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# Brain Tumor Segmentation and Detection using F-Transform

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***Abstract*: MRI is an advanced medical imaging technique providing rich information about the human soft-tissue anatomy. There are different brain tumor detection and segmentation methods to detect and segment a brain tumor from MRI images. Brain tumor is one of the most life-threatening diseases and hence it's detection and segmentation should be fast and accurate. Segmentation is used to separate the abnormal tumor portion in the brain. These tumors are unsharp and faint but their intensity value vary from neighboring healthy tissues. The first step of brain tumor detection is detection and second is segmentation. In detection stage check symmetry and asymmetry of brain and in segmentation stage fuzzy transform and morphological operations are performed.**

***Keywords*: MRI image, Brain tumor, Fuzzy transform, Morphological operations.**

## 1. Introduction

Human body contains no. of cells and each cell has its own functions for the correct functioning of the body, these cells have divided into new cells in controllable manner but sometimes they divide and grows uncontrollably, this results is an unwanted tissues this is tumor. For diagnosis of brain tumor, MRI provides rich information about the basic structure or clinical studies. The fundamental aspect that makes segmentation of medical images difficult is the complexity and the instability of the anatomy that the being imaged [6]. Nuclear network algorithm, watershed and edge detection , fuzzy c means algorithm these are several tumor detection techniques .Canny edge detection is one of the useful feature in image segmentation. The segmentation technique is widely used by the radiologist to segment the image into several regions.

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 edge extraction process. Developing an algorithm for the brain tumor detection and segmentation in order to overcome the accuracy problem. Two main stages of proposed algorithm:

1. Detection.
2. Segmentation.

Fig. 1 shows that brain tumor [1].

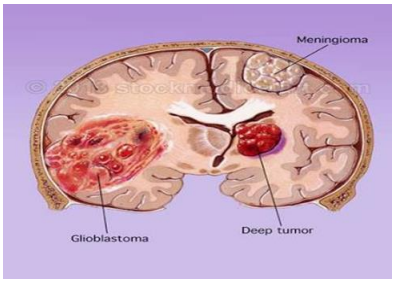

Fig. 1. Presence of brain tumor

## 2. Related work

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 operation 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].

D. Judehemanth 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 [2].

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. The WHO grading scheme was revised and adapted to new entities but its use, as before, remains optional [3].

Ishita Maiti 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 [4].

Azian Azamimi 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].

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 [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].

## 3. Methodology

A healthy human brain is roughly symmetrical with respect to the midsagittal plane, so this system will use symmetry analysis for grey level to detect the existence of tumor. System will introduce an edge detection based on F transform model. There are main two stages in this algorithm. It is detecting stage and segmentation stage. In segmentation stage segmentation and morphological operations are performed. The block diagram of proposed algorithm shown in fig. 2.

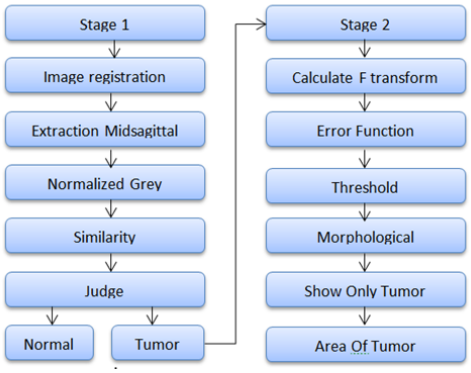


Fig. 2. Block diagram of proposed algorithm

### A. Detection

To ensure that the brain image in the middle so that comparison can be properly done If the cerebral hemispheres were absolutely symmetrical the intensity distribution of in hemisphere should be similar to each other, however brain is symmetrical. Brain tumors producing mass effect displace and distort the surrounding. In detection stage image registration takes place. Image registration is the process of bringing two or more images into spatial correspondence (aligning them). In the context of medical imaging, image registration allows for the concurrent use of images taken with different modalities (e.g. MRI and CT), at different times or with different patient positions. After that separate the brain into left and right hemispheres then find normalized grey level histograms. And calculate the similarity between two image grey levels.

### B. Edge detection for image segmentation

Edge detection is used to determine the boundaries of the objects. The efficiency of many image processing task depends on the detecting edges. In the proposed algorithm to detect the edge based on F transform which suppress noise.

### C. Morphological operations

In this paper erosion is applied to detect the tumor. First calculate the F transform, inverse F transform and error function. Then compute a global threshold that can be used to convert an intensity image. Compute the morphological operations. The extraction region is then logically operated for extraction of massive region. The area of tumor region is found by multiplying horizontal dimensions, vertical dimensions of the image with total no. of pixels in the tumor region.

## 4. Result

Brain tumor segmentation and detection using F transform shown in fig. 3.

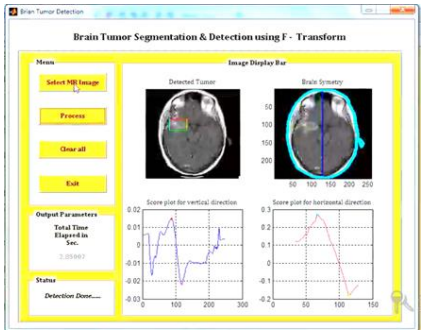


Fig. 3. Final extraction brain tumor from MRI image

Similarity between two images can be calculated using correlation coefficient, root mean square error, average gradient, the variance distance and overall cross entropy. The area of tumor is calculated by multiplying horizontal dimensions, vertical dimensions of the image with total no. of pixels in the tumor region.

## 5. Conclusion

In this paper, Brain tumor segmentation and detection using F transform is discussed. F-transform model capture the silent edges. The speed of detection is improved after using asymmetry of brain. This algorithm can be used to process large brain image database and provide quick outcomes. This brain tumor detection technique may give better result than other brain tumor detection techniques.

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