

Brain Tumor Segmentation from MRI images and volume calculation of Tumor

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ABSTRACT: Oncogene causing Cancer is mainly a tumor oriented disorder which has been found in various parts of the body, specialized into its particular types. The study of uncontrolled histological growth due to apoptosis has become a very important field of Cancer biology. Extracting quantitative data from MRI imaging source helps to understand the functions of different outgrowth clefts. However, such approaches are applicable in the case of Benign Cancer, where the type of Cancer has been initialized to approach inside the body. Insilico image processing of the MRI can be considered as a high throughput for the convenience to analyze the outgrowth region. Differentiation in between the higher proximity and lower proximity has been analyzed by the MRIIS (Magnetic Resonance Image InSilico) which is built up on MATLAB. Extensive experiments are done to analyze the performance of intensity-based techniques for homogeneous tumors on brain magnetic resonance (MR) images. The analysis shows that the state-of-art methods fail to segment homogeneous tumors against similar background or when these tumors show partial diversity toward the background. Therefore, the proposed method content-based active contour (CBAC) uses both intensity and texture information present within the active contour to overcome above-stated problems capturing large range in an image. It also proposes a novel use of Gray-Level Co-occurrence Matrix to define texture space for tumor segmentation in MATLAB. In proposed work Region Growing method is used for segmenting ROI, and then by using Edge detection for boundary segmentation volume of tumor will be calculated. First task will be Region growing segmentation used for segmenting ROI (region of interest).

KEY WORDS: Region Growing Algorithm, Thresholding, Level Set Method

I. INTRODUCTION

In proposed work Region Growing method is used for segmenting ROI, and then by using Edge detection for boundary segmentation volume of tumor will be calculated. First task will be Region growing segmentation used for segmenting ROI (region of interest). In the region growing segmentation, the first aim is to determine the initial seed points. A seed point is the starting point for region growing and its selection is vital for the segmentation result. Seed selection could be done manually or automatically. In this work seed selection will done automatically. After getting ROI next step will be edge detection operation for segmenting boundary. The level set approach used to achieve an exact edges of tumor boundary which is useful in accurate estimation of its volume. In the region growing segmentation, the first aim is to determine the initial seed points. A seed point is the starting point for region growing and its selection is vital for the segmentation result. Seed selection could be done manually or automatically. In this work seed selection will done semi automatically.

A semi-interactive seed point selection which is neither fully automatic nor fully manual was introduced. The principle is a user views the image and based on the personal judgment, choose the seed point by a mouse-based point and click mechanism. Some matlab functions are employed in order to obtain an initial seed point .

After getting ROI next step will be edge detection operation for segmenting boundary.

The level set approach used to achieve an exact edges of tumor boundary which is useful in accurate estimation of its volume.

The segmentation process of proposed method can be divided into six parts:

1. Intensity and texture characterization map
2. Edge map estimation
3. Static motion field (SMF) estimation
4. Dynamic motion field (DMF) estimation
5. Contour deformation
6. Final segment retrieval

II. PROBLEMS

- The problem addressed here is the semiautomatic brain tumor extraction from MRI using segmentation.
- The input for the proposed system will be the series of slices taken from different MR modalities of the same individual in the same session.
- The output will be a binary segmentation of brain tumours, where each pixel in the input images is labeled as either normal or abnormal.
- Finally the area and volume of the tumour will be measured which can be used for the treatment trials.

Main three Algorithm

- Region Growing Algorithm
- Thresholding
- Level Set Method

1. Region Growing Algorithm

The first region-growing method was the seeded region growing method. This method takes a set of seeds as input along with the image. The seeds mark each of the objects to be segmented. The regions are iteratively grown by comparing all unallocated neighbouring pixels to the regions. The difference between a pixel's intensity value and the region's mean, δ , is used as a measure of similarity. The pixel with the smallest difference measured this way is allocated to the respective region.

Partition image directly into regions, without first looking for boundaries or thresholds

Two main approaches:

1. "Bottom-up": Region Growing
 2. "Top-down": Region Splitting and Merging
- Start from a **seed point**(a point that belongs to the region you want to segment)

Algorithm:

We have a predicate

- a) Start from seed point
- b) Look at its neighborhood
- c) For each point p in nhood:
- d) If $P(p) == \text{TRUE}$ then include pin region L
- e) Else p is a border
- f) In each iteration, look at neighbors of each point in L, to save computation, "order" the points in L and don't check the points that have high score (e.g. the ones that are in the middle of the region).

2. Thresholding

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. The key of this method is to select the threshold value (or values when multiple-levels are selected).

Play with seed points & thresholds

- Criteria forthreshold selection:
- Noise level
- Borders (how welldefinedare they?)
- Topology (e.g. holes)
- In short, it's often trial and error...

3. Level Set Method

It can be used to efficiently address the problem of curve/surface/etc. propagation in an implicit manner. The central idea is to represent the evolving contour using a signed function, where its zero level corresponds to the actual contour. Then, according to the motion equation of the contour, one can easily derive a similar flow for the implicit surface that when applied to the zero-level will reflect the propagation of the contour.

The level set approach can be used as a powerful tool for 3D segmentation of a tumor to achieve an accurate estimation of its volume. A major challenge of such algorithms is to set the equation parameters, especially the speed function.

III. MATERIAL AND METHOD

1- Software Requirements –

Matlab: Matrix Laboratory is a special –purpose computer program optimized to perform engineering and scientific calculations. The MATLAB program implements the matlab language and provides a very extensive library of predefined functions to make technical programming task easier and more efficient. It provides accuracy in results.

IV. METHODOLOGY

For automatic seed selection (Seed based region growing)

The concepts of regional maximum and local maximum are used to obtain an initial seed point automatically. The algorithm can be outlined in 6 steps;

Step 1: Find the regional maxima of the image (f) within eight connected neighborhoods. This will return the binary image that identifies the location of the regional maxima in f . The Regional maxima identified are set to '1' and all others are set to '0'.

Step 2: Get the pixel intensity value of the regional maxima. Set the matrix as $n \times 1$ size, where n is the number of regional maxima.

Step 3: Eliminate the plateau pixels by the following process.

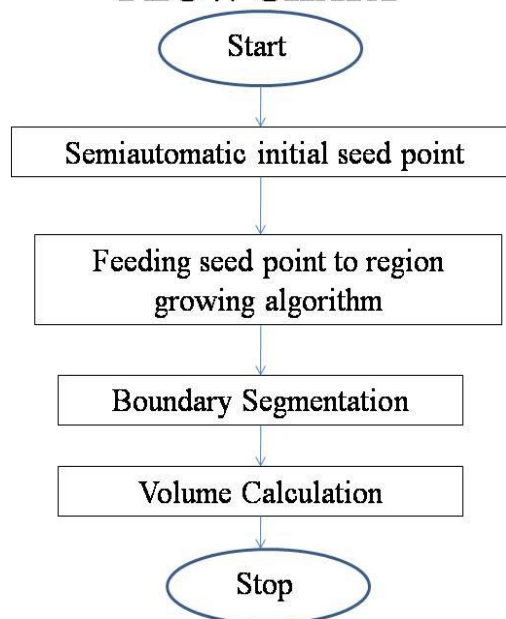
- a. Let X be a $n \times 1$ matrix which contains n regional maxima.
- b. Arrange the pixel values of X in ascending order.
- c. Determine the minimum successive adjacent differences in X and denote then as
 - b) $\Delta X, i= 1,2,3,\dots,n-1$
- a. Apply the formula= $X + \text{random}(n) \times \min\{\Delta X_i\}$

Step 4: Use the dilation operator with a suitable structuring element and appropriate radius. Based on the radius, the maximum of the consecutive pixels are determined. This is repeated until all pixels are considered as pivots. This will return a new matrix Y where each point is replaced by the maximum values obtained.

Step 5: The location of local maxima in the original set X are determined by comparing the points where $'=Y$.

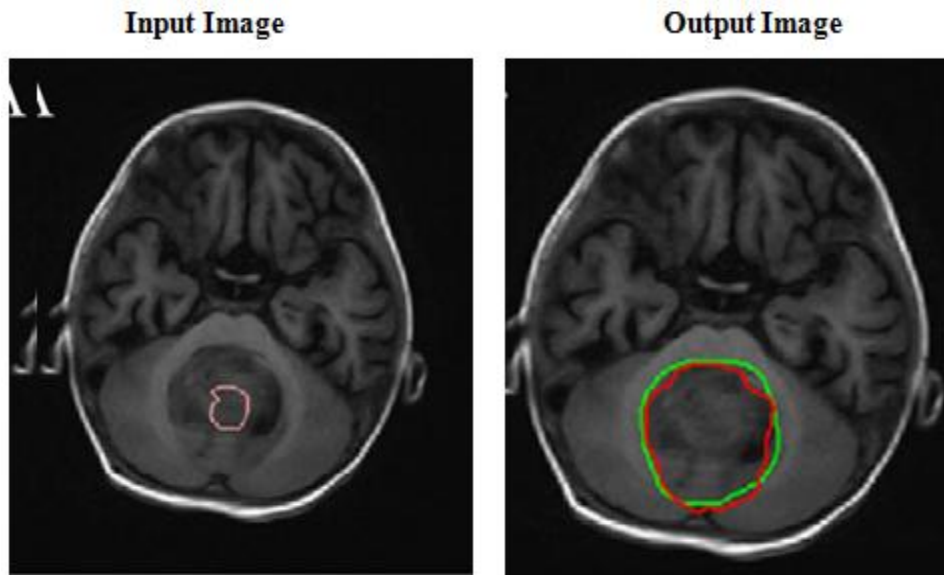
Step 6: Evaluate the average of local maxima and set the average as the initial seed point.

FLOW CHART

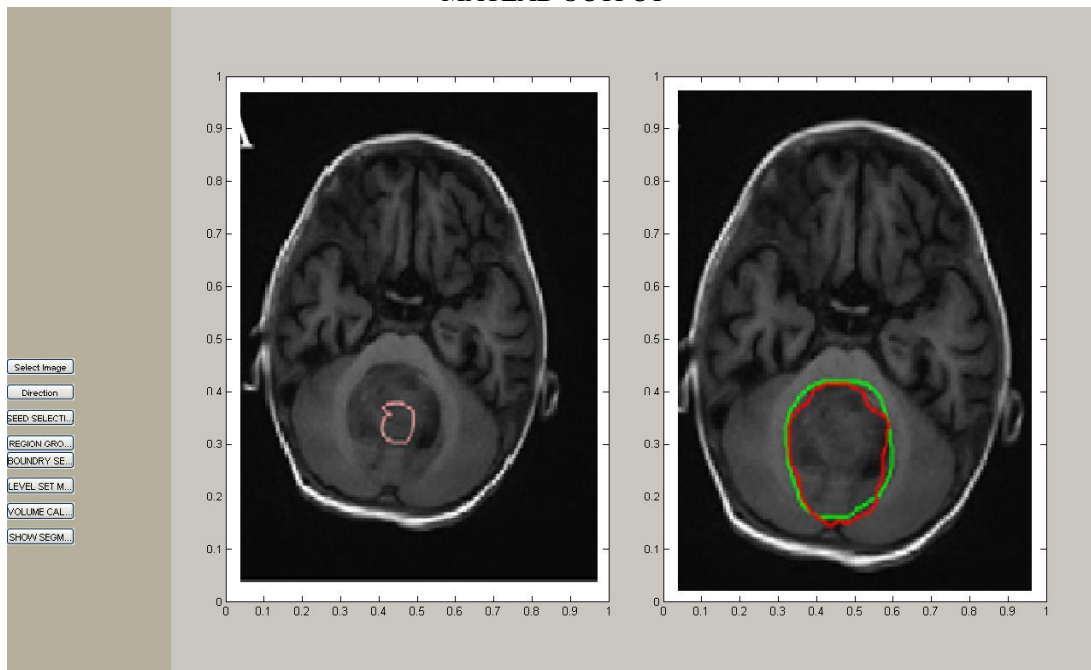


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V. 5. RESULTS & DISCUSSION



MATLAB OUTPUT



VI. REFERENCES

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