A REVIEW: BRAIN TUMOR DETECTION IN MAGNETIC RESONANCE IMAGES

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Abstract
Medical knowledge and Brain magnetic resonance imaging (MRI) scans to obtain the nature and pathological characteristics of brain tumors and to decide on treatment options. In such an automated detection system plays important role, mainly for cancer detection. As result various methods have been proposed in recent years to fill this gap, but still there is no commonly accepted automated technique by clinicians to be used in clinical floor due to accuracy and robustness issues. In this approach, an automatic brain tumor detection and segmentation framework that consists of techniques from skull stripping to detection and segmentation of brain tumors is studied. Experimental results of the proposed method are measured using various parameters like Area, Perimeter, Contrast, Correlation, Energy and Homogeneity detection of brain tumor.

Keywords: Brain Tumor, Medical Resonance Images, Edge Detection, Gray Scale Image, Median Filter.

I. INTRODUCTION

A brain tumor is a mass of unwanted cells in the brain that are not normal. There are two common groups of brain tumors: Primary brain tumors and Secondary brain tumors, Primary brain tumors start in brain tissue and tend to stay there. Secondary brain tumors are more universal. These cancers start anywhere else in the body and pass through the brain. Lung, breast, kidney, colon, and skin cancers are among the most common cancers that can enlarge to the brain. Some brain tumors contain cancer and others don't, benign brain tumors don't have cancer cells**.** They grow slowly; can often be removed, and rarely spread to the brain tissue around them. They can cause problems if they press on certain areas of the brain, Depending on where they are located in the brain, they can be life-threatening. Malignant brain tumors have cancer cells**.** The rates of growth vary, but cells can invade healthy brain tissue nearby. Malignant tumors rarely spread beyond the brain or spinal cord [1].

According to American brain tumor association, Nearly 78,000 new cases of primary brain tumors are expected to be diagnosed this year. This figure includes nearly 25,000 primary malignant and 53,000 non-malignant brain tumors. It is estimated that more than 4,600 individuals between the ages of 0-19 will be diagnosed with a primary brain tumor this year. Malignant brain tumors are the most common cause of cancer-related deaths in adolescents and young adults aged 15-39 and the most common cancer occurring among 15-19 year olds. This year, nearly 17,000 people will lose their battle with a primary malignant and central nervous system brain tumor. The median age at diagnosis for all primary brain tumors is 59 years [1].

There are various techniques for Diagnosis of cancer, like Magnetic Resonance Imaging (MRI), Computed Tomography (CT), Chest radiography (X-Ray) and Sputum Cytology. Basically in this study The MRI is a generally used medical imaging technique which provides detailed information of the internal tissue constitutions of the image. In this technique segmentation process is used to remove the soft

brain tissues like Gray matter (GM), White matter (WM) and Cerebrospinal Fluid (CSF) [2]. Segmentation is divided in three types: Manual, semiautomatic and fully automatic. Segmentation methods includes various approaches: level set methods, Markov random field (MRF), fuzzy c-means(FCM), k-nearest neighbor (KNN) and region growing [3][4][5].

Level set method will give up poor results when there is unbalanced placement of the curves with respect to purpose boundary. KNN is very sensitive to redundant features and they have poor run time performance. FCM requires huge computational time and produces insufficient results in noisy images. . Region growing methods separates the user defined regions with similar properties and its performance is better with noisy images Drawback of Region growing method is that it involves a manual seed point selection [3].

II. RELATED WORK

Parveen and Agrawal [3] described the automated tumor detection technique for human body analysis the internal parts in medical imaging. Image segmentation plays vital role in analysis, surgical planning, navigation and various medical evaluations. Manual, semiautomatic and automatic methods are exists for segmentation of the region of interest. In this paper, a hybrid approach for brain tumor detection and classification through magnetic resonance images has been proposed. First phase of the proposed approach deals with image preprocessing which includes noise filtering, skull detection, etc. The second phase deals with feature extraction of MR brain images using gray level co-occurrence matrix. Third phase deals with classification of inputs into normal or abnormal using Least Squares Support Vector Machine classifier with Multilayer perceptron kernel. Final phase is the segmentation of the tumor part from the brain using fast bounding box. The experiments were carried out on 100 images consisting of 25 normal and 75 abnormal from a real human brain and synthetic MRI dataset. The classification accuracy on both training and test images was found to be 96.63%.

Joshi et al. [6] explained Medical imaging modalities like Magnetic Resonance Imaging, Computed Tomography, and Positron emission tomography is complex modalities. It contains different objects like soft tissues and bony structures along with the noise included during the process of image acquisition. Segmentation of these images is a not easy task, as we need to split the different objects and noise to get better analytical results. This article presents a new method of two stage segmentation techniques. In the first is used Gabor filter and second thresholding technique, in the help of two methods medical images are easily impact noise, and tissue movement field migration effect.

Megersa and Alemu [7] discussed the brain tumor identification, clinicians combine their medical knowledge and brain magnetic resonance imaging (MRI) scans to obtain the nature and pathological personality of brain tumors and to decide on treatment options. In the Brain tumor detection and Segmentation thresholding, region growing, multilayer perception (MLP), Hopfield neural network (HNN). Fuzzy classification, fuzzy c- means (FCM) and fuzzy c- means strategy is integrated with HNN. In the final segmentation mean and standard deviation result in Jaccard similarity index, Dice similarity score, sensitivity and specificity are 0.8569+/-0.0896, 0.9186+/-0.0638, 0.9480+/-0.0402 and 0.9917+/-0.0387 respectively. Quantitative and qualitative segmentation result indicates the potential of the proposed framework.

Al-Azzawi and Sabir [8] explained the brain tumor segmentation studies based on MRI are attracting more and more consider in latest years due to coming new technique that does not involve puncturing the skin or entering a body cavity. This paper describes the proposed approach for detection and extraction brain tumor from MRI scan images of brain. And in which two techniques are used F-Transform (Fuzzy-Transform) and Edge Detection. Asymmetry of brain is used for detection of abnormality, after detect of the tumor. The segmentation based on F-transform (Fuzzy-Transform) and morphological operations are performed to depict brain tumor boundaries and calculate the area of the tumor. The F-transform is a specialized method to handle uncertain information and to extract the salient edges. Accuracy and precision are co-dependent. The accuracy of 96% and precision of 95% were found in detection of brain tumor using the proposed approach. The experimental results showed that the proposed algorithm produces perfectly accurate performance to brain tumor detection for MRI brain images.

Sahoo et al. [9] explained automated analytic systems play vital role, mainly for cancer detection. To detect cancer, it is very difficult to diagnose cancer in prior stage as clinical features in the severe stage. If cancer diagnosis made possible at early stages, the death rate can be greatly decreased. There are many other existing approaches for diagnosis of cancer, but most of the approaches diagnose cancer at the severe stage, thereby bringing down the chance of survival of a patient. The prior diagnose of cancer is a challenge because of the complex structure of the cancer cells. In this section digital image processing techniques are used for preprocessing of the images and feature extraction process and support vector machine (SVM) and neural network classifier to checking early stage.

Thara and jasmine [10] brain Tumor detection is most important so as to explain early tumor. This can be detected from the MRI images as with tumor is enlarged and it gives high intensive, divergent and uncertain boundaries. The Brain tumor occurs when abnormal cells are formed within the brain and these abnormal cells can be detected by tumor segmentation method for MRI images which separates tumor cells from healthy tissues and this is carried out by the use of two types of clustering methods. In this whole process firstly input image is preprocessed, followed by which the segmentation is done using methods that is k-means, clustering technique and fuzzy means clustering method.

Fuzzy clustering methods help in extraction of features like magnitude, direction and area from the tumorous part of the segmented images. While comparing the above mention technique, it seen that fuzzy clustering means it produces better segmentation.

Brain tumor is classified into tumorous or non timorous based on the results extracted from the fuzzy clustering method . Classification is done by using the supervised neural network called the Radial Basis Function (RBF), Generalized Regression neural network (GRNN), Probabilistic neural network (PNN).but the method used in that classification is done by using fuzzy Probabilistic neural network (PNN) classifier which is used to classify MRI image normal and abnormal and images classified were compared with other methods in terms of the accuracy, specificity and sensitivity.

MRI of the brain is mostly used to check tumor growth in the prior stages of the disease. The diagnosis and quantitative estimation of tumor growth can be achieved using segmentation. Brain tumor detection is generally based on region based and texture based feature extraction. In this paper, preprocessing threshold and edge detection is done with the help of median filter [10].

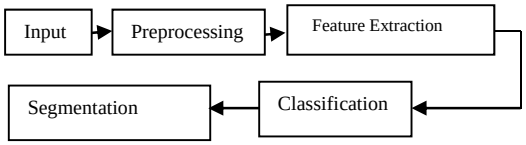


Figure1. Process of Segmentation [2]

A. Preprocessing

Before the identification of the tumor in the brain image a preprocessing is done for increasing the reliability of Optical vision or processing some basic procedure is done to the image so that it is ready to be processed, like the enhancement of the image and if noise is present at the starting stage reducing the noise before going ahead. Skull detection is the preprocessing phase in the brain tumor detection. In the preprocessing some noise reduction and image enhancement methods are done [11] [12].

The steps in preprocessing are written as

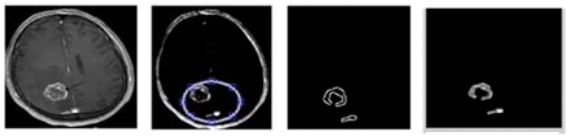
- Gray image is converted from input image, if it is color image.
- Noise is reduced like salt and pepper noise.

B. Median filter

Median filtering is a nonlinear process frequently used in image processing to reduce salt and pepper noise. A median filter is more effective than convolution when the goal is to simultaneously reduce noise and preserve edges [13].

III. RESULT AND DISCUSSION

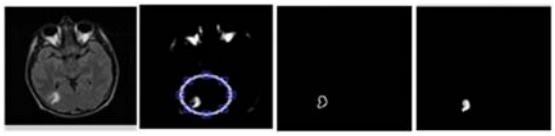
In this section results of the proposed method is presented and discussed. This method is implemented in Matlab. In method six brain tumor images or abnormal images are Consider. In which image (a) is input image, (b) is Gray image, (c) is Edge Detection image and (d) is Segmentation image. All are give different outputs that are discussed in Table I. The different images are shown as



(a) (b) (c) (d)

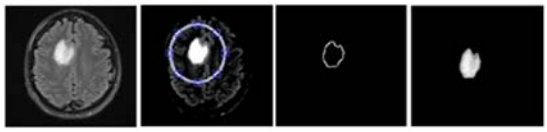
Figure2. (a) Input Image (b) Gray Image (c) Edge Detection Image (d) Segmentation Brain Tumor

Figure3. (a)Input Image (b) Gray Image (c) Edge Detection Image (d) Segmentation Brain Tumor



(a) (b) (c) (d)

Figure4. (a)Input Image (b) Gray Image (c) Edge Detection Image (d) Segmentation Brain Tumor



(a) (b) (c) (d)

Figure5. (a)Input Image (b) Gray Image (c) Edge Detection Image (d) Segmentation Brain Tumor

TABLE I

RESULTS OF VARIOUS BRAIN TUMOR INPUT IMAGES FOR EDGE DETECTION

Parameters	A	b	c	d	e	f
Area	188	44	41	109	270	115
Perimeter	162	41	38	93	263	98
Contrast	0.055	0.018	0.016	0.045	0.120	0.053
Correlation	0.089	0.914	0.885	0.969	0.974	0.931
Energy	0.961	0.987	0.9907	0.948	0.842	0.967
Homogeneity	0.992	0.998	0.9982	0.993	0.983	0.994

In Table 1, six different types of parameters like Area, Perimeter, Contrast, Correlation, Energy and Homogeneity detection of brain tumor are measured using six different images.

IV. CONCLUSION

The proposed method related with the study of different methods for detection of brain tumor in MRI image In this paper preprocessed the input MRI image then noise is removed with the help of median filter to improve the quality of MRI image and then segmented the improved image. As a result speed of detection is acceptable. And consider different types of brain tumor images. Various image quality parameters like Area, Perimeter, Contrast, Correlation, Energy and Homogeneity are measured to analysis the MRI image. The performance of this study is quite promises.

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