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Brain Tumour Classification Using Radial Bias is Function and Identifying the Stage of the Tumour by Segmentation Methods

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ABSTRACT: The Neural network is used with an extension of various image classification based on training and testing networks. In this method efficiently detect brain tumour cell. Neural network with Radial Basis Function will be applied to implement tumour cells segmentation and classification. Decision should be made to classify the input image as normal or abnormal cells. Wavelet transform thresholding is used to perform denoising. This can be performed in two stages: Gray-Level Co occurrence Matrix and the classification using Neural Network based function. The classified image is segmented with the ROI segmentation method and the stage of the tumour is identified

KEYWORDS: Radial Basis Function, Wavelet transform, GLCM and ROI

I. INTRODUCTION

Wavelet denoising [1] generally works as follows:

- In order to produce the noisy wavelet a wavelet transform is applied on the noisy signal so that the PD occurrence can be distinguished.
- To eliminate the noise the limit of threshold and the method should be chosen.
- To obtain a denoised signal the threshold coefficient of the inverse wavelet transform is used.

The wavelet selection [2] is needed to prescribe the best PD spikes in noisy signal. For better approximation and to capture the spikes which are transient in nature in the original signal a better "mother wavelet" is selected. Mother wavelet affects the denoised signal frequency spectrum and also determines the original signal estimation value in terms of PD spike shapes. In PD spikes the eyeball inspection is taken into account so that mother wavelet can be chosen or else the way is it can be chosen based on the correlation and cumulative energy.

Wavelet based nonlinear thresholding [3] is one of the effective methods for the reduction of noise. Depends upon the type of signal the transform can be chosen. The Fourier transform will be better and efficient for signal. Depending upon the data points in a data set the wavelet transform is applied. The operation of down-sampling taken place from one level to the next one. Signal –to-noise ratio (SNR) obtain better results for noise removal.

The Grey Level Co-occurrence matrix, GLCM (Grey Tone Spatial Dependency Matrix) in an image is defined as an tabulation method which describes the different combinations of Pixel's brightness value. Inorder to examine the texture the spatial relationship of pixels is taken into account. The functions of GLCM is used for characterizing the textures of an image by calculating the specific values for every pixel of an image and considering the spatial

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relationship between each and every pixel in an image. Once the GLCM is created various statistics can be obtained by using graycoprops function. The image texture information can be derived from this statistics.

It is also used to obtain a series of texture calculations for second order. First order texture does not consider the relationships of every neighbour pixel but calculates from the original image pixel's values like variance. Second order texture is used to obtain the relationship between every two pixels in an original image. If the relationship between two pixels is considered at a time by the GLCM texture then it is called the reference and the neighbour pixel. The right of each reference pixel is chosen as a neighbour pixel. It can be expressed in the relation (1,0) i.e., X direction denotes the pixel value 1 and The value 0 indicates the Y direction. Every pixel starts from the upper left corner proceeding to the lower right direction within thewindow. The matrix can be read by the GLCM by filling the top left cell with the combination of (0,0),i.e. it indicates the no. of occurrence a pixel with grey level 0(neighbour pixel) falls to the right of another pixel with grey level value 0 (reference pixel). A matrix that denotes the distance and represents the spatial relationship over the sub region of an image is known as co-occurrence matrix. It is used to calculate the occurrence of pixel either horizontally, vertically or diagonally to adjacent pixels in a gray scale image. The following are the properties of GLCM,

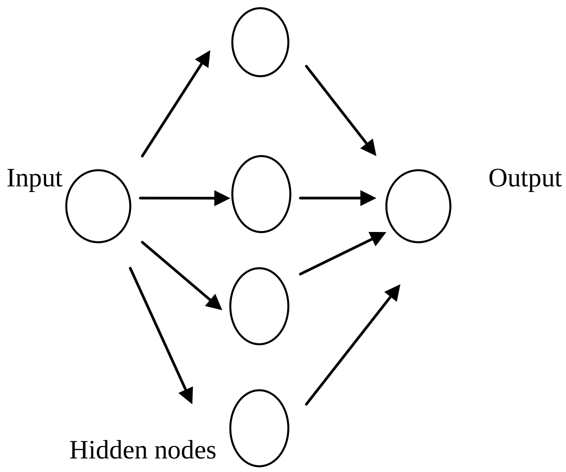
Contrast: In whole image it returns the measure of the intensity contrast between a pixel and its neighbour. For constant image the contrast value would be 0.

Correlation: In whole image it returns the measure of how correlated pixel is to its neighbour. For a positively and negatively correlated image the correlation value would be 1 or -1. The value for constant image is null.

Energy: In GLCM the sum of square elements would be returned. For the constant image the value of energy is 1.

Homogeneity: It measures the closeness of the distribution of elements in GLCM to the GLCM diagonal. The value of homogeneity is 1 for a diagonal GLCM.

Radial Basis Function(RBF) [4] is emerged in late 80's as an alternate to artificial neural network. It is an linear neural network and is simply a class of functions. It has derived from the theory of approximation. If there is more than one hidden layer and if the basis functions changes its size then the RBF network is said to be nonlinear.



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Usually in two layer neural networks the RBF is embedded whereas a radial activated function is used to implement the hidden unit. The output of hidden unit is taken into account for the sum of weighted average and is implemented by the output units. RBF network has the nonlinear input and the linear output. Complex mappings can be modelled by RBF network [5] in which by using multiple intermediary layers the neural networks can be modelled. The hidden unit activation is needed to be specified in order to use a Radial Basis Function.

Identifying the RBF weights is called an network training. The statistics of the RBF network that is similar to the training set can be used with data after training. In order to change the data statistics on-line training algorithms is used. Radial basis function has a set of inputs and outputs and the layer of processing units in output is known as hidden units. Each and every hidden unit implements a radial basis function. In time series approximation and in pattern classification the way of usage of data modelling is different. The input and output denotes the feature entries and a class in pattern classification.

The main features of RBF network are:

- The network would have a structure of two-layer-deed-forward networks.
- A set of radial basis function implement the hidden nodes.
- In MLP linear summation functions are used to implement the hidden nodes.
- Two steps are needed to train the network: Determination of weights from the hidden layer input is derived and the weights from the hidden layer are mapped with the output layer.
- Very fast learning and training process.
- During interpolation the networks are better.

II. PROPOSED SYSTEM

The proposed system classifies the image and also finds the stage of the tumour based the result of ROI segmentation. Initially the input MRI image is taken and an Wavelet thresholding is applied on that image so that the unwanted edges and noise has been removed through the process of denoising.

The next phase is feature extraction using GLCM. Some of the features like contrast correlation, Entropy, Variance are extracted for the threshold image. These features reduce the runtime complexity. The image is given as input o the input layer in the RBF and the processing is done inside the hidden layer and the processed output is given for segmenting if it is abnormal. If the classified image is normal the result is non tumorous.

A.WAVELET THRESHOLDING FOR DENOISING

Wavelet filter of order four is used and identified to get back good results in classification and segmentation of tumor from the brain CT images. By applying 2D DWT,[8] two level wavelet decomposition of Region of Interest (ROI) is done which results in four sub bands. In 2D level decomposition the image is displayed as an approximation and three detail images, representing the low and high frequency contents image correspondingly. LL1, LL2 represent the wavelet approximations at 1st and 2nd level respectively, and are low frequency part of the images. LH1, HL1, HH1, LH2, HL2, HH2 represent the details of horizontal, vertical and diagonal directions at 1st and 2nd level correspondingly and are high frequency part of the images. This DWT[9] can be implemented in many ways such as to compress an image file, to transform the data based on low level, mid level, high level, etc.

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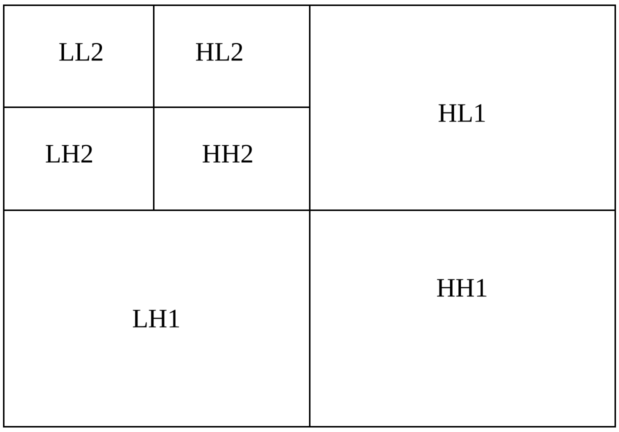

Fig 1: Wavelet Denoising

B.FEATURE EXTRACTION BASED ON GLCM

Gray-level co-occurrence matrix (GLCM) is the method for analyzing the textures based on the spatial relationship of the pixels. The features [6] such as contrast, entropy, correlation and variance are calculated for the thresholded [7] image using below and the analyze the values for the tumorous and non tumorous images

A) Contrast:

$$\text{Contrast} = \sum_{n=0}^{G-1} n^2 \{\sum_{i=1}^{G-1}\sum_{j=1}^{G-1} P(i,j)\} . | i - j | = n$$

B) Entropy:

$$\text{Entropy} = \sum_{i=0}^{G-1}\sum_{j=0}^{G-1} P(i,j) \text{ X } \log(P(i,j))$$

C) Correlation:

$$\text{Correlation} = \sum_{i=0}^{G-1}\sum_{j=0}^{G-1} \{i \times j\} \times P(i,j) - \{\mu_x \times \mu_y\}$$

D) Variance:

$$\text{Variance} = \sum_{i=0}^{G-1}\sum_{j=0}^{G-1} (i-\mu)^2 P(i,j)$$

C. CLASSIFICATION USING RBF

Neural network [10] with Radial Basis Function will be applied to implement tumour cells segmentation and classification. Decision should be made to classify the inputimage as normal or abnormal cells. Density Functions (POF) is approximated using an estimator called the Parzen estimator. It determines the Probability Density Functions [11] by

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reducing the awaited danger in classifying the training set incorrectly. All the output parameters in the pattern layer is tested and trained based on the Neural Network once. An element is trained to return a high output value when an input vector matches the training vector. To obtain more generalization a factor is included to smooth the signals while training the network. If there is no relation between input patterns and the patterns programmed into the pattern layer, then no output is generated. . After the training process is being completed, the abnormal level brain tumour cells are to be identified and classified altogether with the help of Neural Network.

D. SEGMENTATION:

In segmentation process we have to use the region based segmentation method. Using this method we segment the portions of brain image. The boundaries are noted from the regions. According to the boundaries the size of the tumour and the area to be found. Here, we perform the measurement of the particular normal image or abnormal image**.**

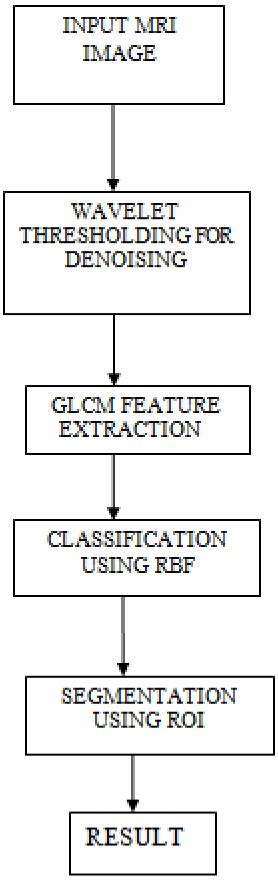

Fig2: Overall System diagram

III. CONCLUSION

The proposed model is a combination of Discrete Wavelet Transform and Radial Basis Function (RBF) with the development of GLCM. Brain tumour classification algorithm is implemented. An efficient classification of tumour is constructed with maximum recognition rate by using the algorithm. The optimal feature extraction and efficient brain tumour classification is viewed through simulation results using brain tumour database. The proposed method is demonstrated based upon the results on brain tumour image database.

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IV. FUTURE ENHANCEMENT

The proposed method provides better classification and feature extraction by using efficient classification. Also the current algorithm provides better analysis and results. Still more optimal classification methods will be proposed in the future so that the results would be prominent. It will be applied for colour images by introducing different classification and segmentation techniques.

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