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 monts 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 amont 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 trhe 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.

- *A.R.Deepa, Reg.No:12437, Research scholar, Nesamony memorial Christian college, Marthandam, affiliated ton Manonmaniam sundaranar university, Abishekapatti, Tamil Nadu 627012*
- *W.R. Sam Emmanuel, Associate Professor, Department of computer science, Nesamony memorial Christian college, Marthandam*

(i) Pre-processing:

Sl.No	Author Name/Year	Techniques	Features	Merits	Demerits
1.	Lahmiri, S & Boukadou[m, M. [6] 2011	• Anisotropic diffusion filters. • Ostu's thresholding and morphological operator.	It is used for removing noise and the inner part of the regions are smoothed and edges are estimated by local image structure.	It extracts suspicious region from complex medical images.	More time consumption. Brightness and contrast of display will affect the segmentation result.
2	Padma A & Sukanesh R. 2011. [7]	• Deep learning methods • Semi-automatic and fully automatic methods.	The region of interest (ROI), containing the approximate tumor region. .The fully automatic method have no user interaction is needed.	Less computational time	Low accuracy when dealing with noisy and low resolution images.
3	Pereira *et.al* , 2016 [2]	• Intensity normalization method. • Convolutional neural network (CNN)	To make the same tissues by varying across the image intensity field distortion. The feature maps can be obtained with kernels of an image.	Achieve smooth segmentation	Difficult to characterize intra and inter-rater errors.
4	Salwe et.al, 2016 [8]	• Adaptive wavelet based histogram thresholding • Novel Classification and IdentificationMethod	It can be used to segment the affected mass in the brain MRI. It has the ability to identify white matter in MRI images.	Better segmentation in perimeter, entropy and eccentricity	Require more processing time

(ii) Feature Selection

Sl.NO	Author Name	Techniques	Features	Merits	Demerits
1.	Lahmiri, S &1 Boukadou m, M. 2011[6]	• Discrete Wavelet Transform (DWT)	DWT signal can be analysed at different resolution.	It can be executed at Multi-level.	Low level decomposition
2	Kong *et.al* 2016 [9]	• Simple linear iterative clustering (SLIC) method.	Generating 3D supervoxels for brain MRI images.	Reducing computational complexity	Low degrade performance of clustering
3	Chaddad *et.al* 2014 [10]	• Multi-thresholding Segmentation • GMM Feature Extraction	The main goal is to find the thresholds for maximizing and minimizing the interclass and intra-class variances. Identify the features with the help of brain tumor using Tl, T2 weighted and FLAIR MR images.	No image registration is needed	Low Intensity Level
4	Kavitha *et.al* 2012[11].	• Multilevel thresholding. • Morphological Operation.	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	Inaccurate detection of tumor region

(iii) Classifiers

Sl.NO	Author Name	Techniques	Features	Merits	Demerits
1	Ghanavati *et.al* 2012 [12].	AdaBoost classifier	In learning process, the discriminative power selects and combines the features.	The weights of misclassified data points are increased.	Low performance
2	Chaddad *et.al* 2014 [10]	Decision Tree Classifier	Using algorithm, the decision tree is automatically generated with a given dataset and the goal is to reduce the generalization errors	Fast and robust	It may suffer overfitting.
3	Deepak *et.al* 2013 [13]	Support Vector Machine (SVM)	In Support Vector Machine, the concept of decision planes are based upon decision boundaries.	The glottal area can detect high resolution images	Image quality is limited for brain image classification.

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.

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