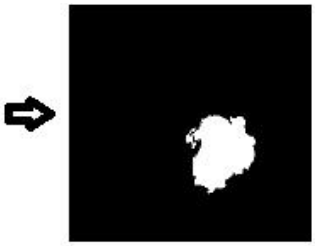


Fig. 2. Threshold Segmented Image

B. Clustering:

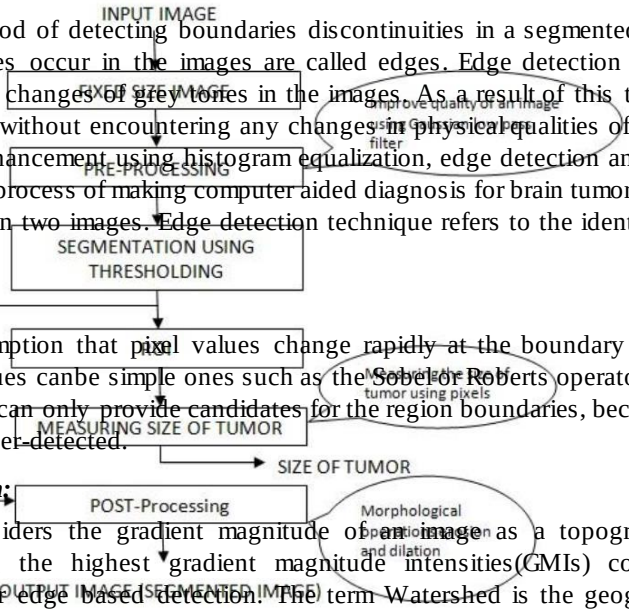
The Method of clustering organizes the objects into groups based on some feature, attribute or characteristic. Hence a cluster consists of groups of similar objects. Clustering can be supervised and unsupervised. In supervised approach, the criteria for clustering are specified by the user. In unsupervised approach, the criteria are decided by the clustering system itself. A Survey of clustering-based image segmentation methods can be found [11].

C. Region growing:

Region growing methods have region are iteratively grown by comparing all unallocated neighboring pixels to the regions. Used this method for the boundaries between region based on discontinuities in intensities (gray-level or color-level) [11]. It is a pixel -based image segmentation technique because it is parts the captured initial seed points. This approach to segmentation examines neighboring pixel of initial seed points and determines whether the pixel neighbors should be added to the region [12].

D. Edge-detection based:

It is far the most common method of detecting boundaries discontinuities in a segmented image [1]. The parts on which immediate changes in gray tones occur in the images are called edges. Edge detection techniques transform images to edge images benefiting from the changes of grey tones in the images. As a result of this transformation, edge based brain segmentation image is obtained without encountering any changes in physical qualities of the main image [13]. This image processing consist of image enhancement using histogram equalization, edge detection and segmentation process to take patterns of brain tumors, so the process of making computer aided diagnosis for brain tumor grading will be easier [10]. Edge is nothing but boundary between two images. Edge detection technique refers to the identification and locating the sharp discontinuities in the image.



E. Boundary based method:

This method is used the assumption that pixel values change rapidly at the boundary between two regions [7]. Edge detectors used in these techniques canbe simple ones such as the Sobel or Roberts operators, or more complex. The output of most existing edge detectors can only provide candidates for the region boundaries, because these obtained color edges are normally discontinuous or over-detected.

F. Watershed transformation:

Watershed transformation considers the gradient magnitude of an image as a topographic surface [12]. Watershed transformation is pixal having the highest gradient magnitude intensities(GMIs) correspond to watershed lines. Watershed method comes under edge based detection. The term Watershed is the geographical. The rain that falls on either side of the watershed linewill flow into the same lake of water. This idea can be fruitfully cashed in the digital images[8]. The aim of watershed is to search the areas having high intensity gradients (watersheds) that divide neighbored local minima(basins) [8].

III. ALGORITHM

An algorithm for image segmentation in which there are different steps like fixed size image, preprocessing, segmentation (Thresholding Method) and post processing.

First Start with MRI Image, Brain Images is considered as an input by MRI scan of brain and the output of MRI p rovides gray scale images. A MR image gives better result compare to other technique used in the field of medical science like CT images and X-rays [14].

The main purpose of Preprocessing step there is one input MR image and removing noise or reduces the noise and improves the image quality for detecting the correct tumor. Image is converted to gray scale [9]. Grayscale conversion and histogram equalization are applied on the images as a part of preprocessing the image [5].
Segmentation is an important process to extract suspicious regions from MRI brain images. MRI brain image segmentation is done in order to change and MRI image in to more meaningful from which will make it easier for us to identify the tumor in the brain [5]. This segmentation process is occurs using the thresholding method. On this segmented image ROI is applying and select the region for cropping an image and then measuring the approximate size of tumor for treatment planning. For automatic tumor detection here the final step is of erosion and dilation of a segmented an image.

Fig. 3 Algorithm for detecting tumor and measuring its size
using thresholding method

Input Image

Input image is a fixed size T2 type MR image in JPEG
Format

Fig. 4 Input image

Fixed size image

Here an input image is converting into fixed size image 256x256.

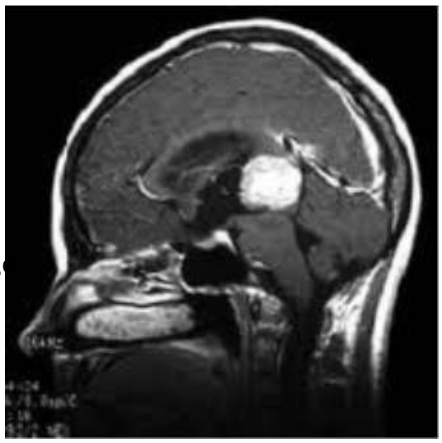


Fig. 5 Fixed size imag

Pre-processing

Pre processing is the key step for the imagesegmentation. At preprocessing step there is one inputMR image and removing noise or reduce the noise.The main purpose of this step is to improve the imagequality for the further pro cess to detecting the correcttumor.Smooth the fixed size input image and removing noiseusing Gaussian low pass filter.H (u ,v)=$e^{-D*D(u,v)/2*D0*D0}$ D0 is cutoff frequency

Fig. 6 Filtered image

Segmentation Using Thresholding

After the pre-processing, the MR Image (MRI) is apply to the next step as a input to segment the image using the our proposed technique i.e. thresholding technique in this step we are selecting the threshold value between 0-256 because our image of fixed size image of 256X256. Here threshold value is selecting as 175 because at the threshold value 175 the image segmentation proving best results then other threshold values. And this value is selecting after the testing on many images.

In this stage if the threshold value is <175 then the pixel value is change to 0 and if threshold value is >175 then pixel value is changed to 1 and then we get a segmented image and on that image we can do many other operations on it as we required for the measuring the size of tumor.

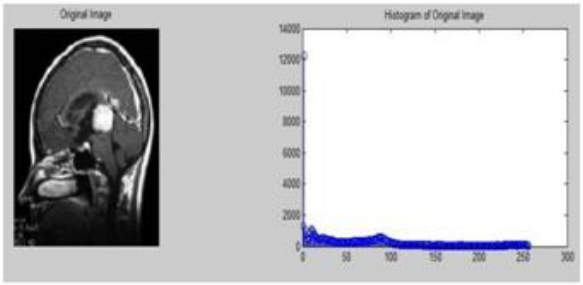
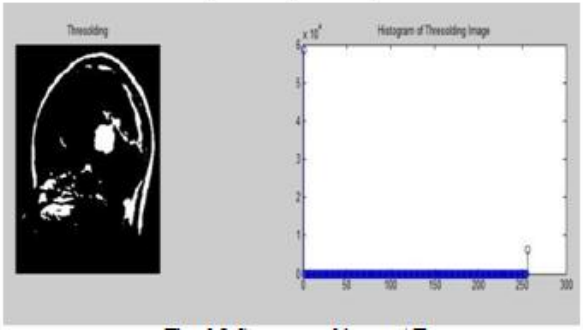


Fig. 6.1 Original image



ROI (Region of Interest) /Crop the image

After Segmentation process we get A one segmented image in which there is clearly able to see the detected tumor and after to measure the size of the image applying ROI (Region of interest) method on the obtained segmented image. ROI is the process for selecting the area in the image. ROI is used for the cropping of the image, so this step crops the detected tumor.

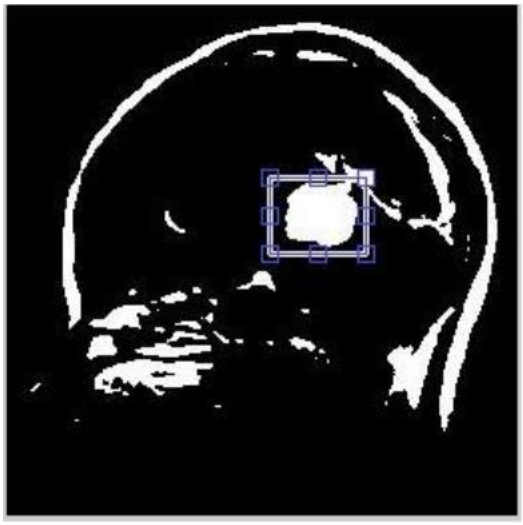


Fig. 7 ROI Iamge

Measuring the size

In this process the input image is cropped image using ROI method. Here, to measuring the size of the tumor based on the pixels of the segmented image. After getting the pixels we convert them in to the mm.

For measuring size first count the number of pixels in the segmented are and based on that counting number of pixels system can able to calculate the size in mm.

Fig. 8 Cropped image/ Tumor

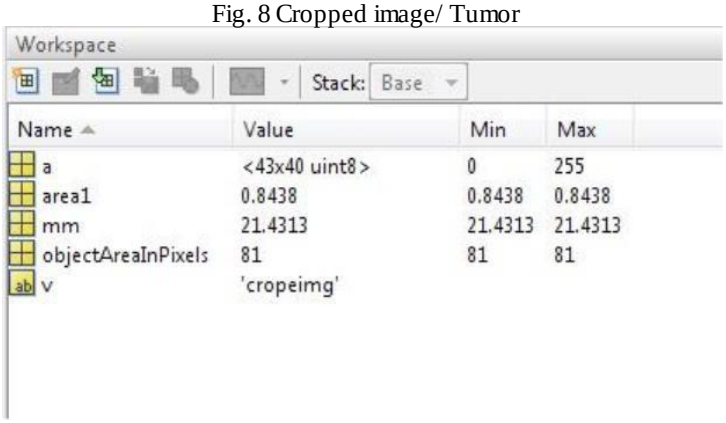


Fig. 9 Tumor size in mm

Post-processing

Postprocessing is the step where apply the morphological operations to extract the image. Here for morphological operations we use erosion and dilation technique. After erosion and dilation system give automatic tumor detection.

Erosion:

Erosion of A by B is denoted as below A θ B = {z l (B), ((A }[13] Here the B is commonly referred as structuring elements.

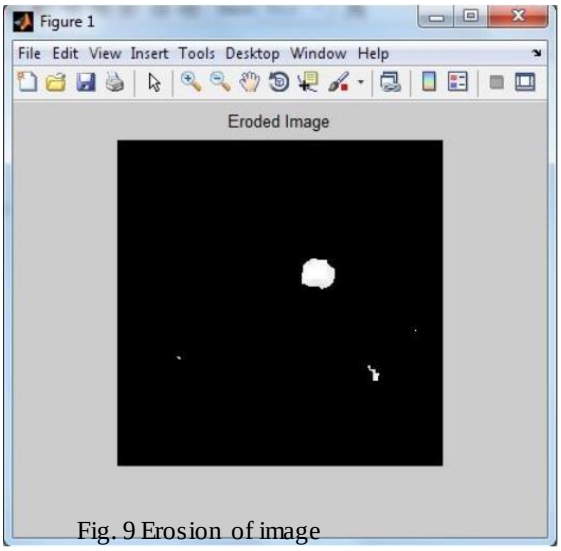


Fig. 9 Erosion of image

Dilation:

Dilation of A by is denoted as below *A al B = {z l(B),n A* * 0 }[13] Here the B is commonly referred as structuring elements.

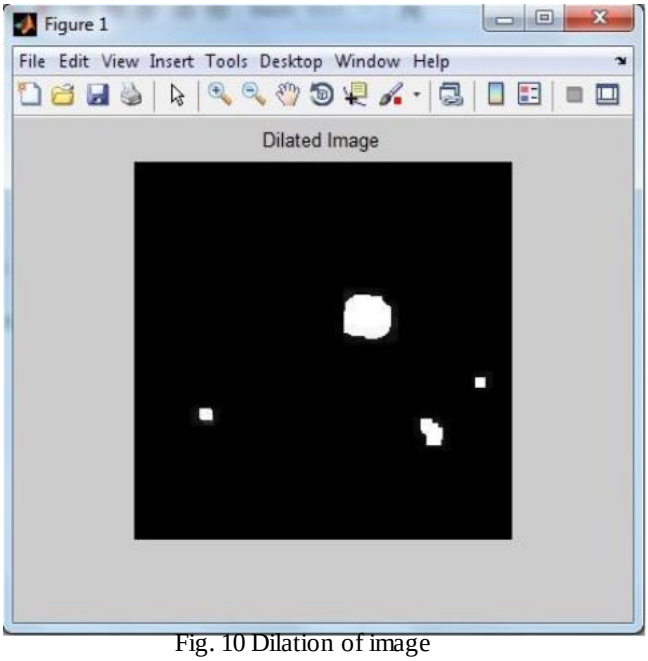


Fig. 10 Dilation of image

IV. CONCLUSION

It is conclude that MR image segmentation is one of the essential tasks in detecting tumor size in medical area. It is concluded that the segmentation methods giving the segmented image or result of the MR image to detect the tumors and

also measuring the size of the tumor or segmented image. It is also observed that Thresholding method followed by Region of Interest (ROI) can give better and accurate results as compared to other methods in detecting and measuring tumor size. So here an algorithm is developed that is able to detect the tumor or giving a good result for the segmentation and measuring its size which is used for the tertment plamnning.

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