

Efficient Way to Analysis the Texural Features of Brain Tumor MRI Image Using Glcm

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Abstract:- Tumor spotting and elimination is one problematic issue in medical science that still remains. Untimely imaging techniques CT and MRI imaging techniques aid specialist in coming up with preferable perception, but because of high variability in tumor tissue of divergent patient process come up with laborious risks .In this paper, tumor image processing concern the three stages, namely pre-processing, segmentation and feature extraction using GLCM. After the accession of the source MRI image, it is pre-processed by converting the original image to grayscale image, then use of filters for removal of noise and using arithmetic operators for enhancement, then the stage of thresholding segmentation and watershed segmentation is done followed by a morphological operation to detection of tumor, thereby texture analysis using Gray Level Co -Occurrence Matrix. The above proposed procedures and techniques is applicable in accomplishing the reports axiomatically in less span of time.

Keywords:- Brain Tumor, Mri Image, Segmentation, Glcm.

I. INTRODUCTION

To achieve a better results medical staff and patient work together so that establish preferable results. An abnormal growth of cell in the brain is defined and treated well in time, although the cause of brain tumor is not clear and not a set of symptoms. Sometime symptoms depend upon their size, shape and location [1].Based on the areas, size and shape brain tumor classified into two types; Primary

and Secondary brain tumor. This primary further divide into two types;

- Benign Tumor: This type of tumor is non-cancerous cluster of cells. They are slow, it usually does not spread as must fast then malignant tumor.
- Malignant Tumor: This type of tumor is more serious and considered as causing effects on the various parts of the brain and spinal cord which sometimes lead to death of person [2]

To diagnose the brain tumor many methodologies can we use such as an MRI scan, CT scan, BIOPSY, SPECT scan. Mostly MRI imagining is a popular, efficient and growing field in medicine. MRI (magnetic resonance imagining) is a scan that use strong magnetic field and radio waves to produce images of various parts of brain [3].

Methodology: Brain MRI image is processed and elegant, well for the detection of tumor by using image processing tools in MATLAB. The block diagram of the whole process is shown in Figure 1. The methodology engages following steps [4].

Step 1: Read the input image

Step 2: convert the input image into a Gray scale image

Step 3: use various filters for removal of noise and enhancement of Image and perform arithmetic operations on the image such as subtraction

Step 4: Apply threshold segmentation for getting binary image and watershed segmentation for getting same intensity value.

Step 5: Perform Morphological operation such as dilation and erosion

Step 6: Analysis outcome of morphological operation using feature extraction technique i.e. GLCM

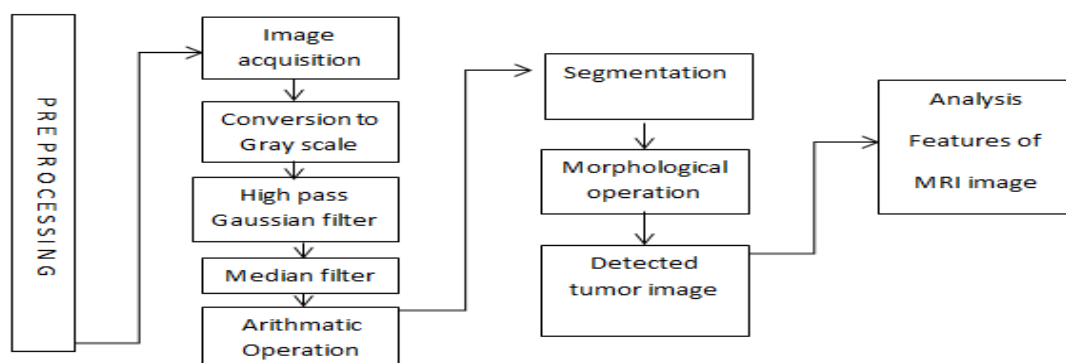


Fig (1): Block diagram of the process

- *Image conversion into Gray scale*

Some tie image of MRI consists of the small scale of RGB content as this red, green, blue components consist of equal intensity values of each pixel so it is required to specify a single intensity value of pixel [7].By conversion of RGB content of the image into grayscale image which have single specify the intensity value of each pixel, this is a single specifying intensity value easy the process of filtration and enhancement [8]. Fig (2) gray scale image

II. METRIALS AND PROPOSED SYSTEM

A .Description of used database

In this study , the used database is used for analyzing which is available from “Whole Braine Atlas” site [5].

B. Schematic of the study

Preprocessing: As images contain certain types of distortions and noise to get better and enhance image pre-processing comes further within action with removal of noise and provide high contrast enhanced image the function of pre-processing starts with[6]:

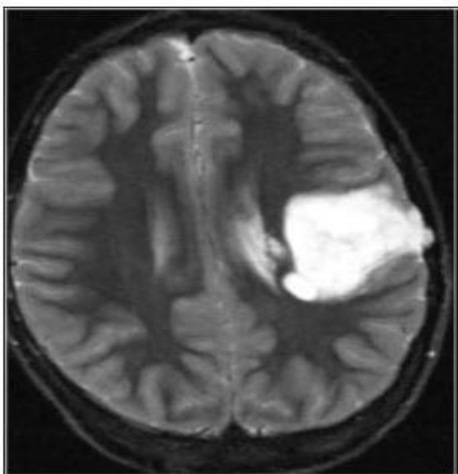


Fig (2): Converted into a gray scale image

- *Use of Filtration technique:*

Using the filtration technique, it is easy to remove the noise present in the image , noise is normally high frequency signal.Removing noise using filters can be selected by analyzing the noise behavior of the image.Here noise a generally defined as Gaussian noise which is removed by using high pass Gaussian filters and salt and paper noise can be eliminated by using median filter.

- *Using High pass Gaussian filter:*

It retains the high frequency components within an image and diminish low frequency, helpful in sharpening images.High pass filter enhances the brightness of the center pixel, enhance the edges . Figure (3) shows High pass Gaussian image.

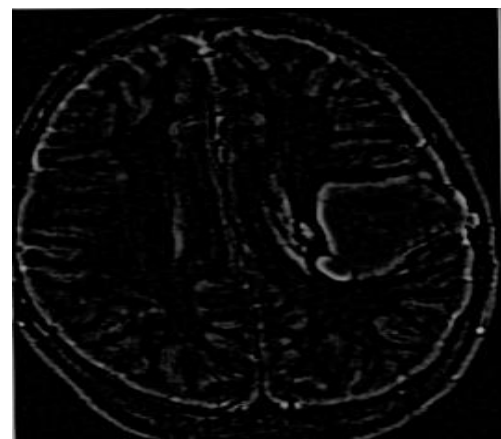
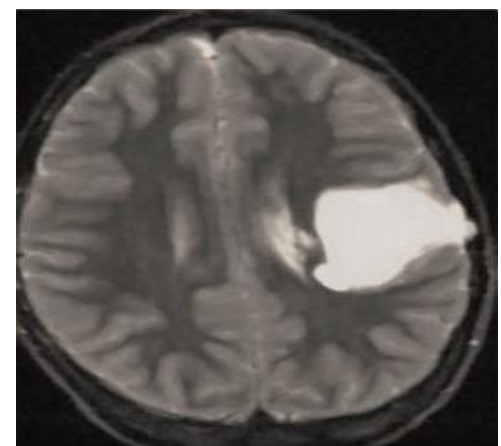


Fig (3): High pass Gaussian image



Fig(4): Output of median filter

- *Using Median filter:*

It considers as each pixel presents in image it turns, looks at their neighbors either it representative of its surroundings or not it generally replaces the pixel value into the median of its value example by calculation.

123	125	126	130	140
122	124	126	127	135
118	120	150	125	134
119	115	119	123	133
111	116	110	120	130

Neighboring value- 115, ,120, 123, 124, 125, 126, 127, 150

Median value: 124. The median filter uses to remove salt and pepper noise arise due to the motion of a device that use of patient MRI scans. Figure (4) shows the Median filter image.

- *Image enhancing by using arithmetic operations*

Image arithmetic operations are applied in pixel by pixel way, here image subtraction operation is used to enhance the image, image subtraction used by 'imsubtract' inbuilt Matlab function to subtract the image from the background.

C. Segmentation process

Segmentation of image is a division of the image into regions, this division is based on similar attributed.

Image segmentation is the process of assigning a label to each pixel, such that pixel of image with same label shares identical characteristics. In this process, segmentation is done using the following methods.

1) *Threshold segmentation*: It is the simplest segmentation method, in this grayscale image into a binary image, main function is the selection of the threshold value. Figure (5) shows a threshold image

2) *Watershed Segmentation*: It is the best process in groups of pixels of an image on the basis on their intensities; this grouping is done on the basis of their equal intensity value. For watershed segmentation, local minima of gradient magnitude form which is chosen as a marker. So by mean here operate using of the Sobel edge mask it is generally high pass mask, information we need edges which are defining the image, these edges are high at the borders and lower inner side of the image. Figure (6)

3) *Morphological operations*: Morphological operations is a wide range in image processing that operate image on the based on shape .In morphological operation, the value of every pixel present on the output image in based balancing analogous pixels in the input image with its adjoining neighbors. Its has two main components a structuring element and Dilation and Erosion. The number of pixel added and deleted from the object in image depends on size and shape of structuring element or kernel used in processing the image ,in dilation its function to grow ,dilate,expand the object in an image while erosion its basic effect of the operator on binary image is to erode away the boundaries of regions of foreground pixels (i.e. *White pixels, typically*)[9]. Figure(7) shows the erosion process followed by dilation.

1) *Analysing the image textural feature*

Texture is a description of the spatial arrangement of color or intensities in an image or a selected region of an image .Here image textural features are measured using Gray level Co-occurrence matrix(GLCM) was offered by Harlick in 1970. It is most classical second order statistical method for texture analysis, it exhibits how the pixel brightness in an image occurs. A matrix is formed at a distance of $d=1$ and at an angle in degree $\{0, 45, 90, 135\}$ and on the basis of matrix different measures can be determined i.e. Energy ,contrast, correlation, Homogeneity. These dimensions calculated at different angles [12]. It is considered pixel with gray value comes either horizontally, vertically and diagonally mark the pixels with the value j . Glcm dimenention calculated like

Horizontal(0), Vertical(90) and diagonal at bottom left to right top (-45), left top to right bottom(-135) and announced as P0, P45, P90, P135 respectively[10].



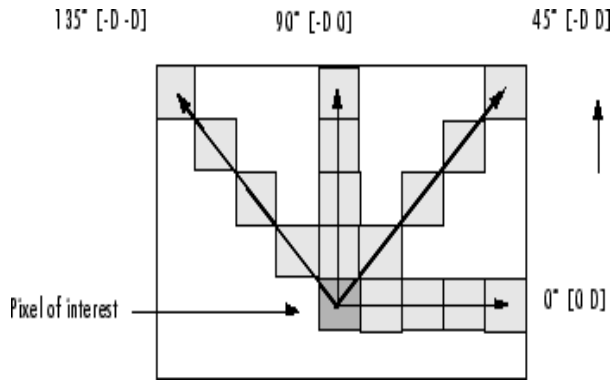
Fig (5): Threholded segmented image



Fig (6): Watershed segmented image



Fig(7): After dilation and erosion



$$\sum_{i,j=0}^{N-1} \left(P_{\frac{(i,j)}{1+|i-j|}} \right)$$

III. RESULT AND DISCUSSION

Finally calculated parameter values of contrast, energy, homogeneity and correlation using above formulation gives following results, in this value are extracted on a different angle as already discuss above and tabulation is on average values :

Texture is grouped according to the weight of the equation and to the degree. The following features are extracted :

1. Contrast: It is also known as ‘sum of squares variance’. Spaced frequency is the difference between the highest and the lowest value of a bordering sets of pixel , it differs the calculations of intensity contrast linking pixel and adjacent over the whole image. Its Range = [0(size(GLCM)-1^2)].The contrast expected to low if the gray level of each pixel pair of the image are similar, the contrast is 0 for the constant image following formula is used to determine:

$$\sum_{i,j=0}^{N-1} P_{i,j} (i - j)^2$$

Here(i-j) increases contrast continue as increase exponentially,when i and j as equal the value is 0 i.e i-j=0

2.Correlation:It is a measure of gray level linear dependencies in particular direction same as vctor displacement .High correlation vlue close to 1 implies linear relation between the gray tone of a pixel pair on the behalf of a positive and negatively correlated image , the correlation value is 1 and -1 . Range=[-1,]and following fomula

$$\sum_{i,j=0}^{N-1} P_{i,j} \left[\frac{(i-\mu_i)(j-\mu_j)}{(\sqrt{\sigma_i^2})(\sqrt{\sigma_j^2})} \right]$$

3.Energy: energy is defining the use for doing useful work in that way it represents orderliness,it calculates the order of the image when the window is accomplished orderly , energy value is high , the square root of ASM(Angular second moment) character is used as energy, the value of energy for constant image is 1the formula of energy:

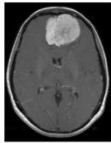

$$\sum_{i,j=0}^{N-1} P(i,j)^2$$

4. Homogeneity: In short form it is HOM, its pass other v and calculates the closeness of distribution of element in GLCM to the GLCM diagonal, opposite of the contrast weight homogeneity weight values, it decreases exponentially lose from the diagonal and its expected to low as gray level of each pixel are not similar. Range [0 1], following formula:

FEATURES	INPUT IMAGE	OUTPUT IMAGE	IMPROVE - MRNT (%)
Contrast	0.23322	0.02265	90.30
Homogeneity	0.89754	0.94443	5.22
Correlation	0.96493	0.76806	2.04
Energy	0.54724	0.99392	81.63

FEATURES	INPUT IMAGE	OUTPUT IMAGE	IMPROVE - MRNT(%)
Contrast	0.44358	0.07725	82.59
Homogeneity	0.79524	0.91624	15.2
Correlation	0.42180	0.64848	5.37
Energy	0.48985	0.98643	81.63

FEATURES	INPUT IMAGE	OUTPUT IMAGE	IMPROVE - MRNT(%)
Contrast	0.03573	0.00628	82.60
Homogeneity	0.89754	0.94443	12.1
Correlation	0.96493	0.76806	4.309
Energy	0.54724	0.99392	46.88

FEATURES	INPUT IMAGE	OUTPUT IMAGE	IMPROVE - MRNT(%)
			
Contrast	0.34675	0.04124	88.11
Homogeneity	0.79524	0.84985	6.88
Correlation	0.67973	0.86459	2.71
Energy	0.65516	0.99114	51.28

IV. CONCLUSION

The proposed methodology aim to detect brain tumors from MRI images and detected tumor from segmented process and doing a morphological operation so to get the perfect size of tumor, with the process of feature detection using GLCM process give a variation improvement in different features of image such contrast, homogeneity, correlation and energy. From the obtained numerical results on different angle are tabulated in the form of the average of their values. From this analysis, we observed that using GLCM technique, it is easy to detect the features of the image and the detected tumor, which help and avail the pathologist to analysis the image with accurate result in less span of time.

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