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A Review on Various Techniques of Brain Tumor Detection

Rajeshwari G Tayade [1], Miss. P. H. Patil [2], Miss. Prachi A. Sonawane [3]
Research Student [1], Assistant Professor [2], Research Student [3]
Department of Electronics &Telecommunication, SGDCOE
Jalgaon - India

ABSTRACT
The brain tumor detection using Magnetic Resonance Imaging (MRI) is very important but difficult task which further used in medical field for the detection of tumor medical imaging techniques get used, in which different segmentation techniques get evolved. If the segmentation done manually by researchers using their own medical knowledge results in more time consumption. Therefore researchers provides different techniques for automatic detection of brain tumors using MRI images, which helps in diagnosis This paper includes the different techniques such as k-means, Fuzzy C-Means and region growing algorithm, curve let transform, multi fractional Brownian motion(mBm), Proximal Support Vector Machines(PSVM) etc. for brain tumor detection from MRI images.

Keywords:- Magnetic Resonance Imaging (MRI), curve let transform, Fuzzy C-Means, Proximal Support Vector Machines (PSVM).

I. INTRODUCTION

In medical imaging technique, magnetic resonance imaging (MRI) images are used to provide detailed information about the internal tissue of respective image. In the diagnosis of brain tumor, determination of the exact location is an important task, using which helps to find out the shape &size of tumor. In brain tumor detection techniques, image segmentation plays an vital role there are many image segmentation methods are used to extract tumor from magnetic resonance imaging (MRI) images of brain. Whereas segmentation provides the detailed information about the soft brain tissues such as gray matter(GM), white matter(WM), cerebral spinal fluid (CSF)etc. There are two types of segmentation involves a manual segmentation and automatic segmentation. Manual segmentation technique depends on experience or expert knowledge of human and time consuming technique but reduces the computational efficiency.

Whereas automatic segmentation deals with histogram. Which is only based on the intensity of pixels. In this review paper, some image segmentation techniques are introduced as, SOM clustering, k-means clustering and fuzzy c-mean algorithm etc. And also a comparative study of different techniques of brain tumor detection using MRI images.

II. BRAIN TUMOR DETECTION TECHNIQUES

In this paper the different techniques of brain tumor detection using MRI images as discussed below:

A. An Automated MRI Brain Image Segmentation and Tumor Detection using SOM-Clustering and proximal Support Vector Machine Classifier

K. B. Vaishnavee and K. Amshakala introduced a technique for segmentation as clustering which gets widely used for segmentation purpose [7]. Here SOM clustering was used for MRI brain image segmentation. To improve segmentation, feature extraction was required. Hence for feature extraction Histogram Equalization was used. Further the grey level co-occurrence matrix was utilized to avoid the formation of misclustered regions. Principle component Analysis (PCA) method was proposed to improve the accuracy of classifier. For the automatic brain tumor detection from MRI brain image proximal support vector machines (PSVM) algorithm was used.

In this paper precision rate using PSVM technique was 0.93, which was higher than SVM algorithm. Hence according to experimental results, it was concluded that the PSVM technique reduces the computational complexity and provides high accuracy rate and less error rate. To support the other type of cancer images few modifications were required in segmentation & classification stage.

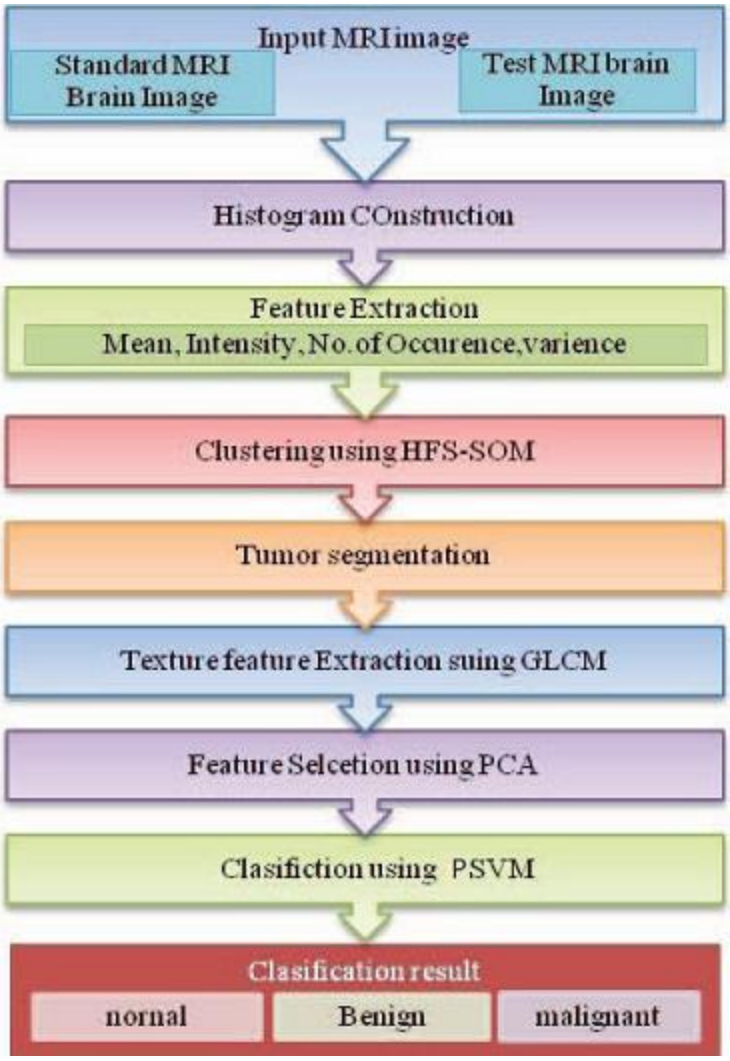

Fig.1 Overall Block Diagram

Clustering Technique plays an integral role in image segmentation field. For unsupervised segmentation of MR brain images, SOM Clustering technique was used [4, 2]. The PSVM-HSF-GLCM-PCA was proposed to get computationally more accuracy. This technique was faster & more efficient, hence effective segmentation & classification was achieved using HFS-SOM & PSVM. According to experimental results the proposed system shows high accuracy rate and less error rate.

B. Brain Tumor Segmentation and Stage Detection in Brain MR Images with 3D Assessment

According to above paper, helps to achieve high accuracy rate some modifications were required in segmentation whereas, in this paper Fuzzy c-means segmentation technique was used, which removes the noise present in the MR images [9]. Then to extract mass tumor from brain cells MRI k-means algorithm was sufficient.

Purnita majumdar and V. P. Kshirsagar proposed a technique for detection of tumor stage from brain MRI images, using k-means method and fuzzy c-means algorithm and 3-D assessment of brain for better tumor detection. For segmentation purpose different algorithms were get used which deals with the computer aided methods.

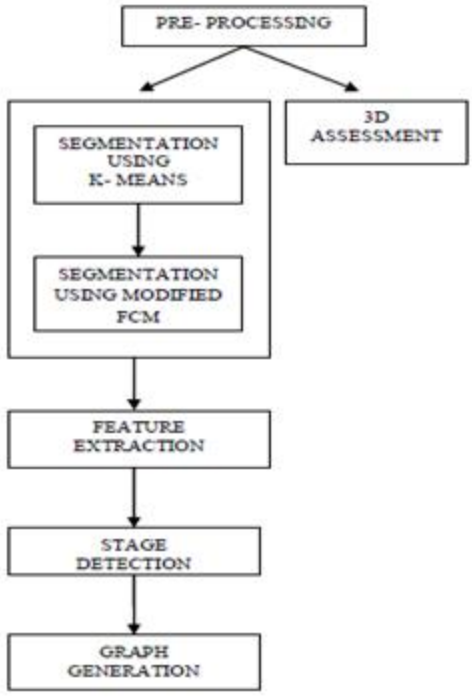

Fig.2 Flow Diagram for Proposed System

3D assessment would be done with the help of 3D analyzer tool i.e., 3D slicer Mat lab bridge. K-means algorithm was enough to extract mass tumor from brain cells and gets noise free image from MRI images. For accurate tumor shape extraction Fuzzy c-means segmentation was used. 3D analysis would be done through 3D slicer. It provides high accuracy & also extracts shape, position and stage. In this technique time consumption was more.

C. Multifractal Texture Estimation for Detection and Segmentation of Brain Tumors

Atique Islam, Syed M. S. Reza and Khan M.Iftekharuddin introduced an mBm model i.e. multifractional Brownian motion model which helps to formulate brain tumor texture from complex MRI images [3]. The automatic segmentation of the varying intensity of tumors in brain Magnetic Resonance Images (MRIs) was extremely challenging.

Furthermore, for segmentation purpose AdaBoost algorithm is introduced, whereas comparing the feature values between non tumor and tumor regions experimental results are calculated. As computational complexity of AdaBoost

algorithm is linear and increases the slice resolution. Fractal and fractional Brownian Motion (FBM) for tumor segmentation includes information as fractal means an irregular geometric object with complex structure at all scales. Using non-integer FD, fractal texture can be quantified.

Piece-wise-triangular-prism-surface-area (PTPSA) method is used for fractal dimension (FD) from brain MRI images [5], [6].

D. Noise and Skull removal of Brain Magnetic Resonance Image using Curvelet transform and Mathematical Morphology

A Lakshmi, T. Arivoli, R. Vinupriyadharshini Proposed a technique which helps to improve detection of brain tumor in medical field [1]. Preprocessing technique was used to carry out the segmentation more accurately. Further helps in noise removal enhancement of image, artifact removal and skull stripping. Using curvelet transform noise was removed from MR images. Using Morphological operations image data, preserving the objects' essential shape characteristics, and could eliminate irrelevant objects gets simplified. Curvelet transform was having many advantages as compared to real image including in prior knowledge of true tissue types. Mean intensity, noise and intensity in homogeneities such image parameters are controlled.

Image segmentation and classification was a challenging task to overcome this problem a pre-processing method is used which was based on soft computing techniques. These techniques proposed for adapted and efficient for functional MRI data segmentation. Using this segmentation more accurate and the problem occurred by manual segmentation as it was more time consuming technique, Hence using automatic segmentation this problem overcome and also an efficient method for noise removal [9].

III.COMPARATIVE STUDY

Sr. No.	Title	Techniques	Parameters	Algorithm	Output
I	An Automated MRI Brain Image Segmentation,Tumor Detection using SOM-Clustering and Proximal SVM Classifier	SOM clustering, Histogram equalization, Grey level co-occurrence matrix, PCA, PSVM	Precision rate accuracy, recall rate	PSVM	Faster computationally more efficient than SVM
II	Brain Tumor Segmentation and Stage Detection in Brain MR Images with 3D Assessment	Preprocessing ,segmentation, Feature extraction, stage detection, 3D assessment,graph generation	Tumor size growth, shape, Position, stage.	mBm multifractalBrownian motion.	Evaluate efficacy
III	Multifractal Texture Estimation for Detection and Segmentation of Brain Tumor	Multifractal process, MRI preprocessing segmentation & classification, performance Evaluation.	Efficacy, true positive	AdaBoost	linear & increases with slice resolution.
IV	Noise and Skull removal of Brain MRI Image using Curvelet transform and Mathematical Morphology	Preprocessing technique, Soft computing technique.	Mean intensity values noise &intensity in homogeneities	Curvelet transform& mathematical morphology	Improves efficiency

IV. CONCLUSIONS

In this paper, we have proposed different techniques to detect and segment Brain tumor from MRI images. To extract and segment the tumor we used different techniques such as SOM Clustering, k-mean clustering, Fuzzy C-mean technique, curvelet transform. It can be seen that detection of Brain tumor from MRI images is done by various methods, also in future work different automatic methods achieve more accuracy and more efficient.

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