Image Segmentation and Classification of MRI Brain Tumor: A Review

Somya Yadav
M. Tech Student, EC Department
Amity University, Lucknow-226028, India

K. K. Singh, PhD
Assistant Professor, EC Department
Amity University, Lucknow-226028, India

ABSTRACT
This paper talks about image segmentation which can be attained through different ways such as water shed and contours, thresholding, region growing. In image classification, an image is classified according to its visual content. This paper also discuss how to extract information about the tumor, then in the first level i.e pre-processing level, the parts which are outside the skull and don't have any information are removed and then anisotropic diffusion filter is applied to the MRI images in order to remove the noise. In this paper we have tried to explain how by applying the algorithm, the tumor area is displayed on the MRI image and the central part is selected as sample points for training. Then Support Vector Machine classifies the boundary and extracts the tumor.

Keywords
Thresholding, MRI images, SVM classifier

1. INTRODUCTION
A brain tumor is result of an abnormal growth of cells that have generated in an uncontrolled manner. When a normal cell grows old or get injured, either they repair themselves or undergo in cell death .Research shows that people affected by brain tumors die because of their inappropriate detection. Brain tumor detection is done basically by image segmentation. Segmentation of images is a collection of segments which cover the image as a whole, or sets of contour selected in the image . Each pixels in the region which have similarity from the aspect of some characteristics or computational properties, such as texture, color, intensity. Adjacent regions are significantly different in terms of the characteristics. When applied over an image collection , especially in medical imaging sciences, the resulting contours after the image sectionalization can be used for creating the 3D projection by using interpolation algorithms.

The segmentation of image is based on Mean Shift approach. It uses a concept of moving window which calculates an average pixel value to be determined that which pixels should be included in each segment. As the window moves over an image, it iteratively recomputes the value to make sure that each segment is suitable. The result is a grouping of image pixels into a segment characterized by an average color.

2. LITERATURE SURVEY
Vijaya Rekha. R etl.[1] proposed the detection of tumor blocks by classifying the tumor type using the decision tree in MR images tumor. This technique comprises of different stages i.e preprocessing, GLCM Feature Extraction, Decision Tree Classification Adaptive Thresholding Segmentation.

The architecture workflow described steps required for input and output.

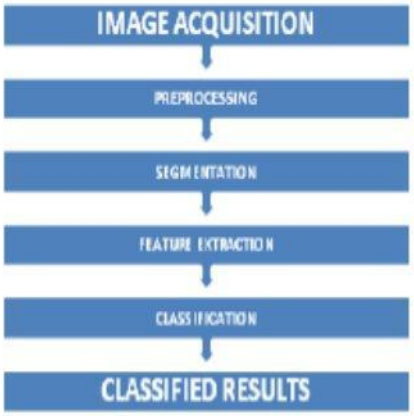

Fig 1: Architecture Workflow [1]

M. Madheswaran and D. Antov Sahaya Dhas [2] developed an advanced system classification for categorisation of brain tumor from MR images using kernels along with the SVM. Image segmentation is done by modified fuzzy c-means algorithm also called as Penalized fuzzy c-means algorithm. The tamura and texture features, extracted using the Tamura method and GSDM. The categorisation is being done by SVM with certain kernels and then results are validated. The obtained accuracy by using GRBF and kernels is of 98.83%. The flow chart through which the results were obtained using the SVM along with ORNARD filter showed variations when compared with other filters.

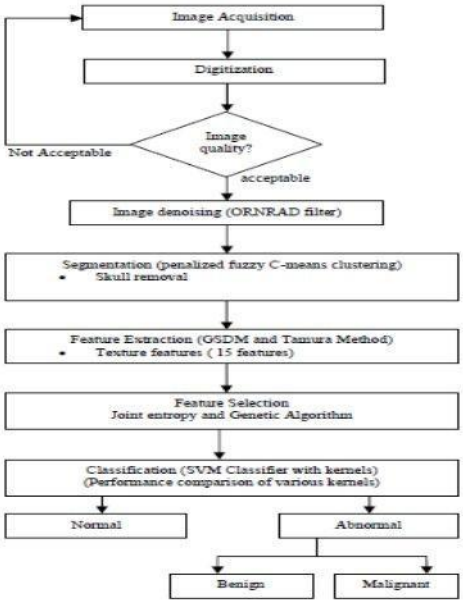

Fig 2: Flow Chart of Brain Tumor Classification System[2]

The results are obtained on various characteristics of an image using the proposed method is shown in table 1.

Table 1: Performance Comparison Of Varous Filters [2]

Parameters / Filters	MSE	PSNR	CNR	IQI	MAE
HMF	47.6	31.42	53.23	0.935	2.97
LMMSE	84.8	28.75	45.52	0.15	4.2
HOHM	85.66	29.02	45.35	0.88	3.62
NLM	49.2	31.25	58.2	0.89	3.18
ORNRAD	30	33.35	52.26	0.92	1.25

98.83% is because of the combination of GRBF kernel for classification and characteristics of an ORNRAD filter smoothing.

P Rajendran etl.[3] used an intelligent classification technique to differentiate between the normal and abnormal MRI brain image. Medical images such as ECG, MRI and CT-scan images are the significant ways to diagnose disease in human being effectively. To avoid manual errors, an automated intelligent classification technique is developed which provide the need for classification of image. In this paper, categorization techniques based on Support Vector Machines (SVM) and histogram based image segmentation are applied to brain image classification. Here feature extraction from MRI Images is carried out by gray scale, texture features, symmetrical and. This level head system enhances accuracy rate and it represses the error rate in MRI brain tumor classification using SVM.

R.S. RajKumar and G. Niranjana[4] proposed segmentation of MRI brain tumor using cellular automata and classification of tumors using Gray level. In this method, cellular automata (CA) based tumor segmentation method on magnetic resonance (MR) images, which uses the information based on volume of interest (VOI) and seed selection. Seed based categorisation is done in the image for the detection of tumor region and specifying the region with help of level set method.

The brain images are categorized into three stages i.e normal, benign and malignant. The conventional method for tumor detection and medical resonance brain images classification is done by human review. Decision making under this method is performed in two stages: feature extraction using Gray level Co-occurrence matrix As compared to other neural networks the artificial neural network gives fast and accurate results.

There are numerous ways which are present for the purpose of sectionalization of tumor effectively. Still it's decisive to identify the effective area of brain tumor from the given MR images. The sectionalization process is basically extraction of different tumor tissues such as necrosis, tumor, active and edema from normal brain tissues from cerebrospinal fluid (CSF), gray matter (GM) and white matter (WM) Ruchi D. Deshmuk and Prof. Chaya Jadhav [5] studied the brain tumors, which are easily detected sometimes from the brain MR image. The partitioning of tumor of brain comprises of several stages. Therefore need of automated segmentation method for brain images are necessary. There are several techniques available to look into the performance of brain tumor's automated computerized detection for medical analysis.

The main aim of this review paper is to enlighten the different techniques of brain tumor sectionalization using certain MR images. In this paper the various methods for the sectionalization purpose are analysed with their pros and cons.

D. Selvaraj [6] based on his study have classified different methods of brain image segmentation for the purpose of exact partitioning of an image into useful sections . Segmenting an MRI image has been a challenging task, although several algorithms have been developed for dealing with this. The biggest risk is, it may be possible that an algorithm performs well for a particular type of tumor but it is also possible that it may not be able to detect the other one which may lead to one's life. Segmentation could give best results of the MRI images but not for other images of the same type. For this purpose several algorithms are reviewed and has been showed in figure 3.

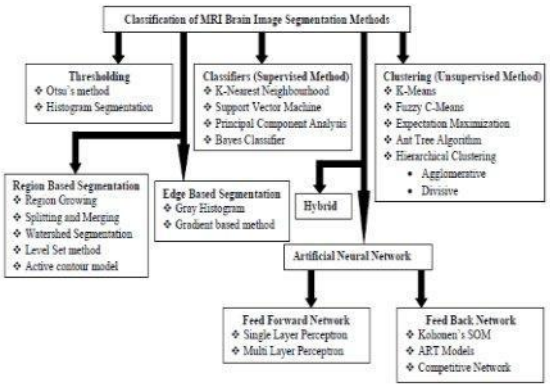

Fig 3: Classification of MRI Image Segmentation Methods

So it's very difficult to achieve a generic sectionalization Method which can commonly be used for various types brain MRI images. Under this research, several advantages and disadvantages of automated techniques for identification brain tumor detection analysis in detail.

The tumor detection requires various operations over MRI images which constitutes the pre-processing of an image, extraction of feature, enhancement of images and it's classification. The result after the process of classification evaluates that the person is suffering with the disease or not. Certain novel advancements can be developed from the ideas under in this paper.

3. CONCLUSION

In field of medical imaging numerous efforts and promising results have been obtained but still procreating sectionalization and categorization of defects is a crucial task because of their intensities, shapes, types and location of tumors.

After reviewing several papers it can be concluded that classifier used i.e BPN [6] gives comparatively effective and quick categorization which could be efficiently utilized for the segmentation of MRI brain images along with the accuracy. The image obtained by this algorithm are very much better in contrast and are limited to few artifacts.

This also has a benefit over certain imaging algorithm such that it provides high contrast between soft tissues and hard tissues.

Although the quantity of data is very much high to be analyzed manually, which is a really big problem problem in the effective MRI use. But still BPN classifier gives promising result with respect to several characteristics of an image as compared to other algorithms. If further enhancements could be done then surely few drawbacks such as manual analysis which is a major one could be eliminated.

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