Medical Application For Brain Tumor Detection And Area Calculation Using Algorithm.

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Abstract – *Now a days tumor is second leading cause of cancer. Due to cancer large no of patients are in danger. The medical field needs fast, automated, efficient and reliable technique to detect tumor like brain tumor. Detection plays very important role in treatment. If proper detection of tumor is possible then doctors keep a patient out of danger. In this medical application using K-mean and FCM segmentation algorithm System detects the proper shape and size accurately. It works accurately in small time. It accepts MRI and CT images as a input. Mostly MRI images are preferred because MRI images does not use harmful radiations which is dangerous for human body. Is uses magnetic field detection. MRI is more accurate than CT images. Various image processing techniques are used in this application. Using this application doctors provide proper treatment and save a number of tumor patients.*

Key Words: Automated, MR, CT, Image processing, K-mean, Fuzzy C-mean(FCM).

1.INTRODUCTION :

In now a days doctors use manual system to detect the tumor. Manual system means doctors detect tumor using their eyes. But it is not detected accurately and the result is not efficient. The tumor is nothing but the unwanted growth in tissues in brain area. If it is limited for only one particular part of body then it is primary but if it is spread all over the body then it is secondary. To detect those type of secondary tumor using manual system is very hard and not accurate. In this situation this application helps to doctor as well as patients to know more about tumor seriousness. This medical application uses K-Mean for clustering of tumor tissues and FCM foe segmentation of brain area. It improves the accuracy , efficiency and time required to gain proper result. Using this computer system doctors provide proper treatment to patient and protect number of human life in very less time[4].

1.1 Existing Method:

The existing method is based on the thresholding and Region growing. In manual system it is hard to detect tumor if tumor is in secondary stage. Manual system uses thresholding and region growing. In the thresholding based segmentation the image is considered as having only two values either black or white. But the bit map image contains 0 to 255 gray scale values. So sometimes it ignores the tumor cells also and due to this it does not return accurate result[2].

2.OBJECTIVE OF APPLICATION:

- The main aim of the application is tumor identification.
- The main reason behind the development of this application is to provide proper treatment as soon as possible and protect the human life which is in danger.
- This application is helpful to doctors as well as patient.
- The manual identification is not fast, accurate and efficient. to overcome those problem this application is design.
- It is user friendly application.

2.1 Proposed Method:

There are five stages of this application. Using those five stages it return the proper and accurate result. The stages are as follow:

- Pre-processing
- Segmentation using K-mean
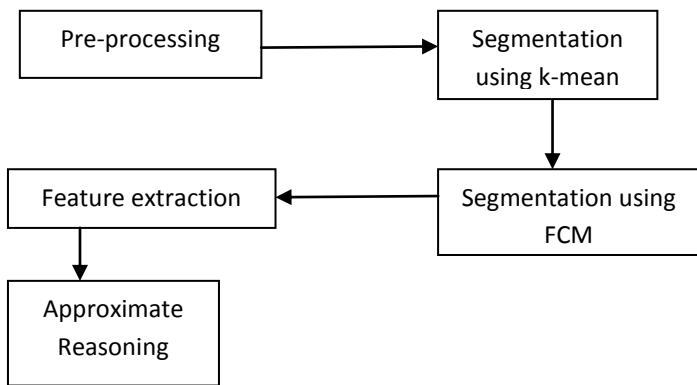- Segmentation using FCM
- Feature Extraction
- Approximate reasoning

Fig-1: Block diagram of proposed method.

The proposed system has mainly five modules. Pre-processing, segmentation, Feature extraction, and approximate reasoning. Pre processing is done by filtering. Segmentation is carried out by advanced Kmeans and Fuzzy C-means algorithms. Feature extraction is by thresholding[4] and finally, Approximate reasoning method to recognize the tumor shape and position in MRI image. The proposed method uses two algorithms K-mean and fuzzy C-mean(FCM)[1].

3. WORKING:

A)Pre-Processing:

Pre-processing plays very important role in this system. It uses some filters method to remove the noise. System can accept color images also. If the input image is in color or RGB format then it will convert into gray scale. Gray scale is nothing but the image in only black and white part. If image is already in gray scale then no need to convert it into gray scale. Simply the pre processing is nothing but the removal of unwanted data or elements in images. As shown in figure gray scale MRI imager as a input then pre-processing is done and the gray scale image is display in second block[3].
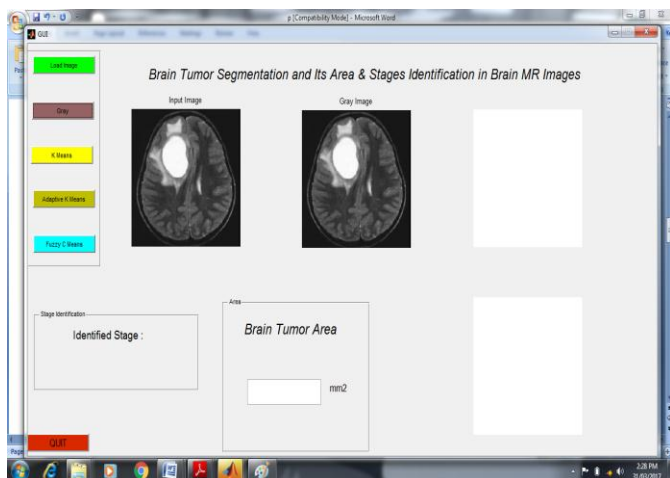

Fig-2: Output image for Pre-processing.

B)K-means segmentation:

K-Means is the one of the unsupervised learning algorithm for clusters[3]. Clustering the image is grouping the pixels according to the some characteristics. In k mean algorithm initially there are number of clusters . then those n clusters are grouping together according to their properties. To group those clusters the element needs having same properties or characteristics like distance. In some situation using distance characteristics the clusters are form. If the element is near to the cluster according to some condition then those element is in same cluster. Then the centroid is re-estimated. Again each element is compared to all centroids. The process continuous until the center converges.

- Properties of K-mean:
  - There are always k clusters.
  - There is always at least one item in each cluster.
  - The cluster are non-hierarchical and they do not overlap.
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- Steps for algorithm:

1. Dataset is partitioned into k clusters.
2. For each datapoint:
A. calculate the distance from the data point to each cluster.
B. if data point is closest to cluster, leave is where it is.
C. if data point is not closest to its own cluster then move is into another cluster.
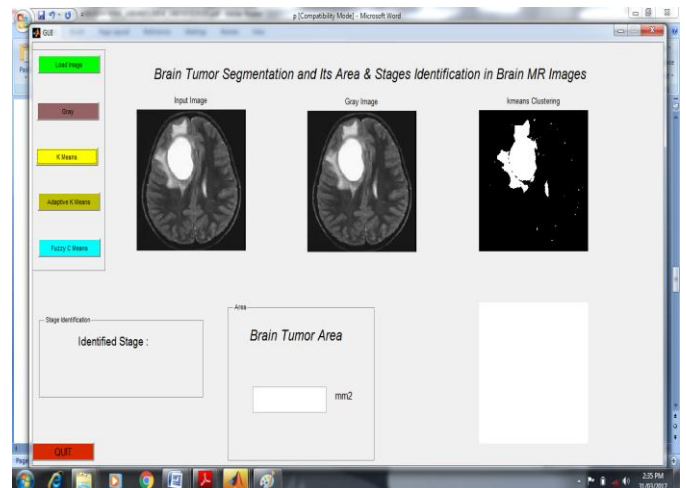3. Repeat the above step[3].

Fig-3: Output image for K-mean.

As shown in figure gray scale image is applied to the k -mean then the result is display in third block. There is clustering of tumor tissues are highlighted using white part.

C)Segmentation using FCM:

The fuzzy logic is a way to processing the data by giving the partial membership value to each pixel in the image. The

membership value of the fuzzy set is ranges from 0 to 1. logic that allows intermediate values i.e., member of one fuzzy set can also be member of other fuzzy sets in the same image. There is no abrupt transition between full membership and non membership. The membership function the fuzziness of an image and also to the information contained in the image. These are three main basic features involved in characterized by membership function. They are support, Boundary. The core is a fully member of the fuzzy set. The support is non membership value of the set and boundary is the intermediate or partial membership with value between 0 and 1[4].

- Steps for algorithm:

1. Cluster image in feature space, with next conditions: number of Clusters is c.

2. Repeat for each pixel aij of image I.

2.1. Find out, into which cluster Ci belongs pixel aij at most.
2.2. Find out, whether in the closest surroundings of pixel aij exists segment k, which points belong to same cluster CA.
2.3.If such segment R k exists, than pixel aij add to segment R k,Else create new segment R k and add pixel aij to new segment Rn.

3. Merge all segments, which belong to one cluster and are neighbors.
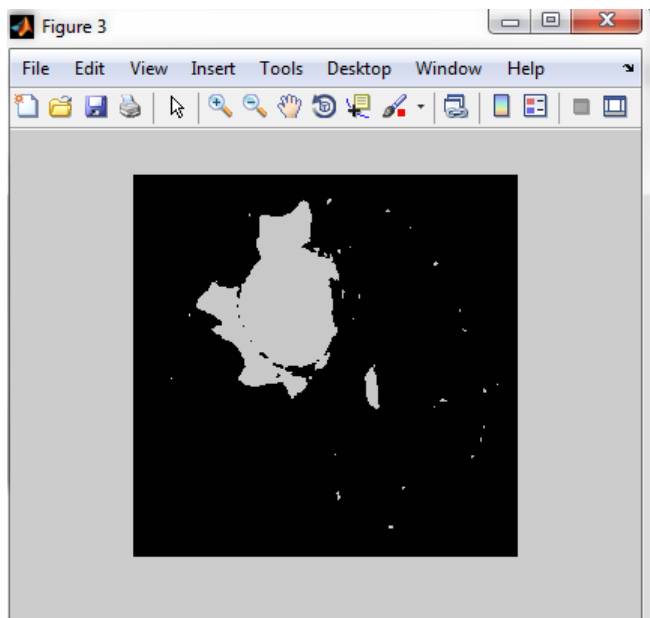
4. Arrange borders of all segments

Fig-4: Output image for FCM.

As shown in figure proper boundary can be detected using the FCM. FCM plays very important role for boundary detection in this algorithm. As figure shows the result of k-mean is give to the next stage and click on Fuzzy c-mean

button then the result of boundary detection is displayed in next block.

D)Feature extraction:

The feature extraction[5] is extracting the cluster which shows the predicted tumor at the FCM output. Tumor can be exstracted using K-mean and FCM and the stage is detected. Some conditions are set to display the stages as per medical field. The conditions are as follow:

- If the tumor area is between 0 to 7 mm then it is First stage and the it displays First stage comment in identified stage block as shown in fig.
- If the tumor is between 7 to 14 mm then the tumor is at second stage.
- If the tumor is between 14 to 21 mm then the tumor is at third stage.
- If the tumor is 21 and above then the tumor is in critical stage.

In this way proper size and stage is detected and it helps to doctor to provide a proper treatment or medicines as per patient situation[5].

E)Approximate Reasoning:

In the approximate reasoning the proper result is printed using proper device. The copy of patient report is also stored as per user wish and as per given location. User can brows a result when they wish to see.
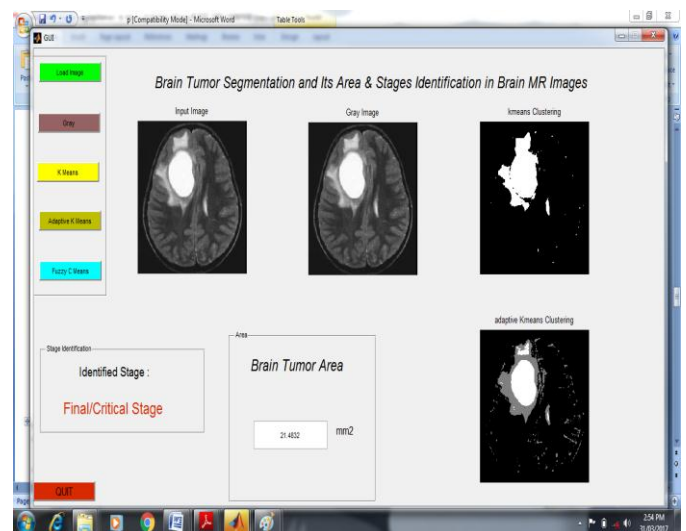

Fig-5: Final Result.

4. STEPS IN DETECTION PROCESS:

Step 1: Start the process.
Step 2: Get the MRI scan image input.
Step 3: Check whether the input image is in required
        format and move to step 4 if not display error

message[4].

Step 4: If image is in RGB format covert it into gray scale else move to next step.

Step 5: Find the edge of the grayscale image.

Step 6: Calculate the number of white points In the image.

Step 7: Calculate the size of the tumor using the formula.

Step 8: Display the size and stage of tumor.
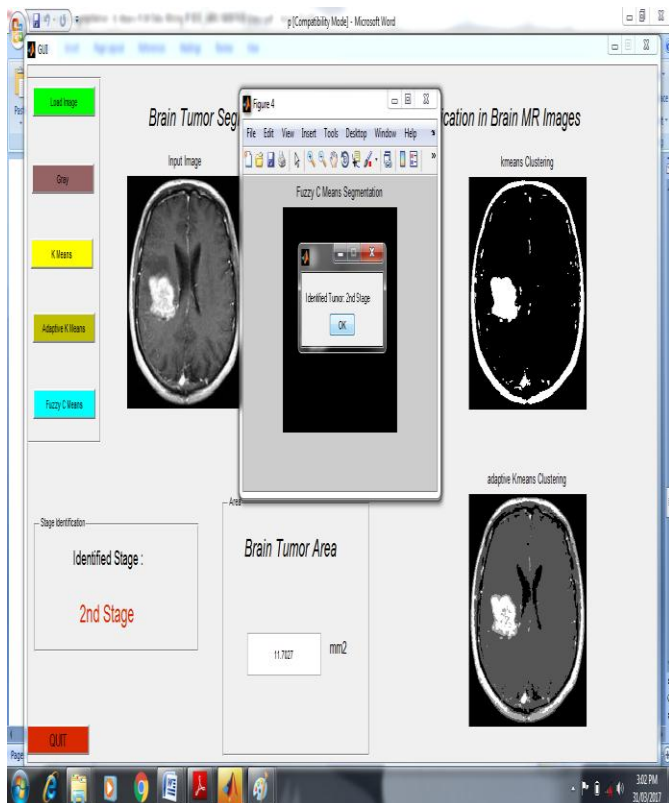
Step 9: Stop the program.

Fig-6: Overall Working.

5.TOOLS USED:

A. Noise Removal and Sharpening:
Unwanted data of element are remove using filter and image Can be sharpen and black and white gray scale image is used as a input.

B. Erosion and Dilation:
It is typically applied to binary image , but there are versions that work on grayscale images. The basic effect of the operator on a binary image is to erode away the boundaries of regions of foreground pixels i.e. white pixels, typically[2].

C. Negation:
A negative is an image, usually on a strip or sheet of transparent plastic film, in which the lightest areas of the photographed subject appear darkest and the darkest areas appear lightest.

D.Subtraction:
Image subtraction is a process whereby the digital numeric value of one pixel or whole image is subtracted from another image. The white part of tumor can be subtracted from another remaining part that is black portion of the images.

E. Contrast Adjustment:
Allow different feature in the image to be visualized[1].

F. Threshold:
Thresholding is a process of image segmentation. It convert the gray scale image into binary image.

G. Boundary Detection:
Total area or boundary can be form properly using boundary detection method. White part of tumor tissues can be highlighted and there proper boundary can be detected. It is useful method to calculate the size and shape occupy by tumor tissues.

CONCLUSIONS:

The proposed application is inputted in gray scale images of brain that contain tumor using MATLAB programming which is used to perform mathematical function very efficiently and fast. The system is very useful to detect a tumor when the tumor is in secondary stage because in this situation manual system is not work properly. The application is useful to doctors as well as patients. Application is useful to protect tumor patients life and provide proper treatment before any harmful stage.

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