RESEARCH ARTICLE OPEN ACCESS

An Image Segmentation to Detect Tumor and Measuring Size of Tumor Using Segmentation of MR Image

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ABSTRACT
Medical image segmentation is the research focus in the medical image processing field. Detection of tumor requires image segmentation. The segmentation of tissues and tumors in magnetic resonance images has been an emerging field in research. There are several techniques used for tumor detection using MR image segmentation. This paper presents a segmentation algorithm to MR image which is able to detect the tumor in the MR image and also able to measure the size of the segmented image for treatment planning. First, an input image is converted into fixed size then preprocessed by Gaussian law pass filter which improve the quality 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 segmented image using pixels for the treatment planning. And also there is post processing for morphological operations. This algorithm is much simpler and less complex in the calculation**.**

Keywords **-** Gaussian law pass filter, thresholding, Region of interest (ROI), erosion and dilation.

I. INTRODUCTION

For analysis of an image, image segmentation is a key step. Image segmentation means to the process of partitioning a digital image into multiple segments (sets of pixels, also known as super pixels)[12]. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. Thus image segmentation is concerned with partitioning an image into multiple regions according to some homogeneity criterion. 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, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics.The result of image segmentation is a set of segments that collectively cover the entire image.

II. TECHNIQUES OF IMAGE SEGMENTATION

Thresholding [13] - The simplest method of image segmentation is called the thresholding method. This method is based on a clip-level (or a threshold value) to turn a gray-scale image into a binary image.
Clustering methods - The K-means algorithm is an iterative technique that is used to partition an image into K clusters.

Compression-based methods [13] - Compression based methods postulate that the optimal segmentation is the one that minimizes, the coding length of the data and over all possible segmentation,. The connection between these two things is that segmentation tries to find patterns in an image and any regularity in the image can be used to compress it. The method describes each segment by boundary shape and texture.

Edge detection - Edge detection is a developed field in image processing. Region boundaries and edges are related to each other; since there is often a sharp change in intensity at the region boundaries. The edges identified by edge detection are often detached. To segment an object from an image however, one needs closed region boundaries. Edge is nothing but boundary between two images. Edge detection technique refers to the identification and locating the sharp discontinuities in the image.

Region growing methods [8] - The region growing method was the seeded region growing method. This method takes a set of seeds as input with the image. This seeds mark each objects for the segmentation of an image. The regions are grown by comparing all unallocated neighboring pixels to the regions. The difference between a pixel's intensity value and the region's mean is used as a measure of similarity. The pixel with the minimum difference measured this way is allocated to the relevant region. This process continues until all pixels are allocated to a region.

Watershed transformation [11] [14] - The watershed transformation considers the gradient magnitude of an image as a topographic surface. Pixels having the highest gradient magnitude intensities (GMIs) consider as watershed lines, which

represent the region boundaries. Water placed on any pixel enclosed by a common watershed line flows downhill to a common local intensity minimum (LIM). Pixels draining to a common minimum form a catch basin, which represents a segment of that image.
Neural networks segmentation [6] [15] - Neural Network segmentation relies on processing small areas of an image using an artificial neural network or a set of neural networks. After processing the decision-making mechanism marks the areas of an image accordingly to the category recognized by the neural network.

III. APPLICATIONS

- To Medical imaging - Medical Diagnosis - Automatic segmentation of MRI images for identification of cancerous regions
- Mapping and Measurement- Automatic analysis of remote sensing data from satellites to identify and measure regions of interest.
- Image Compression - Segment the image into homogeneous components, and use the most suitable compression algorithm for each component to improve compression.
- Locate objects in satellite images (roads, forests, etc.)
- Face recognition
- Fingerprint recognition
- Traffic control systems
- Brake light detection
- Machine vision

IV. ALGORITHM

A conclusion Here as below there is a algorithm for the image segmentation in which there are different steps like fixed size image, Preprocessing, segmentation and post processing. .preprocessing stage are used for reduce noise from the input image so the quality of an image is increased. And then after the main stage of the process is segmentation in which. 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.

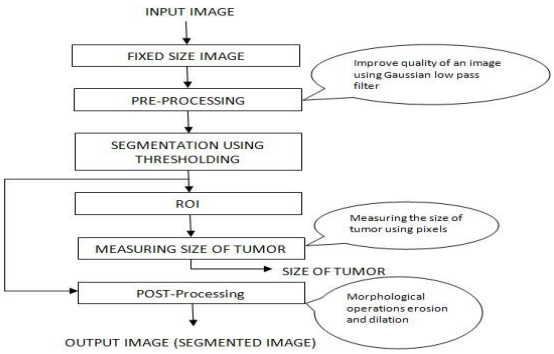

Figure 1 An algorithm for detecting tumor and measuring tumors size for treatment planning

Input Image
Input image is a fixed size T2 type MR image in JPEG format

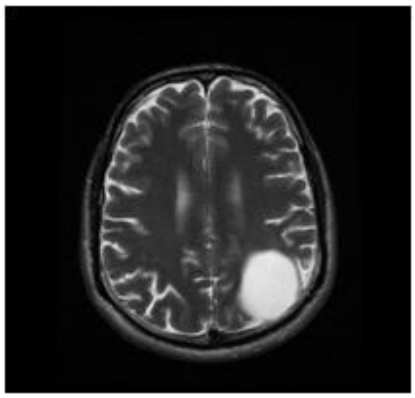

Figure 2 input image

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

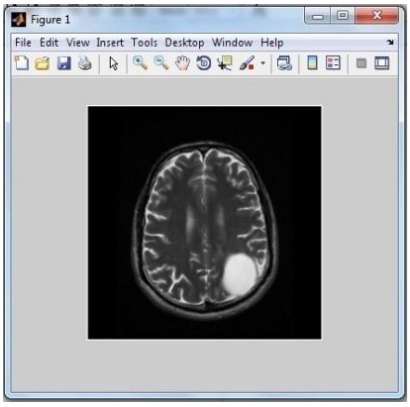

Figure 3 Fixed size image

Pre-processing [13]
Pre processing is the key step for the image segmentation. At preprocessing step there is one input MR image and removing noise or reduce the noise. The main purpose of this step is to improve the image quality for the further process to detecting the correct tumor.
Smooth the fixed size input image and removing noise using Gaussian low pass filter.
$H(u,v)=e^{-D*D(u,v)/2*D0*D0}$ D0 is cutoff frequency

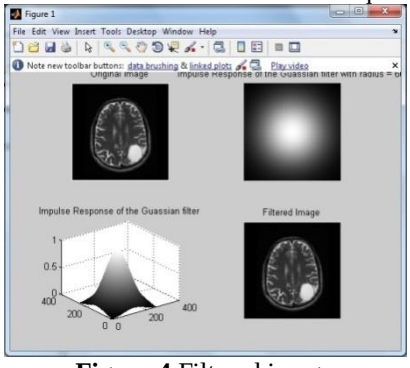

Figure 4 Filtered image

V. 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.

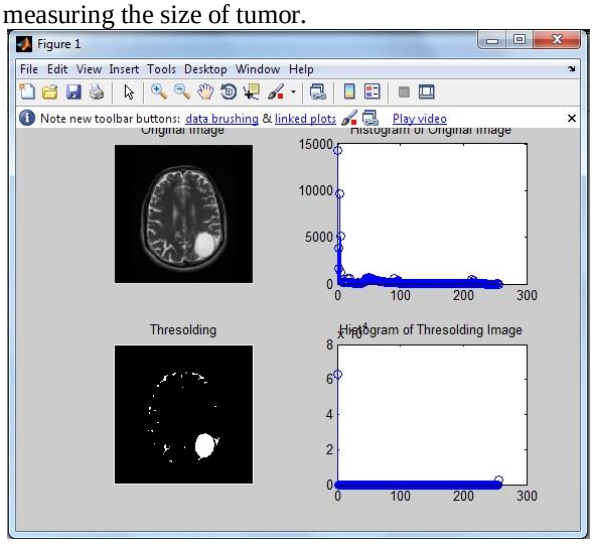

Figure 5 Segmented image/Tumor

VI. 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 that 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 and measuring its size in next stage or process.

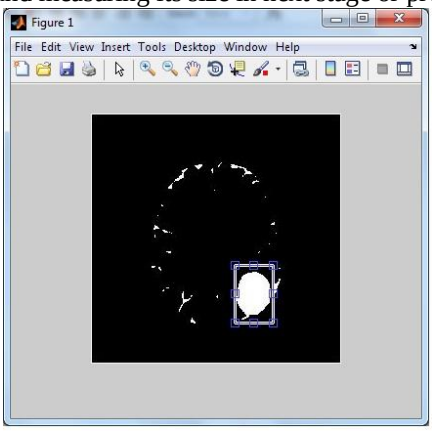

Figure 6 ROI Image

VII. 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 area and based on that counting number of pixels system can able to calculate the size in millimeter.

Figure 7 cropped Image/Tumor

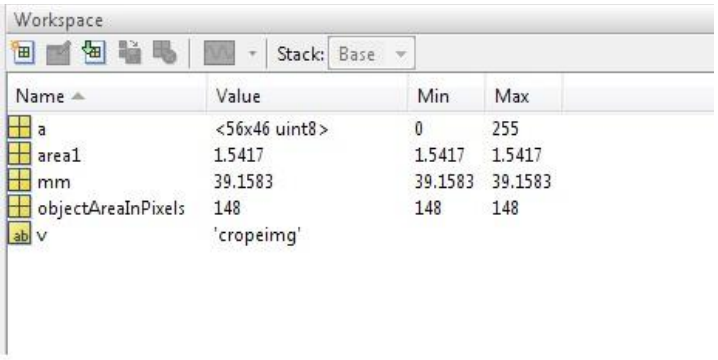

Figure 8 Tumor's size in mm

Post-processing

After segmentation process and ROI the next process is the post processing in which several operations are applied on the image to clearly locate the tumor in the MR image.

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

Erosion:

Erosion of A by B is denoted as below

$A \theta B = \{z \mid (B), ((A\}$[13]

Here the B is commonly referred as structuring elements.

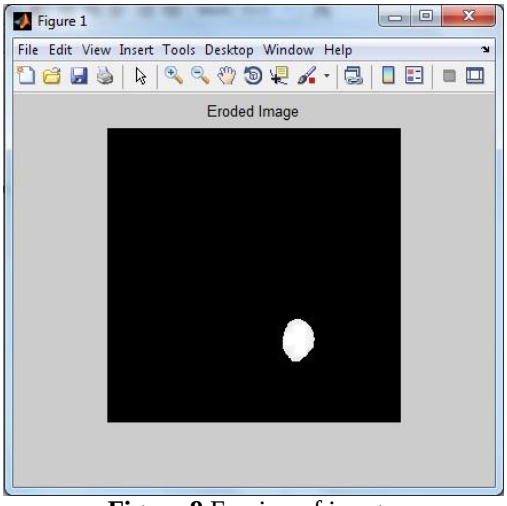

Figure 9 Erosion of image

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.

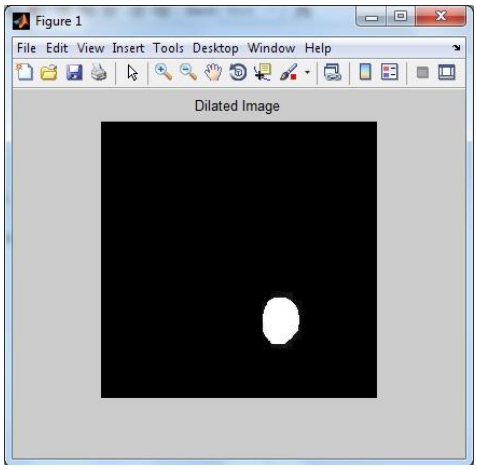

Figure 10 Dilation of image/automated detected Tumor

VIII. System requirement

Above algorithm is performed on the system having Processor Intel® Core™ Duo CPU T6400 @ 2.00 GHz ,RAM 1.00 GB,32 bit operating system and installed software is MATLAB 7.8.0(R2009a)

IX. Conclusion

It is concluded that the methods like edge detection is not giving the good segmented image or result of the MR image to detect the tumors and also not measuring the size of the tumor or segmented image which is used for treatment planning. 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 treatment planning. This is measuring true size only for the images having 96 dpi.

REFERENCES

[1] Subhranil Koley and Aurpan Majumder "Brain MRI Segmentation for Tumor Detection using Cohesion based Self Merging Algorithm" IEEE,2011

[2] Zhu Zhengtao, Yu Xiongyi, Huang Liuqian, Wu De "Fast Capsule Image Segmentation Based on Linear Region Growing" IEEE, 2011

[3] Ayan Chaki, Pragya Jain, Rohit Kumar Gupta "Information Measure Ratio Based Real Time Approach for Hand Region Segmentation With a Focus on Gesture Recognition" IEEE,2011

[4] Qing Ming,Kang-Hyun Jo "Vehicle Detection Using Tail Light Segmentation" IEEE,2011

[5] Huan-Wen Tzeng, He-Chin Lee, Mei-Yung Chen "The Design of Isotherm Face Recognition Technique Based on Nostril Localization" ICSSE, 2011

[6] Ehab F. Badran, Esraa Galal Mahmoud, and Nadder Hamdy "An Algorithm for Detecting Brain Tumors in MRI Images" IEEE, 2010

[7] *Qiang Chen, Benben Xue, Quansen Sun, Deshen Xia* "Interactive image segmentation based on object contour feature image" IEEE, 2010

[8] MAO Xinyan, ZHANG Ying, HU Yanxiao, SUN Binjie "Color Image segmentation method based on region growing and ant colony clustering" IEEE,2009

[9] Jianjun, Yin,Hanping, Mao, Yongliang, Xie "Segmentation Methods of Fruit Image and Comparative Experiments" ICCSSE,2008

[10] Yong Zhu, Naixue Xiong, Ruhan He "A Two stage image segmentation method based on watershed and fuzzy c-means" IEEE,2008

[11] "Image Analysis and Communications Lab", http://www.iacl.ece.jhu.edu/static/gvf

[12] "Image Segmentation" http://en.wikipedia. org/wiki/Segmentation_(image_processing)

[13] Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing," 2nd Edition, New Jersey: Pearson Prentice Hall, 2008.

[14] "Grid-Based Genetic Algorithm Approach to Colour Image Segmentation http://people.cs.uct.ac.za/~mgallott/honsproj/ watershed.html

[15] K.Srinivas, Dr. V.Srikanth "A Scientific Approach for Segmentation and Clustering Technique of Improved K-Means and Neural Networks" IJARCSSE, 2012