A REVIEW ON IMAGE PROCESSING AND IMAGE SEGMENTATION

Priyanka Rawat[1], Shilpa Sethi[2], Nancy Aggarwal[3]

Research Scholar[1]

Assistant Professor[2]

Research Scholar[3]

[1]Department of Computer Engineering

[1] J.C. Bose University of Science & Technology, YMCA, Faridabad, India

ABSTRACT: Now a days medical field and computer science field are combined together to make the process of medical science easy and faster. Processing of medical images is a developing field .It includes various imaging methods like CT scans(computed tomography),X rays and MRI(magnetic resonance imaging) etc. For study of brain tumor detection the MRI images is very useful. MRI helps in detecting unusual growth of tissues in nervous system. The first step of detection of brain tumor is abnormality of brain. Abnormality includes symmetric and asymmetric shape of brain. Next step is segmentation. Segmentation is based on two techniques 1) fuzzy transfer 2) morphological operation. These techniques helps in detecting the boundaries of tumor. It also help in calculating the actual area of tumor. To learn about tumor detection using MRI images and different techniques , a review is done on existing papers. This survey paper provides an outcomes of different techniques along with their strengths and weaknesses.

Index Term : Brain Tumor, MRI Images , Fuzzy Transform , Segmentation , Morphological Operations.

I. INTRODUCTION

Now days image processing plays an vital role in every field. It also helps in medical field. MR images detects an existence of brain tumor in nervous system. Brain tumor is the growth of abnormal tissue and uncontrolled cell division in brain itself. If the growth becomes more than 50%, then the patient may not be able to recover. So it is important to detect the tumor at early stage with accurate diagnosis. Tumor can be identified by CT and MRI. Brain tumor is having two stages.

1) Primary stage
2) Secondary stage

when brain tumor can identified number of symptoms including seizures, mood changing, difficulty in walking and hearing, vision, and muscular movement etc. brain tumor is classified into Gliomas, medulloblastoma, epeldymomas, CNS lymphoma and oligodendrogloma. In primary stage the tumor can be removed but in secondary stage ,the tumor disease spread, due to this after removal of tumor the seldom remains and grow back again so this is the biggest problem in the secondary stage of tumor .

This problem occurs due to inaccurate location of area of tumor. The next step is to detect the area by detection and segmentation techniques. Imaging techniques includes 1) MRI scanning that is magnetic resonant image 2) CT scanning i.e. computer tomography   3) Ultra sound etc. There are several method to detect an brain tumor . These are nuclear network algorithm watershed and edge detection, fuzzy c mean algorithm, asymmetry of brain is used to detect an abnormality

II. BRAIN TUMOR DETECTION AND SEGMENTATION

Image Acquisition: Here MRI scan images of a patient are considered either color or Gray-scale. It is displayed with a default size of 220×220. If it is color image, then   convert into a Gray-scale image by using a large matrix whose entries are the numerical values between 0 and 255, where 0 corresponds to black and 255 white for instance.

Pre-processing stage: Pre-processing helps in removing the noise. This can be done by using various spatial filters, linear or nonlinear filter. Also called median filter. Other filteration like text removal,   RGB to grey conversion and reshaping are also done in this step. It uses median filter for noise removal. Thepossibilities of arrival of noise in modern MRI scan are very less.

A. Median Filter

This   techniqueis used to eliminating the noise. This is a 'non-linear' filtering technique. It helps ineliminating the 'Salt and Pepper noise' from the greyscale image . Median filter is based on average value of pixels. The advantages of median filter are

efficient in reducing Salt and Pepper noise and Speckle noise. It also preserved the edges and boundaries .The main disadvantages of median filter are complexity and time consumption as compared to mean filter.
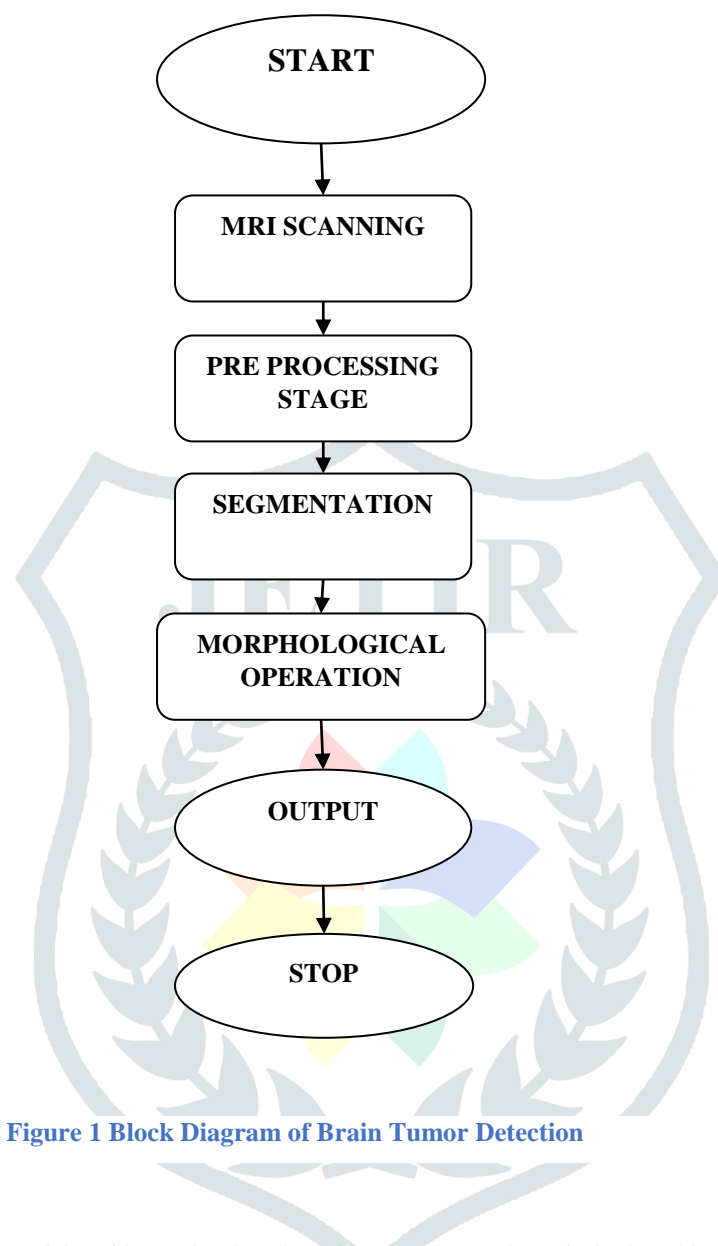
Figure 1 Block Diagram of Brain Tumor Detection

B. Mean Filter

This filter is also known as de-noising filter.It is also based on average value of pixels. This technique helps in reducing the Gaussian noise. The response time is fast. The disadvantage of this technique is that it distorted the boundaries and edges.

C. Modified Hybrid Median Filter

This filter is also a de-noising filter . It consists of both Mean and Median filter. It helps in eliminating Speckle noise, Salt and Pepper noise and the Gaussian noise. But the main disadvantage of this filter is high time consumption as compared to the simple Median filter.

D. Morphology Based De-noising

 This filter is based on Morphological operations of opening and closing. It produced better results than other de-noising filters. The advantage of this filter is high efficiency.

Image Segmentation: The segmentation helps in analyzing the image properly . However proper segmentation is difficult because of the great verities of the lesion shapes, sizes, and colors along with different skin types and textures. Some lesions have irregular boundaries and in some cases there is smooth transition between the lesion and the skin. To address this problem, several algorithms have been proposed. They can be broadly classified as thresholding, edge-based or region-based, supervised and unsupervised classification techniques

- Threshold segmentation
- K-mean Clustering
- Fuzzy C-means Clustering

A) Threshold Segmentation

'Segmentation' helps in dividing a digital image into number of segments.It includes sets of pixels .It converts the image in a way that it will become more detailed , meaningful and easy for further analysation. Placing of objects and boundaries in images such as lines, curves could be performed through Image segmentation. In image segmentation, every pixel is assigned a label and the pixels consist of same label share certain visual features. Each pixel in the region is similar in relation to some features or computed properties, such as color, intensity or texture. Adjoining regions are particularly different in regard to the same features. Thresholding methodology is the simplest technique of image segmentation. This technique involves a threshold value that is used to converting a gray-scale featured image to a binary image. The major advantage of this method is selecting the threshold value to be used.

B) The K-Means Algorithm

 k means is an unsupervised technique. It is most used and well known technique used in partitioned clustering. The main job of this algorithm is to minimize the distances of all the elements to their cluster centres. The algorithm upgrades the clusters iteratively and runs in a loop until it reaches to optimalsolution.Performance of K-means algorithm depends on initial values of cluster centers. It gives the optimal solution.

C) Fuzzy Clustering

Fuzzy clustering is used in pattern recognition. There are various similarity measures like distance, connectivity, intensity etcare used to identify classes that depends on the data and the application. It helps in data analysis, pattern recognition and image segments. This method can represent the relationship between the input pattern data and clusters more naturally . Fuzzy c-means is known as softclustering method. Traditional clustering approaches generate partition, each pattern belongs to one and merely single cluster.

Morphological Operations: Morphological process takes place after segmentation. This process is applied to remove unwanted part. It consists of image opening, image closing, dilation, erosion operations. It tells whether MRI image consists of any tumor or not. It also tells about the severity of the tumor.

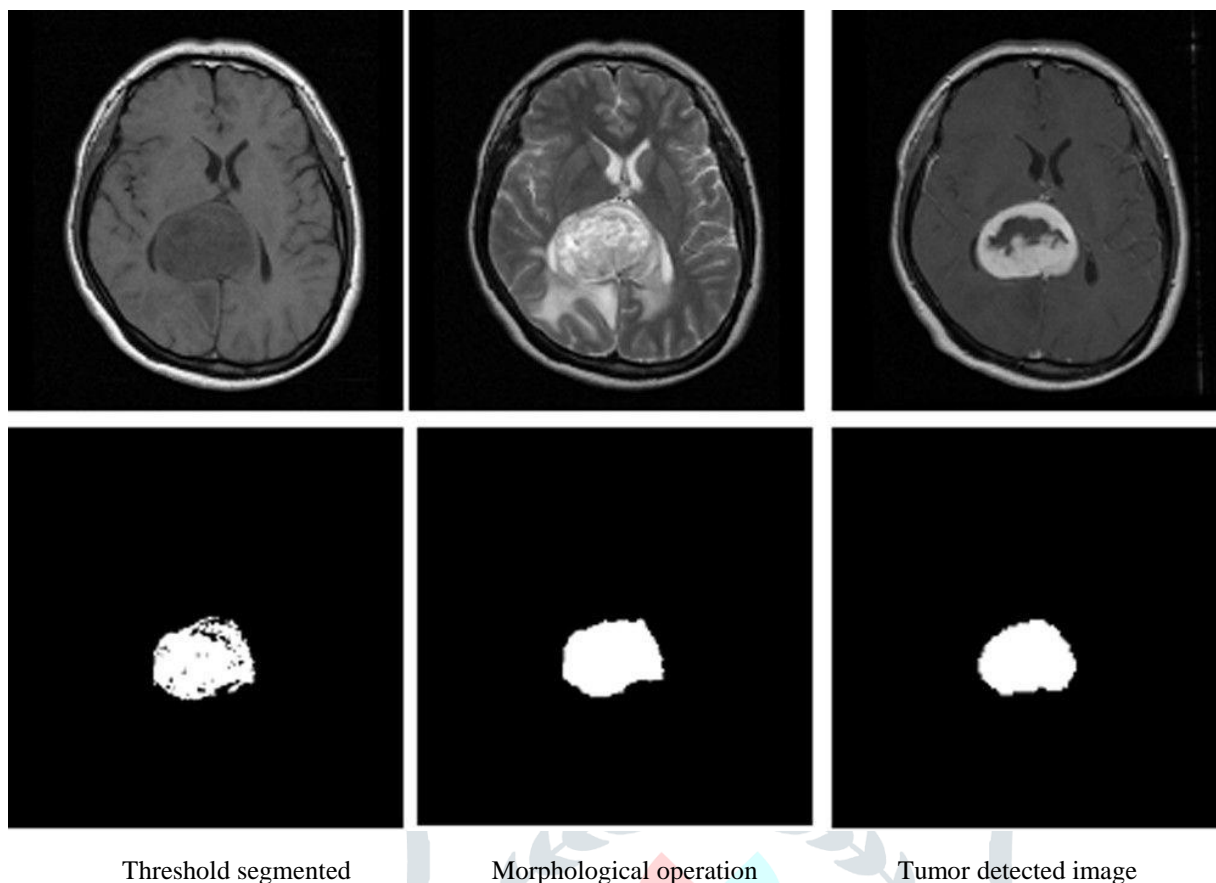   MRI image   Grayscale image   Median filtered

Threshold segmented   Morphological operation   Tumor detected image

Figure 2 Steps of Brain Tumor Detection

III. REVIEW OF THE DIFFERENT PAPER

Now a day's brain tumor is one of the most dangerous diseases.so its important to diagnosed it at early stageand its detection should be fast and accurate. It can be achieved by automated tumor detection techniques on medical images and one of the automated tumor detection techniques is MRI images ,which defines the tumor growth region and the edges detection. As compare to other techniques this gives more accurate results [4].

Many of the researchers proposed many methods, and algorithms to find brain tumor, stroke and other Kinds of abnormalities in human brain using MR Images. Manoj K Kowar and Sourabh Yadav et al, 2012 his paper "Brain Tumor Detection and Segmentation Using Histogram Thresholding", they presents the novel techniques for the detection of tumor in brain using segmentation, histogram and thresholding .

Rajesh C. Patil and Dr. A. S. Bhalchandra et al, in his paper "Brain Tumor Extraction from MRI Images Using MATLAB", they focused on Meyer's flooding Watershed algorithm for segmentation and also presents the morphological operation .

Vinay Parameshwarappa and Nandish S. et al, 2014 in his paper "Segmented morphological approach to detect tumor in brain images", they proposed an algorithm for segmented morphological approach . M. Karuna and Ankita Joshi et al, 2013, in his paper "Automatic detection of Brain tumor and analysis using Matlab" they presents the algorithm incorporates segmentation through Nero Fuzzy Classifier. The problem of this system is to train the system by neural network and it desires many input images are used to train the network. The developed system is used only for tumor detection not for other abnormalities.

R. B. Dubey, M. Hanmandlu, ShantaramVasikarla et al, 2011, compare the image segmentation techniques in his paper "Evaluation of three methods for MRI brain tumor segmentation", they apply preprocessing techniques like; de-noising, image smoothing, image contrast enhancement and comparison of the level set methods and morphological marker controlled watershed approach and modified gradient magnitude region growing technique for MRI brain tumor segmentation. They concluded the MGMRGT method gives better result.

R. Preetha and G. R. Suresh et al, 2014,[7] in his paper "Performance analysis of fuzzy C means algorithm in automated detection of brain tumor" they used fuzzy C means clustering for segmentation. This method gave the high computational complexity. FCM

shows good performance result in segmented the tumor tissue and accuracy of tumor. The boundary of tissue can be seen clearly in their paper

Amer AlBadarneh, Hasan Najadat and Ali M. Alraziqi et al, 2012, proposed the method for brain tumor classification of MRI images. The research work applied, based on Neural Network (NN) and k- Nearest Neighbor (k-NN) algorithms on tumor classification has been achieved 100% accuracy using k-NN and 98.92% using NN.

The watershed method is combined with edge detection operation. The color brain MRI images can be obtained by this algorithm. In this the RGB image is converts into on HSV color image so that the image is separated in 3 regions which are known as hue, saturation and intensity. The canny edge detector is applied is applied to an output image for rebuilt process of edge occurs in this .at last combining the three images and the final resultant brain tumor segmented image is obtained. This algorithm is applied on 20 brain MRI images for excellent result [6].

Table 1 Comparison of Different Techniques

Author	Year	Paper name	Techniques used	Results
D.J Hemanth	2009	"Effective Fuzzy Clustering Algorithm for Abnormal MR Brain Image Segmentation	Image Segmentation	• It gives accurate region of cancer. • Give better identification of stages of cancer.
I. Maiti and M. Chakraborty	2012	A new method for brain tumor segmentation based on watershed and edge detection algorithms in HSV color model	watershed and edge detection algorithms in HSV color model	• It gives color brain MRI image. • Results in good accuracy.
S. Charutha and M. J. Jayashree	2014	An efficient brain tumor detection byintegrating modified texture based region growing and cellular automata edge detection	Automated and efficient brain tumor detection	• The proposed method is efficient in treatment of brain tumor • It also helps in detecting the tumor.
R. Preetha and G. R. Suresh	2014	Performance Analysis of Fuzzy C Means Algorithm in Automated Detection of Brain Tumor	Fuzzy C Means Algorithm	• The boundary of tissues can be seen clearly

IV.CONCLUSION

In this paper, different research paper on brain tumor detection and segmentation has been reviewed. In survey we found different results of different techniques applied in the paper. This comparison helps in better future work .In survey we got to know about various disadvantages and benefits of techniques applied in different research papers. This helps in finding the better technique for future.It can be seen that detection of Brain tumor from MRI images is done by various methods.

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