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Classification of Brain Matters Disease in MRI by using GLCM and ANN Classifier

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***Abstract*---In this project we proposed detection and classification system which is used for Brain Matters Diseases. The Brain generally consists of three layers namely White Matter, Gray Matter and Cerebral Spinal Fluid(CSF). Here the White and Gray Matters acts as a major part of the brain. And the Diseases in those matters are to be detected and monitored to cure that. The image is given as input to feature extraction technique which is transformation of input image into a set of features. In this the image which taken for detection is feature extracted by using Gray Level Co-occurrence Matrix(GLCM). The GLCM has a four basic properties for extraction. The classification techniques used here was the Artificial Neural Network Classifier(ANN) for getting the average values of the extracted features. Finally, the relevant images are retrieved from a large database and the detection of the Matter Disease is done. The software used is MATLAB 2010a (MATrixLABoratory) which is built software applications.**

Keywords–ANN Classifier,Brain Matters, Feature extraction.

I. INTRODUCTION

Magnetic resonance imaging (MRI) uses radio waves and a strong magnetic field rather than x-rays to provide remarkably clear and detailed pictures of internal organs and tissues clusters. Many clinical and research applications using MR datasets require a segmentation into different intensity classes which are regarded as the best available representations for biological tissues. Traditional classification methods are based on spectral feature and use the spectral dataset independently.

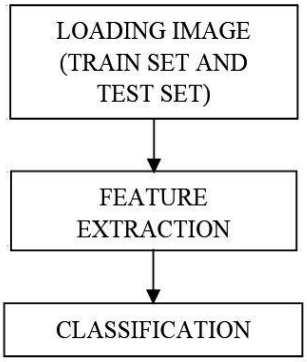
The automatic detection of longitudinal changes in images of the brain has found applications in several neurological diseases, such as tumors and Multiple Sclerosis (MS), with the aim of assessing disease evolution and treatment efficacy. In neurodegenerative diseases, such as Alzheimer's Disease (AD), most change detection methods can detect large-scale brain deformations.

The feature extracted components are classified by using the KICA method [1].The tested Magnetic Resonance Image(MRI) of brain is classified either benign or malignant. Automated classifications of brain tumors are performed in two stages. Feature extraction using Principal Component Analysis (PCA) and classification using Probabilistic Neural Network(PNN) [6].

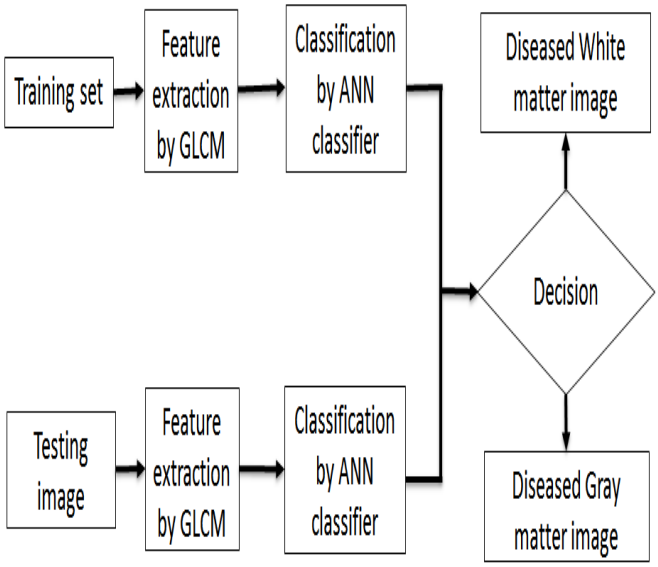
In some methods the classification is done using the Modified FCM method and the SVM classifier [7]. There is a challenging process for automatically classifying MRI in normal and abnormal classes. For this goal researchers have proposed a lot of approaches which fall into two categories. One category contains supervised classification techniques such as artificial neural networks (ANN) and support vector machine (SVM). The other category has unsupervised classification techniques such as self-organization map (SOM) and fuzzy c-means [8].

Detection of Brain Matters and its Diseases is a major issue in today's medical development, and that the monitoring of such cases are not an easy one. Here we developed a new algorithm for the detection of the diseased brain matters. And our proposed algorithm is that the feature components of the image are extracted by GLCM and the classification is done by ANN classifier.

II. BLOCK DIAGRAM



Block diagram 2.1. Steps involved in the process



Block diagram 2.2. Main Block Diagram

III. FEATURE EXTRACTION

Texture features are extracted using Gray Level Co- Occurrence Matrix. In this project four features are extracted. These features are explained below.

Texture Feature Extraction:

The textural features of an image are extracted by using the Gray Level Co-occurrence Matrix (GLCM). It is used to calculate the pixels with gray level value i occurs horizontally adjacent to a pixel with a value j. The features which generally extracted are Contrast, Correlation, Energy and Homogeneity. These values are obtained by using the formula. Matching of the image pixel values are done with query images and database images.

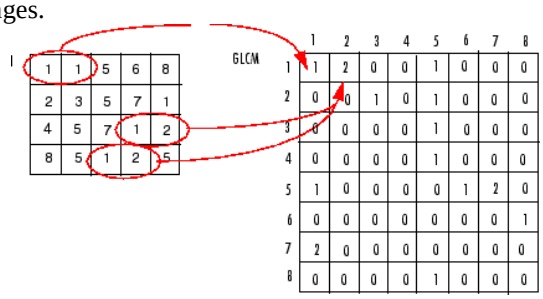


Fig 3.1 GLCM

A) Contrast:

The measure of local variations in gray level co-occurrence matrix of the pixels. And returns a measure of intensity contrast between a pixel and its neighbor over the whole image. The contrast formula is given below.

$$\sum_{i,j} |i-j|^2 \, p(i,j)$$

B) Correlation:

The measure of joint probability occurrence of specified pixel pairs. And it returns a measure of correlated a pixel to its neighbor image. The range of pixels lies within [-1,1]. Correlation is 1 for positive image and -1 for negative image.

$$\sum_{i,j} \frac{(i-\mu i)(j-\mu j)p(i,j)}{\sigma_i \sigma_j}$$

C) Energy:

It also provides the sum of squared elements in GLCM known are as uniformity or angular second moments. And its range lies within range [0 1]. Energy is 1 for constant image.

$$\sum_{i,j} p(i,j)^2$$

D) Homogeneity:

The measures closeness of distribution of elements in GLCM to GLCM main diagonal. Homogeneity is 1 for the diagonal matrix. The range lies within [0 1].

$$\sum_{i,j} \frac{p(i,j)}{1+|i-j|}$$

Tabulation of the Diseased Brain Matter Values

Table 3.1 Extracted values for Brain Matter Diseased and Non Diseasedimages

IMAGES	CONTRAST	CORRELATION	ENERGY	HOMOGENEITY	AVERAGE
Diseased White Matter					
1.jpg	0.1522	0.9862	0.1313	0.9471	0.5542
2.jpg	0.1417	0.9707	0.1589	0.9308	0.5505
3.jpg	0.2589	0.9680	0.1112	0.9012	0.5598
4.jpg	0.3073	0.9523	0.1269	0.8811	0.5669
5.jpg	0.1356	0.9824	0.1747	0.9335	0.5565
6.jpg	0.1710	0.9812	0.1572	0.9183	0.5569
7.jpg	0.2178	0.9505	0.1792	0.9070	0.5636
8.jpg	0.2150	0.9639	0.1357	0.9046	0.5548
9.jpg	0.1901	0.9804	0.1343	0.9308	0.5589
10.jpg	0.2157	0.9774	0.1216	0.9207	0.5588
Diseased Gray Matter					
1.jpg	0.8209	0.8380	0.1534	0.8576	0.6675
2.jpg	0.4237	0.9549	0.1395	0.8822	0.6601
3.jpg	1.1129	08648	0.0605	0.7295	0.6919
4.jpg	1.1042	0.8434	0.0888	0.7571	0.6948
5.jpg	0.8621	0.8705	0.0791	0.7736	0.6463
6.jpg	0.8394	0.8840	0.0825	0.7715	0.6444
7.jpg	0.5889	0.9189	0.2396	0.8551	0.6506
8.jpg	0.7624	0.8876	0.2182	0.8451	0.6783
9.jpg	0.6711	0.8906	0.2462	0.8627	0.6676
10.jpg	0.6571	0.8865	0.2105	0.8875	0.6604
Normal Brain Matter					
1.jpg	0.2276	0.9469	0.2622	0.9277	0.5911
2.jpg	0.0907	0.9829	0.2802	0.9614	0.5788
3.jpg	0.2715	0.9550	0.1913	0.9182	0.5840
4.jpg	0.3945	0.9448	0.1512	0.8739	0.5717
5.jpg	0.2938	0.9554	0.1785	0.9063	0.5835
6.jpg	0.2402	0.9722	0.3048	0.9506	0.6170
7.jpg	0.2956	0.9755	0.3058	0.9104	0.6218
8.jpg	0.1510	0.9859	0.3606	0.9677	0.6163
9.jpg	0.4541	0.9325	0.1711	0.9112	0.6172
10.jpg	0.2750	0.9777	0.2229	0.9397	0.6038

IV. CLASSIFIER

In our proposed work, we are using Artificial Neural Network Classifier. These procedures are explained below.

ARTIFICIAL NEURAL NETWORK

Artificial Neural Network (ANN) has providedawell-trained alternative method for solving avariety of problems in different fields of Medical fields and other engineering purposes.It has characteristics such as parallelism, distributed representation, computation and learning skill which are seems to be simple but it is really complicated.

BACK PROPAGATION MODEL

Back Propagation is a feedback network which is done until the error rate is low.And has a reference value in hidden layer for changing in weights to learn train set.

Her it follows supervised learning.
It has 2 modes:
A)Pattern mode:
In the network for each iteration every node is updated to back propagate the network.
B)Batchmode:
In the network after all nodesareupdated the back propagation is done.
And it has some parameters are as follows:

1)Epoch:Itis a measure of the number of times the training loopsof backpropagation, for all of the training vectors are used once to update the weights.

2)Iterations: It is every single repetition of a process of Backpropagation.

3)Error rate: It is done until low error as keeping the ref value in hidden.

The steps are to be followed:

1) A set of images with the Diseased brain matters are selected.
2) The extracted features for those set of images are given as input.
3) The overall net trained value for these features is calculated.
4) A sample image is taken as test image.
5) The difference between trained image and the test image is calculated.
6) The average value is set as threshold value and according to the value the images are classified by Neural network.

V. RESULTS AND DISCUSSION

Initially the features for Diseased Brain Matter images extracted are tabulated. The below images shows that the given input image is diseased image in white matter or in gray matter and non-diseased images. The input image is converted into gray scale image. The gray image is given as input and the feature extraction and classification is done to detect the Diseased White Matter and Diseased Gray Matter image to monitor the Brain.

In this the trained images by neural network are having an average threshold value for the diseased matters image for the white and gray matters are obtained.And so the epoch and error rate are varied according to the backpropagtion process.So that the if any test image is given as input ,it checks for the threshold value.And takes the decision according to that.

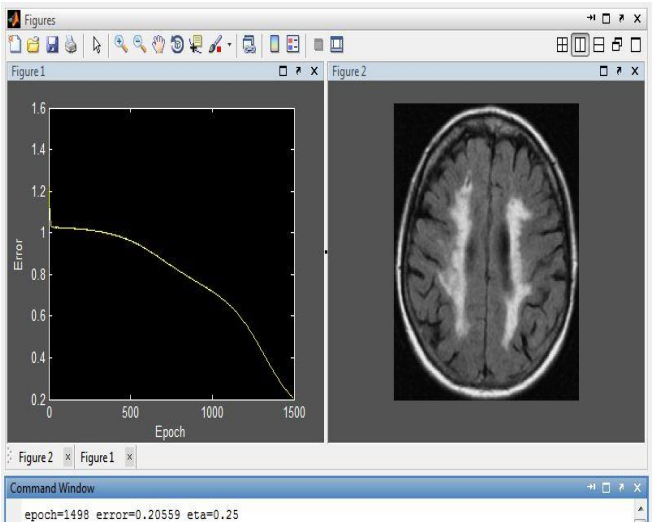


Figure 5.1 Diseased White Image.

In this image, the brain matter image pixel values are classified to say as it is a diseased white image. Because the trained image is ranged between certain values to classify it.

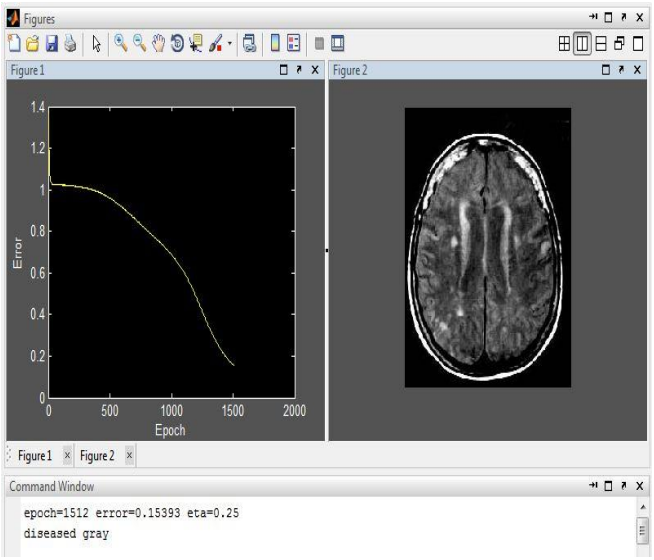


Figure 5.2 Diseased Gray Image.

In this image, the brain matter image pixel values are classified to say as it is a diseased gray image. Because the trained image is ranged between certain values to classify it.

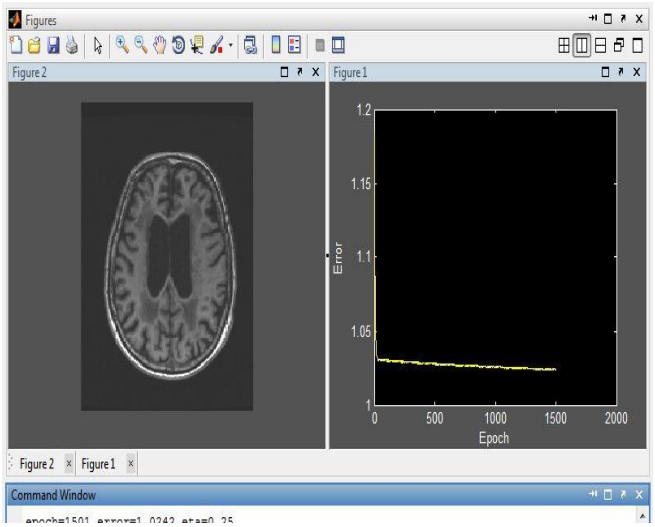


Figure 5.3 No Diseased Image.

In this image, the brain matter image pixel values are classified to say as it is a no diseased image. Because the trained image is ranged between certain values to classify it.

VI. CONCLUSION

The trained images are having an average threshold value for the diseased matters image for the white and gray matters. So that it checks for the values in given input image for classification. And thus it analyses it as the diseased and non-diseased image. Thus we have done that the diseased brain matters are feature extracted and classified by using GLCM and ANN classifier respectively. And the future enhancement for this work is to be done by extracting the features by VGLCM andclassification is to be done by SVM Classifier.

VII. REFERENCES

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