



## A Survey on MRI based automated Brain Tumor Segmentation Techniques

Chitradevi D, Assistant Professor, Hindustan University

Dr. M. Krishnamurthy, Professor, KCG College of Technology

### ABSTRACT

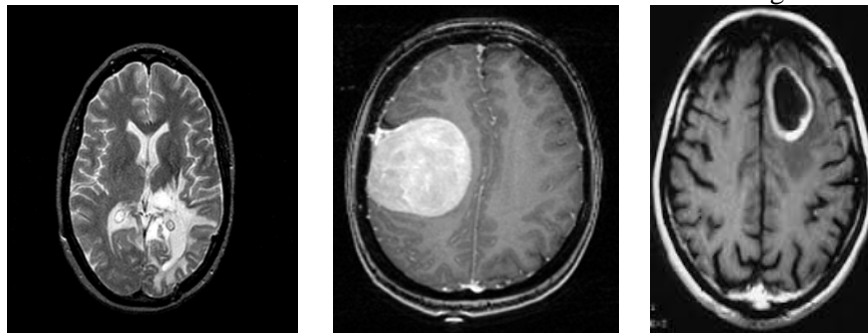
Manual brain tumor segmentation of brain tumors from MRI is a challenging and time consuming task. Brain tumors are very difficult to segment because they have a wide range of appearance and effect on surrounding structures. Brain tumors generally vary in size, position and image intensities (such T1 intensity, T2 intensity etc.) as seen in MRI. MRI images have overlapping intensities with normal tissues and may be accompanied by surrounding edema (Swelling). Due to that an automated system has been developed for brain tumor segmentation. There are various techniques are available for brain tumor segmentation such as Threshold based segmentation, Texture based segmentation, Fusion based segmentation etc.,

**Keywords :** MRI brain images, Brain tumor,

### INTRODUCTION

Brain tumor segmentation is a very important process to extract information from complex Magnetic Resonance Image (MRI) of brain images. Functional MRI, Magnetic resonance imaging (MRI), computed tomography (CT), digital mammography, and other imaging processes will give an efficient means for detecting different type of diseases. MRI is generally useful because it provides more detailed information about tumor type, position and size.

**Brain Tumor:** A brain tumor is a mass of cells that have grown and multiplied uncontrollable i.e. a brain tumor is an uncontrolled growth of solid mass formed by undesired cells either normally found in the different part of the brain such as glial cells, neurons, lymphatic tissue, blood vessels, pituitary and pineal gland, skull, or spread from cancers mainly located in other organs [5]. Brain tumors are classified based on the type of tissue involved in the brain, the positioning of the tumor in the brain, whether it is benign tumor or malignant tumor and other different considerations. Brain tumors are the solid portion permeate the surrounding tissues or distort the surrounding structures [6].



**Figure. 1 :** Sample Brain tumor images

There are different type of brain tumor they are i) Gliomas, ii) Medulloblastoma, iii) Lymphoma, iv) Meningioma, v) Craniopharyngioma, vi) Pituitary adenoma.

## 1. TUMOR DETECTION USING FPCM

This method proposes hyper-intensity tumor based segmentation on possibilistic C-means FPCM[1][2]. It is a combination of fuzzy c-means (FCM) and possibilistic c-means (PCM) algorithms. This method proposes histogram based FPCM. This is applied into five 3D T1-weighted images with hyper-intensity tumors at different locations and with different sizes. In this method the brain is extracted into five classes such as cerebro spinal fluid (CSF), white matter (WM), gray matter (GM), tumor and background. In all five cases the tumors have been detected. This method is fully automatic and unsupervised. But generalization of the tumor type is very difficult.

## 2. TUMOR DETECTION BY SYMMETRY ANALYSIS

This method proposes to overcome the generalization of the tumor type. Initially, an approximate symmetry plane is selected [1][3]. Then, the tumors can be detected by evaluating asymmetry with respect to the obtained plane. This position is further improved by using the downhill simplex method. This method is investigated with the influence of the optimization procedure to control the parameters on the speed of the algorithm and the final result precision. Local optimization method is used to find efficiently the global maximum. The algorithm achieved good results on all real MRI images. But, compared with previous experiment, it gives better result.

## 3. THRESHOLD BASED SEGMENTATION [9]

This is also one of the methods for image segmentation. As a first step, the input gray scale image is converted to a binary image. This is based on a threshold value which will convert gray scale image into a binary image format. Threshold technique [4][6] is useful for image binarization which is essential to segment the image. There are various methods available in threshold based segmentation such as :

## 4. WATERSHED SEGMENTATION

This is used to group pixels of an image based on intensity values. Here, similar intensity

values are clustered to form groups. It is also a best method to segment the tumor from MRI brain image. It is a mathematical morphological operating tool. This method suffers from over segmentation and under segmentation [11].

## 5. OTSU METHOD

This method is used to automatically perform clustering based image thresholding. Thresholding creates binary images from grey-level ones by turning all pixels below some threshold to zero and all pixels about that threshold to one. Partitioning the pixels of an image into two classes is objects and background at gray level  $t$  [5][8]. Calculate within class variance, between class variance, and total variance. It is a global threshold method. The main disadvantage of this method is it will not properly work for all types MRI of brain images due to large intensity variation of foreground and background intensity.

## 6. KAPUR'S METHOD

In this method, two probability distributions are derived from the original gray level distributions of the image [7]. The main advantage to select this method is, it gives very good results for all type MRI of brain images and it is very effective. When we compare with previous method this is the best method with the results.

## 7. HISTOGRAM THRESHOLDING

This type of segmentation based on histogram features, and gray level thresholding [10]. In this case, threshold is applied to segment object and background. It is suitable for an image with region or uniform brightness placed against the background. It is simplest technique but, it does not work well at segmentation of images.

## 7. CONCLUSION

This paper discussed about only some of the techniques, which is available for tumor detection. Some of method follows symmetry analysis, quality enhancement, noise removal etc., in the above techniques some of the methods will produce good results and those methods are very easy to use.

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