A Review Of Fully Automatic MRI Based Brain Tumor Segmentation Approaches

A.R.Deepa, W.R. Sam Emmanuel

Abstract: Brain tumor is an abnormal disease and its early detection is very important to save life. In MRI, the tumor region can be detected by segmentation. Manually, the segmentation or extraction of tumor from MRI is possible to diagnosis. MRI scans provide very detailed images of most of the important organs and tissues in our body. Many types of automated segmentation algorithms have been presented. For conveying information the medium of images are considered to be more important. The algorithms can predict better classification technique to extract tumor parts.

Index Terms: Medical Resonance Imaging, Brain tumor, classification, Feature Selection, Tumor Detection.

1 Introduction
According to world health organization, the treatment of brain tumor is a complex task in the data of world [1]. Under the treatment, the patients do not survive more than 14 months after diagnosis and the current treatments are very radioactive in nowdays. MRI is useful to acquire sequences for providing complementary information[2]. There are many types of detection to localize the abnormal tissues. However, there are enormous amount of tumors both in terms of location as well as geometric progression [3]. The primary part of the tumor in central nervous system accounting 40% patients are affected across all ages. Accordingly to those studies, the readings are carried out in radiologists and to improve the quality of diagnostic findings in the probability of misdiagnosis [4]. During the therapy, it is critical to segment the tumor inorder to protect healthy tissues as well as after applying any therapy[5]. Almost all medical image processing techniques the segmentation is processed initial. For understanding the structure the structure and function of brain using automatic segmentation of brain organs into white matter (WM), gray matter (GM) AND Cerebrospinal fluid (CSF).

2 Taxonomy of Segmentation Algorithms
There are several types of classification occurred in brain tumor identification and the level in which the detection of brain tumor having many features to find out the location, size, shape and structure of the body. The brain tumor detection can be categorised by three sub-divisions in tumor methods, features are tabled below.

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(i) Pre-processing:

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- Ostu's thresholding and morphological operator. |
- Semi-automatic and fully automatic methods. |
- Convolutional neural network (CNN) |
- Novel Classification and IdentificationMethod |

- It is used for removing noise and the inner part of the regions are smoothed and edges are estimated by local image structure.  
- The region of interest (ROI), containing the approximate tumor region. The fully automatic method have no user interaction is needed.  
- To make the same tissues by varying across the image intensity field distortion.  
- It can be used to segment the affected mass in the brain MRI. It has the ability to identify white matter in MRI images.  
- More time consumption.  
- It extracts suspicious region from complex medical images.  
- Less computational time  
- Achieve smooth segmentation  
- Require more processing time

(ii) Feature Selection

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| 2.    | Kong et al 2016 [9] | - Simple linear iterative clustering (SLIC) method. | The main goal is to find the thresholds for maximizing and minimizing the interclass and intra-class variances.  
  - GMM Feature Extraction | Reducing computational complexity | Low degrade performance of clustering |
- GMM Feature Extraction | It can segment an image into more number of group of images and the segmentation in medical images will make threshold more robust.  
It is a technique that defines the structure and shape of an object. | Multi-level MRI image are considered | Low Intensity Level |
- Morphological Operation. | | Inaccurate detection of tumor region |

(iii) Classifiers

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<td>1.</td>
<td>Ghanavati et al. 2012 [12].</td>
<td>AdaBoost classifier</td>
<td>In learning process, the discriminative power selects and combines the features.</td>
<td>The weights of misclassified data points are increased.</td>
<td>Low performance</td>
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<td>2.</td>
<td>Chaddad et al. 2014 [10]</td>
<td>Decision Tree Classifier</td>
<td>Using algorithm, the decision tree is automatically generated with a given dataset and the goal is to reduce the generalization errors</td>
<td>Fast and robust</td>
<td>It may suffer overfitting.</td>
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<td>3.</td>
<td>Deepak et al. 2013 [13]</td>
<td>Support Vector Machine (SVM)</td>
<td>In Support Vector Machine, the concept of decision planes are based upon decision boundaries.</td>
<td>The glottal area can detect high resolution images</td>
<td>Image quality is limited for brain image classification.</td>
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3. RESEARCHES FINDINGS

A detailed analysis from the literature review shows that the automatic estimation of segmentation of tumor region is essential in the field of medical image processing. In automatic segmentation, the classification of gliomas region from MRI region is a very challenging problem. The tumor shape, size and location are very different from patient to patient. Hence the segmentation process of tumor area is complex. In earlier
approaches, the analysis of watershed segmentation is used to solve the problem for tumor with the help of median filter. The wavelet transform determines the appropriate coefficients of an image which have higher levels. In SVM, the two groups of learning and training fast sample sizes can be analysed by only separate samples. The segmentation of MRI brain image remains difficult to produce satisfactory results. Although many methods are existed earlier in segmentation, there are several drawbacks still existed results for the inaccurate estimation of the tumor. Hence, an efficient technique is needed for the effective detection and classification of tumor area and classification of tumor region and the estimation of the tumor volume.

4. Conclusion
An automated brain tumor is detected from magnetic resonance imaging using segmentation process can be analysed based on various techniques have been performed. In clinical application, the proposed segmentation techniques have been used in real time. From MR images, the goal of segmentation process can be used to detect brain tumor initially. The determination of segmentation techniques are found to be very successful and reliable. Since the thesis is about automatic brain tumor detection from MR images using different segmentation techniques, accuracy of tumor detection is more significant than the execution time. In future, effective feature extraction and fusion strategies will further enhance the accuracy rate of the segmentation result.

REFERENCES