# Fully Automated Approach to Identify Brain Tumors Using Dynamic Region Merging

| Ashwini Jangde | Navneet Sahu |
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| Research Scholar, ECE Department, CSIT, Durg, India | ASST. Professor, ECE Department, CSIT, Durg, India |

**ABSTRACT** *Image segmentation is a fundamental task of computer vision application. In this paper address the automatic image segmentation algorithm ,which exploit the information obtain from deducting tumor in brain MRI. Many segmentation technic are used to deduct the tumor portion like Thresholding technic, Hybrid technic , Boundary based technic, and Region based technic but in this all technic should deducted the initial tumor tissue but when the secondary tumor present or more than one tumor are present in same brain image it is difficult to deducted the irregular tissue from the regular surrounding tissue to get real identification of involved and non involved area which help the surgeon to distinguish the total effected area covered by (primary & secondary ) tumor portion. The proposed method is DRM(dynamic region growing)to deducted the tumor boundary in region merging style .In this paper two essential issue in a region merging algorithms : order of merging and stopping criteria.in the proposed method this two issued are solved by a novel predicates ,which is defined by a sequential probability ratio test (SPRT)and minimum cost criterion. We also proved that the produced segmentation satisfied certain global properties*

## INTRODUCTION

The principle of our task is to recognize a tumor and its quantifications from a particular MRI scan of a brain image using digital image processing techniques and compute the area of the tumor by fully automated process and its symmetry analysis segmentation refers to the process of partitioning a digital image into multiple regions. There are basically three different approaches to image segmentation. First is region based, which relies on the homogeneity of spatially localized features and other pixel statistics, the second one is based on the methods of boundary finding relying on the gradient features at a subset of the spatial positions of an image (near an object boundary), whereas the third one is pixel classification approach. Additionally, image segmentation has applications separate from computer vision; it is frequently used to aid in isolating or removing specific portions of an image. Image segmentation is typically used to locate objects and boundaries in images. The result of image segmentation is a set of regions that collectively cover the entire image, or a set of contours extracted from the image. It provides additional information about the contents of an image by identifying edges and regions of similar color, intensity and texture, while simplifying the image from thousands of pixels to less than a few hundred segments. Each of the pixels in a region is similar with respect to some characteristic or computed property.

A tumor is a mass of tissue that grows out of control of the normal forces that regulates growth. The multifaceted brain tumors can be split into two common categories depending on the tumors beginning, their enlargement prototype and malignancy. Primary brain tumors are tumors that take place commencing cells in the brain or commencing the wrapper of the brain. An inferior or metastatic brain tumor takes place when cancer cells extend to the brain from a primary cancer in a different component of the body.

This paper expresses a well-organized technique for automatic brain tumor segmentation for the removal of tumor tissues from MR images. A well acknowledged segmentation trouble within MRI is the task of category voxels according to their tissue type which take account of White Matter (WM), Grey Matter (GM) , Cerebrospinal Fluid (CSF) and occasionally pathological tissues like tumor etc. A brain tumor is an intracranial mass produced by an uncontrolled growth of cells either normally found in the brain such as neurons, lymphatic tissue, glial cells, blood vessels, pituitary and pineal gland, skull, or spread from cancers primarily located in other organs [1]. Brain tumors are classified based on the type of tissue involved, the location of the tumor, whether it is benign or malignant, and other considerations. Primary (true) brain tumors are the tumors that originated in the brain and are named for the cell types from which they originated. They can be benign (non cancerous), meaning that they do not increase in a different place or attack neighbouring tissues. They can also be malignant and invasive (spreading to neighbouring area). Secondary or metastasis brain tumors take their origin from tumor cells which increase to the brain from a different position in the body.

Most existing methods are region-based. They have several advantages, but line and edge information in computer vision systems are also important. The proposed method tries to combine region and edge information, thus taking advantage of both approaches while cancelling their drawbacks. We first segment the brain to remove non-brain data. However, in pathological cases, standard segmentation methods fail, in particular when the tumor is located very close to the brain surface. Therefore we propose an improved segmentation method, relying on the approximate symmetry plane.

**Flow Chart of our Proposed Method**
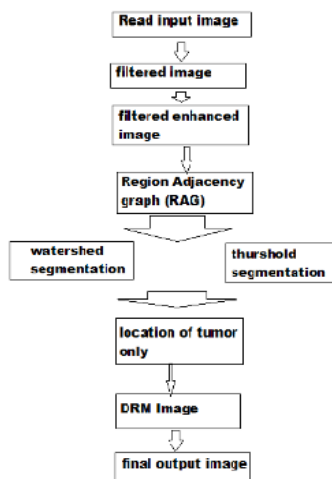
## MATERIALS AND METHODS

We have used these basic concepts to detect tumor in our paper, the component of the image hold the tumor generally has extra concentration then the other segment and we can guess the area, shape and radius of the tumor in the image. We calculate the area in pixel. Noise existing in the image can decrease the capability of region growing filter to grow large regions or may result as a fault edges. When faced with noisy images, it is generally convenient to pre-process the image by using median filter. Median filters have the robustness and edge preserving capability of the classical median filter. In pre-processing some fundamental image enhancement and noise lessening procedure are applied. Apart from that dissimilar traditions to identify edges and doing segmentations have also been used. The intention of these steps is fundamentally to recover the image and the image superiority to get more guarantee and ease in identify the tumor. The noise is reducing by the conversion of grey scale image. Then this grey scale image pass in to the filter. We use here a high pass filter im filter function in matlab to filter an image, replaces each pixel of the image with a weighted average of the surrounding pixels. The weights are determined by the values of the filter, and the number of surrounding pixels is determined by the size of the filter used. Then the grey image and filtered image are merged together to enhanced the image quality. Here we use Median filtering which is a nonlinear operation often used in image processing to reduce "salt and pepper" noise. A median filter is more effective than convolution when the goal is to simultaneously reduce noise and preserve edges. We use here matlab command medfilt2. Then we convert the filtered image into binary image by the thresholding method which computes a global threshold that can be used to convert an intensity image to a binary image with normalized intensity value between 0 and 1.The uses Otsu's method [19], which chooses the threshold to minimize the interclass variance of the black and white pixels. Then segment the threshold image by watershed segmentation because It is the best method to segment an image to separate a tumour but it suffers from over and under segmentation, due to which we have used it as a check to our output. It not give the better result after that some morphological operations are applied on the image after converting it into binary form. The basic purpose of the operations is to show only that part of the image which has the tumour that is the part of the image having more intensity and more area then that specified in the steel command. The basic commands used in this step are steel, improve . It is used to erode an image. Dilate: It is used to dilate an image. Marge these morphological outputs with rescale image by the step9 to step19 and we get resultant output in which tumour detect sharply. Then we make the resultant image with sharp location of tumour by morphological output image and grey image from step9 to step18. Traces the exterior boundaries of objects, as well as boundaries of holes inside these image, in the binary image, it also descends into the outermost objects (parents) and traces their children (objects completely enclosed by the parents). It must be a binary image where nonzero pixels belong to an object and 0 pixels constitute the background. Output is shown only in the colour portion of the image with tumour. Then tumour area is calculated from 2nd algorithms. From this area we can assume the dangerousness of tumour.

### Algorithm for Detecting Brain Tumour
**Input:** MRI of brain image.

**Output:** Tumour portion of the image.

Step1:- Read the input colour or rescale image. Step2:- Converts input colour image in to rescale image which is done by forming a weighted sum of each three (RGB) component, eliminating the saturation and hue information while retaining the luminance and the image returns a rescale colour map.

Step3:- Resize this image in to 200 × 200 image matrix.

Step4:- Filters the multidimensional array with the multidimensional filter. Each element of the output an integer or in array, then output elements that exceed the certain range of the integer type is shortened, and fractional values are rounded.

Step5:- Add step2, step4 image and a integer value 45 and pass it in to a median filter to get the resultant enhanced image.

Step6:- Computes a global threshold that can be used to convert an intensity image (Step5) to a binary image with a normalized intensity value which lies in between range 0 and 1.

Step7:- Compute watershed segmentation by mat lab command watershed (step6 image).

Step8:-Compute the morphological operation by two mat lab command improve and imitate and steel with arbitrary shape.

Step9:- Store the size of the step 8 image into var1 and var2 i.e. no. Of rows and column in pixels by [var1 var2]=size(step8 image)

Step10:- For i=1:1:var1 do

Step11:- For j=1:1:var2 do

Step12:- If step8 image (i,j) == 1 do

Step13:- step2 image (i,j) = 255

Step14:- Else do

Step15:- step2 image (i,j) = step2 image (i,j) * 0.3 Step16:- End If Step

17:- End For

Step18:- End For

Step19:- Convert in to binary image and traces the exterior boundaries of objects, as well as boundaries of holes inside these objects, in the binary image and into an RGB colour image for the purpose of visualizing labelled regions.

Step20:- Show only tumour portion of the image by remove the small object area.

Step21:- Compute edge detection using sober edge detection technique.

### Algorithm for Area Calculation
**Input:** Tumour portion of the image.

**Output:** Area of the tumour.

Step1:- Read the input colour or grey scale image. Step2:- Converts input colour image in to grey scale image which is done by forming a weighted sum of each three (RGB) component, eliminating the saturation and hue information while retaining the luminance and the image returns a grey scale colour map and store it into variable I.

Step3:- Compute numbers of rows and column in pixels by [r2 c2] = size (I)
Step4:- Initialize a variable a=0
Step4:- For i=1:1:r2 do
Step4:- For j=1:1:c2 do
Step4:- If I (i,j)==255 do
Step4:- a=a+0 Step4:- Else do
Step4:- a=a+1
Step4:- End IF

Step4:- End For Step4:- End For
Step4:- Display the area a.

## RESULT:

Results are shown below with image name BT1. Figure 1 is the original MRI scan image; Figure2 and figure3 image are superpose with a median filter image and get the resultant enhanced image of Figure 4; Figure 5 and Figure 6 shows Region adjacency graph image, threshold segmentation , watershed segmentation to localize the tumor portion of the image. Morphological operations with arbitrary shape are applied in Figure 7; Location of the tumor with input image is in fig 8 and actual effected tumor position will shown through DRM image in fig 9.
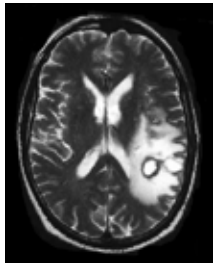


**Figure 5: Thresh-hold Segmentation**
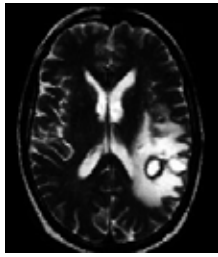


**Figure 6: watersed segmentation**



**Figure 1: Original Input Image**



**Figure 2: filtered Image**



**Figure 8: Output with Tumor Location**
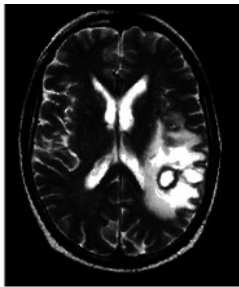


**Figure 9: DRM Image**



**Figure 3: Enhanced filter Image**



**Figure 4: (RAG) Image**

## CONCLUSION

This is dynamic region growing method for segmentation of brain tumour in MRI; in which it is possible to determine the primary and secondary tumor  is present in the image. By taking into region adjacent graph and region merging style show the accurate portion of effected area which help the surgeon to  distinguish the total effected area covered by (primary & secondary ) tumor portion.features of the MRI, we successfully find the seed points and the segmentation results obtained are very much accurate. There are only a small amount of pixels which are misclassified.

So we can say that this method gives better results compared to other methods. Segmentation methods will be  particularly  valuable  in  areas  such as computer integrated surgery, where visualization of the anatomy is a critical component.

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