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Implementation of Proposed Method and Area Calculation for Brain Tumour using MRI Images

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Abstract: ***The brain tumor turns into cancer it becomes life threatening. It is necessary to detect the location, type and size of tumor. It is an uncontrolled growth of tissues in human brain which limits the functioning of brain. Nowadays different types of techniques are used such as X- ray, CT scan, MRI, PET. It is possible with advancement of machine learning (ML) and image processing (IP). In this paper the study of different methodology to detect brain tumor by using image processing. By analysing several research paper that provides gist of technologies which can be used to predict brain tumor.***
Keywords: Brain tumor, Segmentation method, MRI, Entropy, Tumor Size

I. INTRODUCTION

Brain tumor is an uncontrolled growth of tissues in human brain which limits the functioning of brain. There are two types of brain tumor such as 1) Benign tumor 2) Malignant tumor. Benign tumour is noncancerous and has less size, it is in limited area. Malignant tumor are cancerous and spreading speedily, damages other tissue also. Becomes life threatening. Primary brain tumour arises in brain and secondary brain tumor arises in other part of body. Imaging tumor with more accuracy plays vital role in tumor diagnosis. The various techniques of high resolution such as MRI, CT scan, PET. MRI is widely used because it provides more advantage over other it provides rich information bout anatomical structure of human body. Better results than CT scan and PET. MRI uses strong magnetic field and radio wave to analyse the anatomical structure of human body. This entire paper represent as existing methodology ,proposed methodology, k –means and proposed algorithm, tumor area calculation

II. EXISTING METHODOLOGY

In image processing these steps are commonly used such as Pre- processing, filtering, Segmentation, Feature extraction and classification is shown in figure.1. Initial stage is collection of data of MRI images. These are T1weighted, T2 weighted and Flair weighted.

A. Pre-processing and Enhancement of an Image

Firstly gray scale image is filtered and then enhances, reduces noise of image. Denoising the image and prevent edges. Averaging filter used to remove noise. Median filter used to remove salt and paper noise. Also Denoising method makes wavelet scaling coefficient biased.

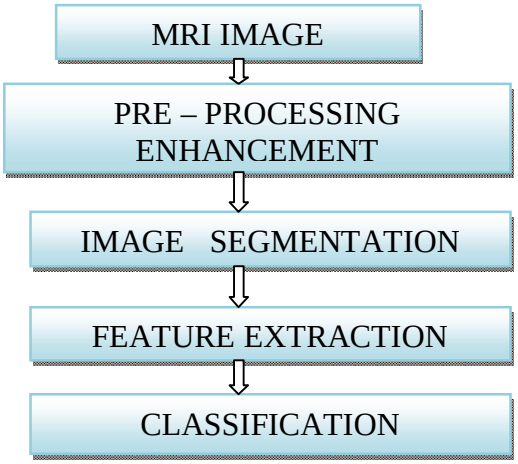

Figure 1.steps for image processing

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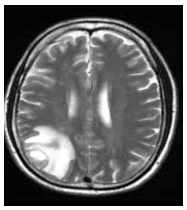

Figure 2. Enhanced image

B. Segmentation Method

It performs the analysis easier. There are following types of image segmentation.

1) *Boundary approach and Thresholding:* It is the most commonly used segmentation method. It is the gray valve remapping method where if p is considered as an operation then as shown in equation (1),

$$P(v) = \{1 \text{ or } 0 \text{ if } v<t \text{ , if } v \geq t \text{ .....1}$$

where v is the gray valve and t is the threshold value . In the thresholding method the gray image is converted to binary image . After thresholding the image has segmented into two values 0 and 1.

2) *Edge Approach:* In edge-based segmentation method , the detected edges in an image are assumed to represent object boundaries and used to identify these objects. Edge based segmentation very rarely gives the absolute distinct and closed boundaries needed for a direct segmentation. Chances are more that false edge detection and many of the times it requires edge linking to join the partial edges into an object boundary.

3) *Region Approach:* Region based approach depends on the assumption that the bordering pixels within one region have similar values. It focuses on finding object region instead of its edges. It compares one pixel with its neighbors,if the congruence criteria satisfies then the pixel can be set to belong to the cluster as one or more of its neighbours. Different clustering algorithms are used in this type of approach.

a) *K-means Algorithm:* K-means algorithm is widely used clustering technique. Which is also known as hard clustering algorithm, it partitions a given dataset into c or k clusters. This algorithm is simple fast and robust to implement. It has some disadvantages as it may not be successful to find overlapping clusters and it also fails to cluster noisy data and non-linear datasets.

b) *Fuzzy Clustering:* Fuzzy clustering also known as soft clustering . In this an object is a member of a single cluster as well as a member of many clusters. i.e. objects which are located on the boundaries of the clusters are not forced to belong to a certain cluster, rather they can be member of many clusters. Comparison between K- means and Fuzzy is given in Table 1.

C. Feature Extraction

Extracting the exact tumor is a crucial task in case of brain tumor because of the complex structure of brain. Certain parameters are taken into account for feature extraction as size, shape, composition, location of the image . As per the results obtained from the feature extraction the classification of the tumor is done.

III.ALGORITHM OF K MEANS CLUSTERING

The purpose of k-means clustering is to cluster the given set if data. k-means is one of the simplest partitions methods of clustering. It is one of the learning algorithms which is unsupervised. Clustering the image means grouping out the pixels depends on some characteristics. In k-means clustering the number of clusters k has to be defining first. The cluster centers k has to be chosen randomly. Then the distance between these cluster centres and pixels are calculated. Every pixel is individually compared with all cluster centers with the help of distance formula. The pixel is moved to the particular cluster which has the shortest distance among all. This process is continuous until the centre converges.

A. Give no. of cluster k.

B. Choose k-cluster centers.

C. Calculate mean,

$$J = \sum_{j=1}^{k} \sum_{n \in j} \left\| X_n - \mu_j \right\|^2$$

D. Calculate the distance between each pixel to each cluster center.
E. If distance is near to center then moved to that cluster.
F. Otherwise, move to the next cluster.
G. Re estimates the cluster center. This process continues until the centre doesn't move .

IV. PROPOSED METHOD

In proposed method Preprocessing of image, applying median filtering partition the image into 4 quadrant .Evaluate the maximum and minimum intensity and entropy of image, by applying run region properties marking boundary around the area and counting number of pixel present in it calculates tumor area. Algorithm followed by:

A. Read image and convert to grayscale image
B. Preprocessing using median filter and enhances the image
C. Partition image into 4 quadrant and calculate maximum entropy where, Entropy = -sum(p.*log(p)) ; [p= histogram counts]
D. Evaluate extended maxima apply run region properties to it.
E. Finally calculate the tumor area Now , Tumor area calculation

Size of tumor,
S = [(√P)*0.264]mm^2
P = No of white pixel; W = width; H = height; 1 pixel = 0.264mm
Database : The patients MRI images taken and calculating some parameters size, area ,time, entropy, type. The image analysis for 12 images

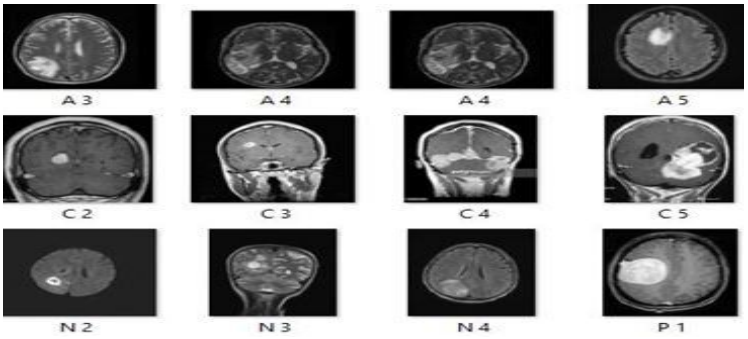

Figure3 : MRI images of 12 patients

V. PERFORMANCE ANALYSIS

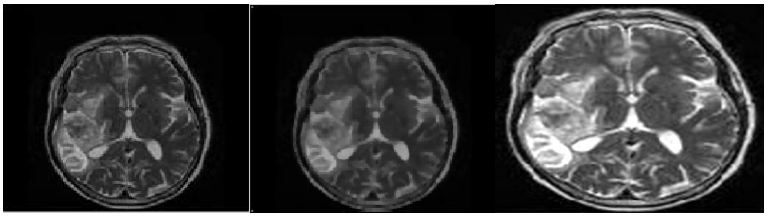
Figure 1:Gray image → Filtered image →Enhanced image

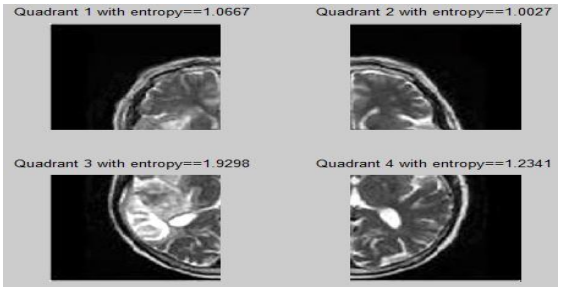

Figure 4:Entropy calculation

Figure 5: Tumor size and execution time

Entropy calculation for each quadrant for 12 mri images is given below,

Sr no	Quadrant 1	Quadrant 2	Quadrant 3	Quadrant 4	Max Quadrant
1	1.3058	0.9139	1.8197	0.9818	1.8197
2	1.0667	1.0027	1.9298	1.2341	1.9298
3	0.4665	0.3270	0.3508	2.0761	2.0761
4	1.1547	0.6894	0.8589	0.8179	1.1547
5	1.8808	0.8135	1.5686	0.6913	1.8808
6	1.4188	1.2062	1.2927	1.2742	1.4188
7	1.2223	2.0536	1.5411	2.7546	2.7546
8	2.1812	2.4526	1.4838	2.7284	2.7284
9	1.1236	1.3508	1.4027	1.1779	1.4027
10	1.3188	1.3236	1.2427	1.3503	1.3503
11	2.0686	1.8989	1.5355	2.6684	2.6684
12	0.3988	1.2842	-	-	1.2842
13	1.4913	1.7555	-	-	1.7555 1.4913

Table 1:Entropy calculation

Table 2:Parameter calculation

Sr no	Tumor size pixel	Tumor Area(mm)	Execution time	Experimental analysis	Doctoral analysis	parameter
1	8056	4.86	5.386	Benign	Benign	TP
2	9057	5	5.957	Malignant	Malignant	TP
3	12001	5.37	5.65	Benign	Benign	TP
4	5587	4.44	5.65	Benign	Benign	TP
5	11536	5.32	5.68	Malignant	Benign	TN
6	2937	3.72	5.33	Benign	Benign	TP
7	9035	5	5.27	Benign	Benign	TP
8	0	0	-	No Tumor	No Tumor	FP
9	1825	4.24	4.24	Malignant	Malignant	TP
10	-	-	-	No Tumor	Benign	FP
11	3034	3.81	5.561	Malignant	Malignant	TP
12	6588	4.27	4.162	Malignant	Malignant	TP

VI.CONCLUSION

In this work, proposed system implemented to calculate the maximum entropy of quadrant ,tumor size inform of pixel and tumor area ,execution time for MRI images. Finally approximate reasoning for calculating tumor area or shape. The experimental results of 13 patients are compared with the Doctor's diagnosis. The execution time for the particular image is evaluated.

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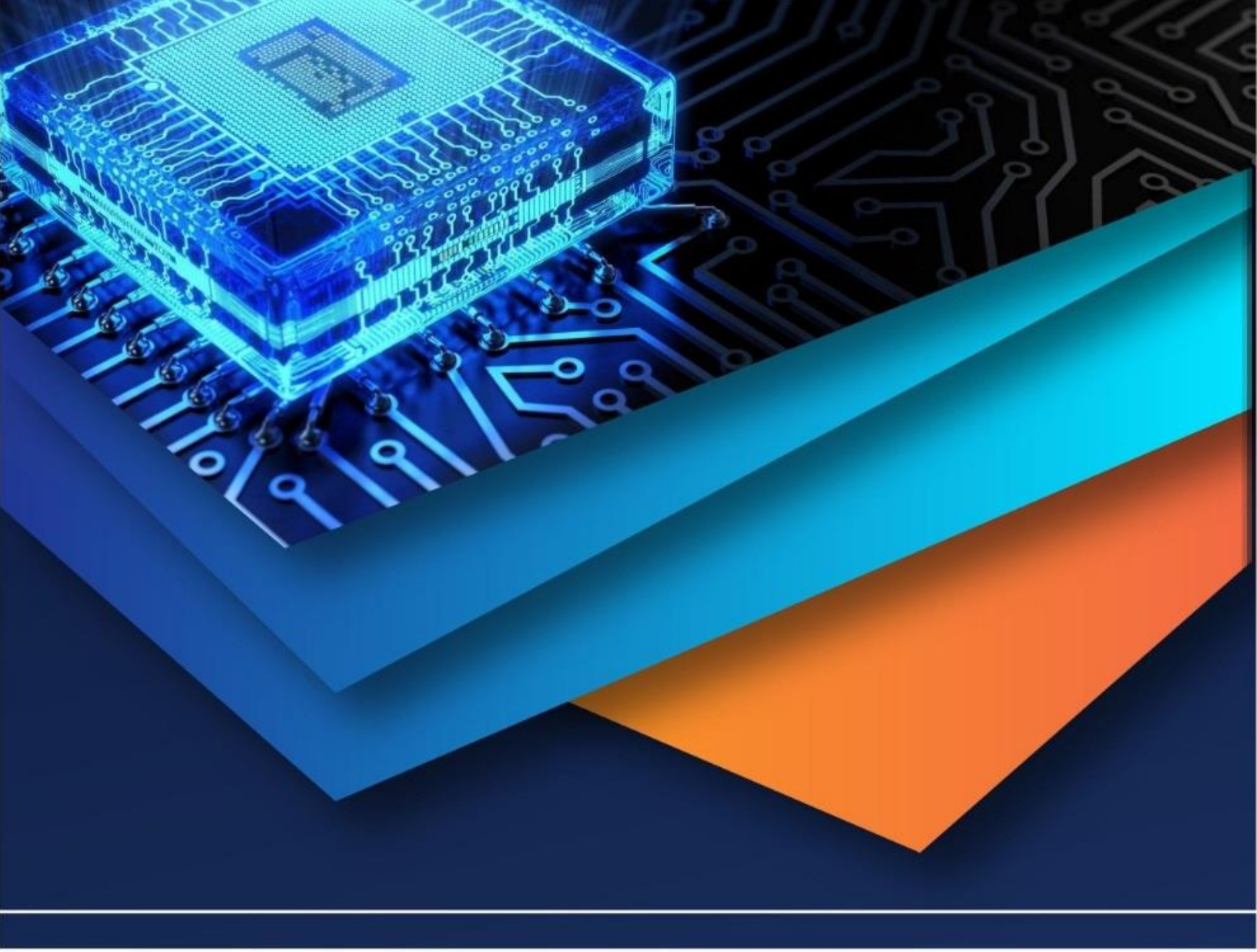

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