# Brain Tumour Segmentation using Digital Image Processing

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**Abstract**—Brain tumour is a serious life-altering disease condition. It occurs by means of abnormal cells which form within the brain. Tumour Detection is one of the most important methods used in image processing. In the past few years, numerous techniques have been proposed. In this paper, we presented an abstract automated, and accurate method to classify a given MR brain image as normal or abnormal. The proposed method first employs high pass filters for noise removal from images, followed by applying medium pass filters to enhance the quality of the image. The extracted features were submitted to the segmentation technique followed by morphological filtering which avoids the unclustered regions that can inevitably be formed after segmentation of the brain MRI image for detection of tumour location. Medical Science in Image Processing is an emerging field that has proposed a lot of advanced techniques in the detection and analysis of a particular disease. Treatment of brain tumours in recent years is getting more and more challenging due to the complex structure, shape, and texture of the tumour.

**Keywords—: Magnetic Resonance Imaging, Computed Tomography, Red Green Blue, Support Vector Machine**

## I. INTRODUCTION

This paper proposes different methodologies to segment a tumour from an MRI image and determines correlation for all of the methodologies except one. For this several segmentation techniques have been implemented and analysis is provided regarding the efficiency of the segmentation technique used. Each MRI image is passed through an imaging chain where the image is preprocessed to remove noise and is further enhanced to improve the contrast of the image. This paper proposes different segmentation techniques which are then applied to the image to extract the tumour

## II. LITERATURE REVIEW

D Suresha, N Jagadisha HS Shrisha proposed "Undesirable behaviours occur in cases wherever a category is unrepresented in training data". So, this paper tended to determine the level of noise present in the image of the segmented tumour based on the value of correlation and tried to rectify the flaws.

Muhammd Sharif, Uroosha Tanvir, Mussarat Yasmin proposed "Brain Tumor segmentation and classification" where "The proposed method achieved average classification accuracy."This paper determined if the tumour extracted has some noise present.

Saurabh Kumar, Iram Abid, Shubhi Garg, Anand Kumar Singh The methods used in this paper "Brain tumour detection using Image Processing" needed to be critically reviewed Which is overcome by a detailed explanation of detection of Brain Tumour using Image Processing

C. Zhou, S. Chen, C. Ding and D. Tao proposed "Learning contextual and attentive information

for brain tumor segmentation" where noise pictures lead to serious inaccuracy within the segmentation. This paper commuted cross-correlation between the target variable vector and the tumour region and determined how pixel values of the tumour region are closely related.

## III. PROPOSED METHODOLOGY

This paper discusses the tumour segmentation from different regions and an efficient algorithm is used. The steps of the algorithm are as follows:-

A. Pre-Processing Stage

B. Segmentation Stage

C. Output Stage Finally output will be a tumour region. A

Pre-processing stages involves

1) **MRI Input Image:** MRI images are magnetic resonance images that can be acquired on a computer when a patient is scanned by an MRI machine. It has the RGB (Red Green Blue) mixing present in it. Since the MRI input image contains some RGB mixing in it, we cannot get a clear expected output. Hence the input image is converted to the grayscale image which is the black and white image.

2) **Gray Scale Image:** MRI (Magnetic Resonance Imaging) creates a magnetic field to detect tumours that may be present in the organs and tissues. images show only black and white pixels, technically the white portions of the image have large amounts of red, green and blue pixels depending on the colour channel. Hence it becomes difficult to preprocess the image as preprocessing is done on a monochrome image, Due to the above- mentioned reasons, we first convert our given image to grayscale where the only possible shades are pure white or pure black. The output will not be clear with the noise present in the grayscale image. Hence we use High pass filters to remove such noise and also to sharpen and brighten the image

3) **High pass filter:** A high pass filter is a basis for most sharpening methods. A high- pass filter is a filter that passes high frequencies well but attenuates frequencies lower than the cut-off frequency. This filter enhances the quality of the MRI image. It is very widely used in digital image processing because, under certain conditions, it preserves edges while removing noise

### A. SEGMENTATION TECHNIQUES

Segmentation is a process of segmenting the image into multiple sections in order to view the region of interest clearly and efficiently

Otsu's Thresholding: Otsu's thresholding is a clustering-based segmentation technique that converts the grayscale image to a binary image by assuming only two classes of pixels (foreground and background). This method is used to perform automatic image thresholding. In the simplest form, the algorithm returns a single intensity threshold that separates pixels into two classes after processing image properties in detail using region props and Morphological Operation. To return measurements in a struct array or a table then we need to get the Confirmation of tumour based on density and area. Based on that If no Tumor is detected then we will end the processing. And if it is detected we will continue the further analysis with the image by segmentation of tumour in the image by the particular border.

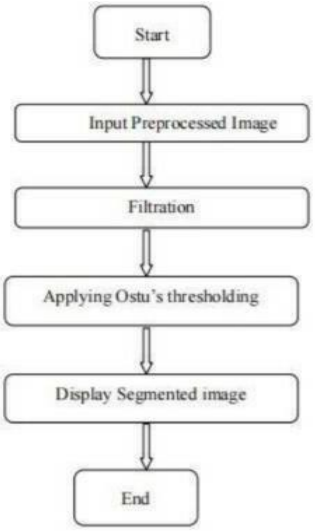


Fig.1 Architecture for Otsu's thresholding method

### B. MORPHOLOGICAL OPERATIONS

The morphological operations are opening, closing, erosion and dilation. Morphological dilation is used to enhance the region of interest whereas morphological erosion is used to remove the unwanted clusters formed as a result of segmentation. For example, in the project, after Otsu's segmentation, erosion is performed with a structuring 7 element of disk size 3 to remove unwanted regions whereas after Local thresholding opening operation is performed which is erosion followed by dilation. It gives the final output from given MRI input In this stage, morphological operations are carried out on segmented images. Morphological image processing is a

collection of non- linear operations related to the shape or morphology of features in an image. These techniques probe an image with a small shape or template called a structuring element. The structuring element is a small binary image, i.e. a small matrix of pixels, each with a value of zero or one .The dimensions of the matrix specify the size as well as the shape of the structuring element. The origin of the structuring element is one of its pixels which is generally outside the structuring element. It is positioned at all possible locations in the image and compared with the corresponding neighborhood of pixels. Some operations test whether the element "fits" within the neighborhood, while others test whether it "hits" or intersects the neighbourhood. The tumor present in the brain is segmented and it is shown in the white color segmented image. It also specifies the type of the tumor.

## IV. RESULTS

As diagnosis of a tumor is a complicated and sensitive task therefore, accuracy and reliability are always assigned much importance. Hence, an elaborated methodology that highlights new vistas for developing more robust image segmentation technique is much sought .Here figures show the images as an output. i.e grayscale image, high pass filtered image , threshold image, watershed segmented image, Finally input image and extracted tumor from MRI image. For this purpose real time patient data is taken for analysis. A tumor in an MRI image have an intensity more than that of its background so it become very easy locate it and extract it from a MRI image.

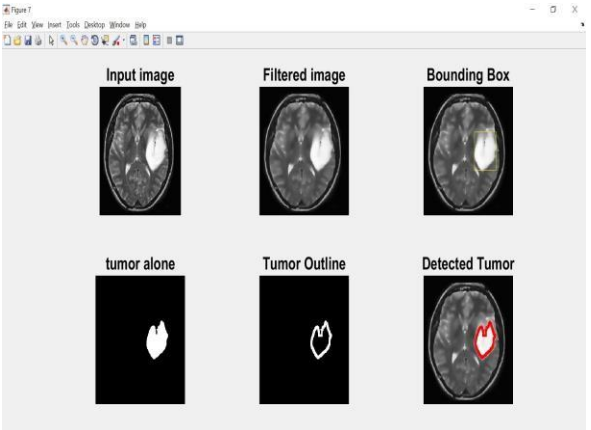


*Fig. 2. Detected Tumor.*

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