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HUMAN BRAIN TUMOR RECOGNITION AND SIZE ESTIMATION BY SVM

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Abstract - *The brain of the human is considered to be the main functional unit, it is responsible for the functioning control of the human body activity. Human will be not able to survive if any defects alter the brain cells or brain part. The general problem associated with the human brain is known as the brain tumor. Brain tumor can be classified based on the factors like size, area and the texture of the pixels in the tumor image. To detect and classify the human brain tumor by using the MRI images has been proposed in this work. The user can upload the brain image; from the uploaded image is processed and needed features are extracted. Based on processed image the texture based segmentation will be performed. The affected area is selected based on the shape and size edge. Then area of the affected region, various parameters are passed to the SVM classifier where the classification is performed.*

***Key Words*: DWT, GLCM, SVM, FEATURE MARKING**

1. INTRODUCTION

Recognizing the human brain tumor and quantifications by using the images of the MRI scan using the digital image processing techniques has been the concept of the proposed work. Our work is capable of estimating the total area of tumor in an automated process. Medical imaging has been the growing are of research in the recent many years. It was focused mainly in the brain tumor segmentation and are estimation. A tumor is the mass of the flesh tissue inside the human body which will grow out of control. In general the tumor is very dangerous which will cause a severe healthy issues in the field of medical scientist it is divided in to two categories based on the tumors beginning, enlargement prototype and also based on the properties like the malignancy.

2. LITERATURE SURVEY

1] The author has proposed the concept of the self-organizing map (SOM) in the image clustering process. This process is used in the medical image segmentation. The two stages has been proposed in this work. Initial stages, MRI brain image collected by the patient database. Arte fact and also the presence of any noise is removed. Later stages (MR) image segmentation major tissue has been detected by the segmentation arrangement by calculating the tumor image areas.

[2] In this work the author proposed Spectral leakage which has the considerable effect tin the frequency analysis. The image finite-length signals or the image finite-length segments in the range of the infinite signals has been proposed. The necrotic (dead) part and also an active part will be segmented by the propose work. The edema or the swelling in brain nearby areas. Hence by using these feature the author proposed the better way of segmenting the brain tumor images.

[3] A Common automatic scheme has been proposed in the work for the effective segmentation of the human brain tumors in the form of the 3D MRI. Proposed method is valid in the dissimilar types of the human brain tumors of the MRI images. The image segmentation based on the image in the mixture of a deformable model. The spatial associations and the principal to for the image of the brain tumor segmentation of the tumors.

[4] He author has proposed the segmentation model for the pathological brain formation structures. The combined effect of the prior information of the proposed structures and also the relevant image information like the region and edge has been used for the image segmentation. Pre-processing and the image segmentation are the two steps in the proposed work. Modalities of the medical MR images has been used with the CE-T1w and the FLAIR.

[5] In this work the method uses the statistical seed and the distributions of the image by using the local bias has been seen in traditional cellular based automata framework. The GPU implementation has been proposed by the author which produces the results at interactive rates.

2.1 Existing System

In the past, many methods has been used for brain tumor detection such as , Otsu's thresholding method, RGB color based, Histogram, adaptive thresholding, novel algorithm, edge detection and other methods. Using a single method for result analysis based on the system generated results will make the system complicated, as no brain tumor s will be of same shape, size or position. Hence need of user interface to detect the brain tumor accurately.

DISADVANTAGES:

- High in cost and need dedicated devices
- Can't measure the area and hence classification is difficult
- Easy to locate the tumor but can't measure

2.2 Proposed System

In the proposed work we have used the texture clustering based tumor are estimation and classification algorithms to compare and analyze the best possible result. Using a single method for result analysis based on the system generated results will make the system complicated, as no brain tumor s will be of same shape, size or position. Hence need of user interface to detect the brain tumor accurately. On the input type and the feature set generated. Based on selected the image region, the region of the brain tumor area detected and the feature set will be generated. This will allow the system to work on the selected pixel instead of complete image to give the best result after use of the SVM classification.

ADVANTAGES:

- Work better in case of the sluggish images
- Increased accuracy as will work only on the Region of selected
- Will help user to understand and decide the level of input
- Use of two algorithms will give efficient and accurate result

3.METHODOLOGY

The methodologies used in this work are as follows:

- Image De-noising by DWT
- Texture extraction by GLCM
- Texture based segmentation
- Tumor location marking
- Stats processing by Feature
- Extraction of Feature in pattern
- SVM based classification

3.1 Image De-noising by DWT

The preprocessing is a sequence of operation that performs on scanned input images. It primarily enhances the image illustration for higher segmentation. The task of preprocessing is to phase the required pattern from the image and perform normalization, noise filtering and smoothing. The preprocessing also defines a solid illustration of the segmented model. After segmentation, linearization procedure is used where it convert a grey scale to a binary image.

The Discrete Wavelet Transform is accordance to a sub band coding, it was set up for the speedy computation of Wavelet Transform. The major advantage of Discrete Wavelet Transform is that it is effortless to implement and reduce the instant management for the resources. The Discrete wavelet transform is as shown in figure

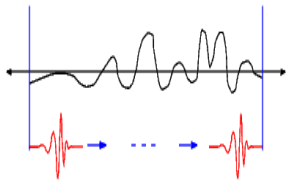

Fig.1: Non-linear Denoise by DWT

3.2 Texture extraction by GLCM

The image captured is initially processed by the user based on the orientation of the angle of deviation. The brain tumor has to be processed based on the system threshold. The initial movement captured in the image feature of considered in the view angle of the aperture. The image orientation is analyzed by the following process.

- input image
- brain tumor mapping for the area localization
- Brain tumor pixel mabrain tumor g and labeling
- Brain tumor area extraction
- Estimate the alignment and orientation
- Calculate the centroid , area as features
- Result passed to the later stages

Image brain tumor pixel mapping and masking is important aspect the input image may consider the undesired objects in the path. Hence to solve and remove the unwanted parts the brain tumor pixel mapping by GLCM is important.

The Gray level co-occurrence matrix is used for the brain tumor pixel extraction and segmentation. The gray-level co-occurrence matrix P [i, j] is consist of displacement vector (d) in which the pixel values are grouped in [3*3] array vector.

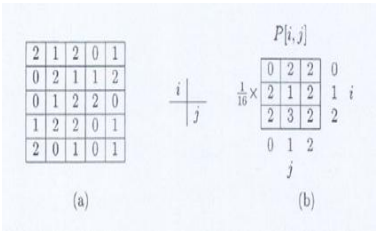

Fig.2: GLCM

3.3 Texture based segmentation

With the help of GLCM, pixels of pairs information is collected, occurrence of the pixel brightness in an image exhibits by the GLCM. The valued matrix is created at distance d=1 and angles which are represented in the degree ranges of (0, 45, 90,135). It provides the stats like the entropy, energy, contrast and correlation. For texture character profile such as smooth, silky, and rough GLCM is used. GLCM is prepared from the gray scale values and picks up the relationship between two neighboring pixel at a time.

GLCM implementation for input image with 8 tones is shown below

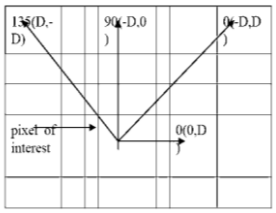

Fig .3: GLCM implementation for 8 tone image

The properties of GLCM are:

- Quantization level of the image is equal to number of rows and columns.
- The test image consists of four grey levels (0, 1, 2 and 3) with eight bit data 256(2^8). 256x256 matric with 65536 cells are obtained.
- GLCM matrix is a square matrix.

3.4 Tumor location marking

Brain tumor marking by tumor pixel labeling place an important role as it's the base for the later stages where the image is proceeds based on the extracted pixel values and the features form the image are extracted

Probability is $c = [Cb\ Cr]^T$, is

$$p(c / pixel) = \sum_{j=1}^{M} p(c / j).P(j) \quad (.1)$$

M-Number of Gaussian components model

P (j), the probability pixel at jth location which is by labelling is,

$$p(c / j) = \frac{\exp\left[-\frac{1}{2}(c-\mu_j)^T \Sigma_j^{-1}(c-\mu_j)\right]}{2\pi\sqrt{|\Sigma_j|}} \quad (.2)$$

μ_j- mean

Σ_j-covariance matrix of the j^{th} pixel

3.5 Stats processing by Feature

Feature Extraction of the brain tumor images are performed by using function **regionprop ().** Feature extraction is of two types.

- Extraction of Feature in pattern
- Extraction of Feature in Texture

3.6 Extraction of Feature in pattern

The image features are extracted from the image part of segmented. The functions used are **regionprops (), bwconncomp()** methods. The connected components form the input image is extracted based on the 8 cc values. These connected co-ordinate values are passed for the **regionprops ()** for the feature extraction.

3.7 SVM based classification

The purpose of SVM is to classify the data set with boundaries and extent it to nonlinear boundaries. SVM becomes prominent when pixel map is used as the dataset values as input. It gives high accuracy equivalent to neural network with elaborated features. By designing the kernel function, SVM can be applied to the complex data and this model is efficient in both linear and nonlinear data handling. It uses the kernel classes for the classification of the input dataset, which is directly applied to data not needed in the feature extraction

. Support vector machine consists of two approaches:

- linearly separable
- nonlinearly separable

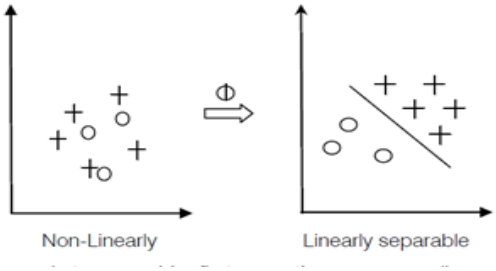

Fig.4: Nonlinear and linear separable

The main purpose is to decide whether linear or nonlinear separable is to be applied because we have utilized the decision boundary technology for the classify of the dataset, it may end up to the nearer dataset compare to other set. When data is not linearly separable, straight line is not available.

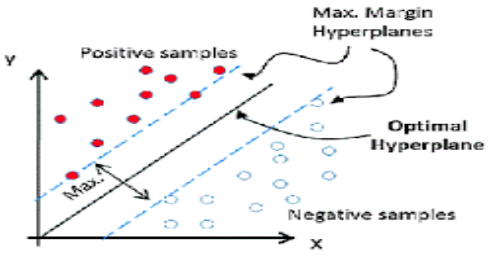

Fig.5: General SVM classifier

3.8 Algorithm of brain tumor

Input: Get gray scale image

Output: Area and diameter of affected tumor region

Step1: Read color image

Step2: Converting color image to gray scale to image

Step3: Decrease the resolution of image by 255*255

Step4: Denoise the image by DWT

Step5: Get enhanced image

Step6: Convert the intensity image to binary image

Step7: Segmentation based on texture

Step8: Store the pixels in the form of matrix

Step9: Repeat

4. FLOW CHART

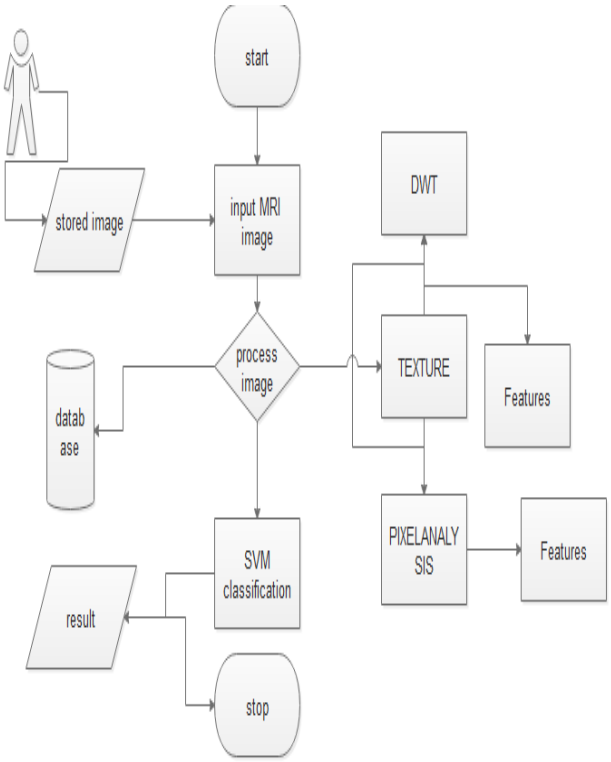

Fig.6: Flow Chart

5.RESULTS

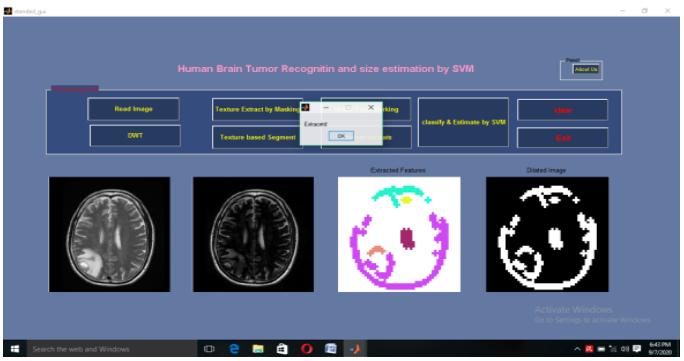

Fig.7:Feature Extraction

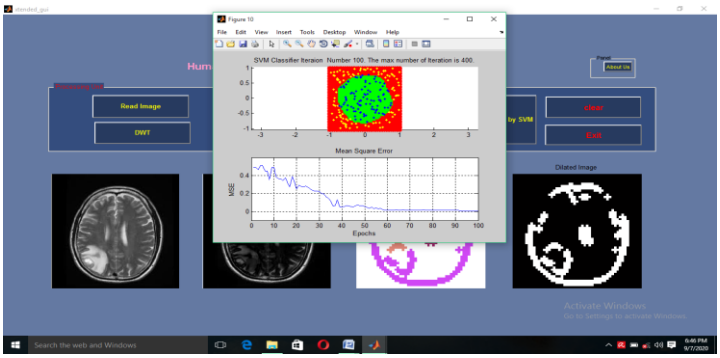

Fig.8 :Run SVM

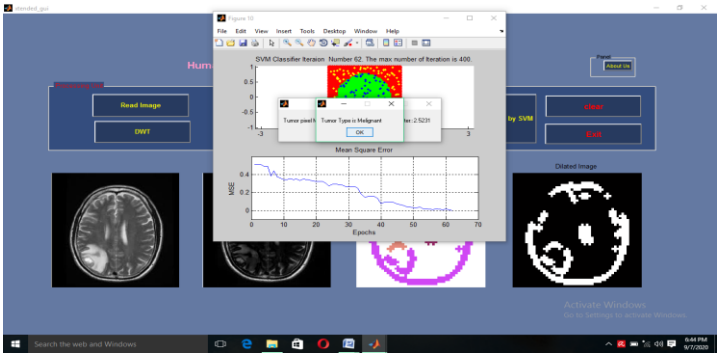

Fig.9:Estimating Tumor Type

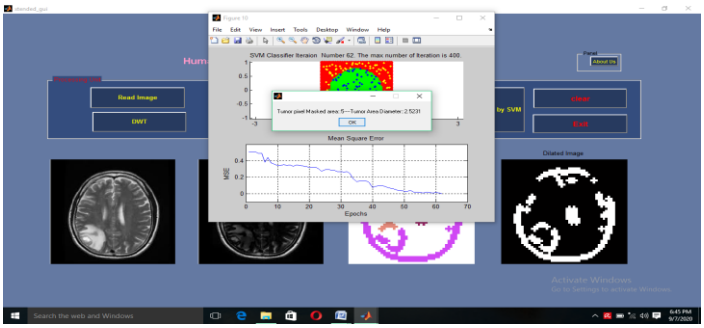

Fig.10:Estimate Area and Diameter of Tumor

6. CONCLUSION AND FEARURE SCOPE

In this work we have proposed brain tumor type by using the image features and texture by GLCM. The tumor is estimated and classified by using the area measurement. The classification is carried out by using the SVM classifier where the MSE is 0. The result is interpreted by using the system. It will help the user to understand the image by using the input. The future work includes the detection of infant brain tumor which is challenging because of its size and shape.

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