Brain Tumor Detection using Segmentation based on Fuzzy Transform
Miss. Shital S. Patil, J.A. Shaikh
M.E. Student, Associate Professor
Department of Electronics Engineering
PVPIT, Budhgaon, Maharashtra, India

Abstract:
The brain tumor segmentation studies based on MRI are attracting more and more attention in recent years due to noninvasive imaging. For detection of unusual growth of tissues and block of blood in nervous system can be seen in an MRI image. The first step of detection of brain tumor is to check symmetric and asymmetric shape of brain which will define the abnormality. After this step next step is segmentation based on two techniques. 1) fuzzy transform 2) Morphological operations. These operations are performed to delineating brain tumor boundaries and calculate the area of the tumor. The F-transform is a professional intelligent method to handle uncertain information and to extract the salient edges.

Keywords: Brain Tumor, MRI Images, Fuzzy Transform, Morphological operation.

I. INTRODUCTION:
Brain tumor is an abnormal growth of cell inside the skull. Normally tumor will grow from the cell of the brain, blood vessels, or nerves that emerge from the brain. There are two types of tumor which are benign (non-cancerous) and malignant (cancerous). Tumor can damage the normal brain cells by producing inflammation, exerting pressure on parts of brain and increase pressure within the skull [5].

Before the treatment was given, radiologist examined the patient physically by using Computed Tomography (CT Scan) and Magnetic Resonance Imaging (MRI). MRI image showed the brain structure, tumor size and location. From the MRI image easy to diagnose the tumor [6].

There are several methods to detect a brain tumor by that the tumor method we can diagnose and detect more easily. Some edges are nuclear network algorithm, watershed and edge detection, fuzzy c mean algorithm, asymmetry of brain used to detect an abnormality.

Canny edge detection is the one of the most useful feature in image segmentation. F-transform is an intelligent method to handle uncertain information. This is useful for detection of tumor boundaries. It is very easy method for detection is a promising and efficient method for future and edge extraction process. The fig.1 shows the MRI result of the brain tumor image. Developing an algorithm for the brain tumor detection and segmentation in order to overcome the accuracy and computational problems. There are two main stages for proposing an algorithm.

1. Detection.
2. Segmentation.

II. LITERATURE REVIEW:
The following techniques have been developed for detection of brain tumor.

Nemir Ahmad Al-Azzawi et al., described approach for detection and extraction brain tumor from MRI scan images of brain. Asymmetry of brain is uses for detection of abnormality, after detect of the tumor. The segmentation based on F-transform (Fuzzy transform) and morphological operations are performing to delineating brain tumor boundaries and calculate the area of the tumor. The F-transform is a professional intelligent method to handle uncertain information and to extract the silent edges. Accuracy and precision are co-dependent [1].

Paul Kleihues et al., states that histological typing of tumors of the central nervous system reflects. The progress in brain tumor classification which was achieved. Several new tumor entities have been added, including the pleomorphic xanthoastrocytoma, central neurocytoma, the infantile desmoplastic neuro, a stryctycoma / ganglioma and the dysembryoplastic neuroepithelial...
tumor. The WHO grading scheme was revised and adapted to new entities but its use, as before, remains optional[2].

D.Judehenmanth et al, states that the clustering approach is widely used in biomedical application particularly brain tumor detection in MR images. Fuzzy clustering using fuzzy C-means algorithm proved to be superior over the other clustering approaches in terms of segmentation.But the major drawback of the FCM algorithm huge computational time required. computational rate is improved by modifying the cluster center and membership value updation criteria[3].

Charutha S. et al,demonstrated that brain tumor is the most life threatening diseases and hence its detection should be fast and accurate. The modified texture based region growing and cellular automata edge detection are efficient techniques, incorporation of both enhance the efficiency of brain tumor detection. It is understood that the modified texture based segmentation integrated with the cellular automata edge detection is better when compare to the one with the incorporation of classical edge detection methods[4].

AzianAzamimi Abdullah et al, proposed a brain tumor detection method based on cellular neural network. To examine the location of tumor in the brain, MRI is used. This procedure is really time and energy consuming. To overcome this problem, an automated detection method for brain tumor using CNN is developed[5].

IshitaMaiti et al, proposed watershed method is used in combination with edge detection operation for brain tumor detection. It is color based brain tumor detection using color brain MRI image in HSV color space. The RGB image is converted into HSV color image. After combining the three images final brain tumor segmented image is obtained[6].

R. preetha et al, states that the boundary of tumor tissue is highly irregular. Deformable model and region based methods are extensively used for medical image segmentation, to locate the boundary of the tumor. Clustering of brain tumor images using, fuzzy C-means is robust and effective for tumor localization. Even though the proposed method has high computational complexity, it shows superior result in segmentation[7].

ArjunNichal et al. states that For detection of unusual growth of tissues and blocks of blood in nervous system can be seen in an MRI Images. The first step of detection of brain tumor is to check the symmetric and asymmetric Shape of brain which will define the abnormality. After this step the next step is segmentation which is based on two techniques 1) F-Transform (Fuzzy Transform) 2) Morphological operation. These two techniques are used to design the image in MRI. Now by this help of design we can detect the boundaries of brain tumor and calculate the actual area of tumor[8].

Different techniques were described for brain tumor detection purpose mentioned as above. But the proposed system has better performance as compared to these techniques. Developing an algorithm for the brain tumor detection and segmentation in order to overcome the accuracy and computational problems. There are two main stages for proposing an algorithm. First stage is based on study of asymmetry of the brain. A healthy human brain is roughly symmetrical bilaterally with respect to the midsagittal plane, so this system will use symmetry analysis of grey level to detect the existence of tumor. The second stage is segmentation based on edge detection. System will introduce an edge detection based on F-transform model which capture the silent edges .After edge extraction, a morphological operation for the final stage to show only tumor[1].

III. PROPOSED METHODOLOGY:

Objective of this work is to enhance the accuracy and reduce computational problems in already proposed algorithms. The main purpose using F-transform is to control the amount of details appears in edge image and suppresses noise.

A) Methodology :-

There are mainly two stages in our proposing algorithm system. It is detecting stage and segmentation stage. The overview of proposing system shown in fig. 2.

![Diagram of Proposed Algorithm](http://ijesc.org/)

1. **Detection:** -
The abnormality of the brain based on symmetry investigation of image grey levels. The detecting stage follows from these steps:

   a) Image registration techniques to ensure that the brain image in the middle.
   b) Extraction of the midsagittal plane of the human cerebrum and separate the brain into left and right hemispheres.
   c) Calculate normalized grey level histogram of the left and right hemispheres.
   d) Calculate the similarity between two image grey level using five symmetry measures: The correlation coefficient, Root mean square error, Average gradient, the variation distance between two probability distributions and overall cross entropy.

2. **Edge detection for image segmentation unit:** -

Image segmentation will partition the brain MRI scan image into several segments (super pixels). The objective of segmentation is to simplify or change the illustration of an image into something that is more meaningful and easier to analyze. Image segmentation is generally used to locate object and boundaries in images. Segmentation method can also e applied to edges
obtained from edge detectors. In the proposing algorithm to detect the edge based on F-transform is used.

3. Morphological operations:-
Morphological image processing is a group of nonlinear operations related to the shape of an image. The basic morphological operators are erosion, dilation, opening and closing. The primitives of morphological operations are erosion and dilation. Erosion is applied to detect the tumor. Erosion of B by A given by,

\[ A \Theta B = \{(i, j) : B(i, j) \in A \} \]

Where, A is binary image, B is the structuring element and (i, j) is the central pixel of structuring element. The segmentation stage follows from these steps:

a) Calculate F[u]-the direct F-transform of image and calculate u_{nm}–the inverse of F-transform.

b) Calculate the error function \( e(x) = |u(x) - u_{nm}(x)| \) for all \( x \in p \). Rescale and round the values of e from \([0, \max_x e(x)]\) the integer in [0,255], which results in the new image \( e_r \)

c) Compute a global threshold that can be used to convert an intensity image.

d) Compute the morphological operation as given in above equation. The extracted region is then logically operated for extraction of massive region in given MRI image.

e) Show only tumor portion of the image by remove the small object area.

f) The area of tumor region is calculated. The area of the tumor region is found by multiplying horizontal dimensions, vertical dimensions of the image with total no. of pixels in the tumor region.

IV. CONCLUSION:

This paper discusses, Brain tumor detection using segmentation based of fuzzy transform. F transform model capture the silent edges. The speed of detection is improved using asymmetry of brain. The primitive techniques are based on manual segmentation which is time consuming process. his algorithm can be used to process large brain images with its high speed and good sensitivity.

V. REFERENCE:


