Design and Development of an Interface to Detect the Brain Tumour

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Abstract— Nowadays Image Processing is an effective area where the medical field is relaying on. It is helpful in diagnosing the disease easily at the right time. It is a support vector for the technician to categorize the disease of the patient. In this paper an effective method is given to diagnose the brain tumour. This automation of interface accurately classifies the brain tumour using hybrid method.
Key words: Brain Tumor, Image Processing, Hybrid method

I. INTRODUCTION

Magnetic Resonance Imaging (MRI) is a medical imaging technology which allows the brain to be scanned in the cross-sectional. This view helps the examiner to predict the tissue growth in the brain of the patient. MRI is an effective scanning that provides the clear cross sectional view of the brain. Effective tool that provides detailed information about the targeted brain tumour anatomy. These techniques are proved to be effective for diagnosis and treatment.

Person knowledge in interpreting the MRI-scan for decision will increases the possibility to false detection and identification of the brain tumour. Digital image processing ensures the quick and precise detection of the tumour. The proposed method preprocess the MRI image with histogram equalization applied the wavelet transform to extract features from images, followed by applying principle component analysis (PCA) to reduce the dimensions of features. The reduced features were submitted to hybrid method to classification.

II. EXISTING WORKS

Shasidhar et al (2011) proposed modified FCM algorithm. Clustering approach is widely used in biomedical applications particularly for brain tumor detection in abnormal magnetic resonance (MRI) images. Fuzzy clustering using fuzzy C-means (FCM) algorithm proved to be superior over the other clustering approaches in terms of segmentation efficiency. But the major drawback of the FCM algorithm is the huge computational time required for convergence.[1]

Karnan and Logheshwari (2010) proposed a hybrid with Fuzzy segmentation. Ant Colony Optimization (ACO) metaheuristic is a recent population-based approach inspired by the observation of real ants colony and based upon their collective foraging behavior.[2]

Selim and Gokberk (2009) proposed a new image mining technique using directional spatial constraints. The significant contributions in their approach include expanding the association model to numerous reference objects, integrating the spatial information into the Bayesian decision rule as spatial priors for background classification, and facilitating dynamic queries by using directional associations as spatial parameters with support for the visibility of image areas that are incompletely enclosed by reference objects.[3]

Yan and Zheru (2005) proposed a new unsupervised MR image segmentation method based on self-organizing feature map (SOFM) network. The magnetic resonance imaging (MRI) is an advanced medical imaging technique providing rich information about the human soft tissue anatomy. The goal of magnetic resonance (MR) image segmentation is to accurately identify the principal tissue structures in these image volumes. The algorithm includes spatial constraints by using a Markov Random Field (MRF) model.[4]

III. BRAIN CLASSIFICATION TECHNIQUES

There are various methods are used in brain tumor classification. This paper discussed only three methods such as k-Nearest Neighbor, Neural network and Support Vector Machine.

A. k-Nearest Neighbor

It is simple and good classifier to implement and attain the high accuracy. It recognize the nearest point to make query to classify the data. In this type of classification based on the calculate the minimum distance between given point and other points. It does not include any training process. It is not match for large number of data. This Classifier is works well on basic identification problems. The main disadvantage of the KNN algorithm is that it is a slow learner, i.e. it does not learn anything from the training data and simply make use the training data itself for classification. Another disadvantage is this method is also rather slow if there are a large number of training examples as the algorithm must have to compute the distance and sort all the training data at each prediction. Also it is not robust to noisy data in case of large number of training examples. The most serious disadvantage of this method is that very sensitive to the occurrence of immaterial parameters.

B. Support Vector Machine

Support Vector machine (SVM) is a non -linear Classifier. This is a new trend in machine learning algorithm which is used in many pattern recognition problems, including texture classification. In SVM, the input data is non -linearly mapped to linearly separated data in some high dimensional space providing good classification performance. SVM maximizes the marginal distance between different classes. The division of classes is carried out with different kernels. SVM is designed to work with only two classes by determining the hyper plane to divide two classes. This is done by maximizing the margin from the hyper plane to the two classes. The samples closest to the margin that were selected to determine the hyper plane is known as support vectors.

C. Artificial Neural Network (ANN)

An Artificial Neuron is essentially an industrial approach of organic neuron. It consists of a number of nodes, called neurons. These are typically organized in layers. In NN each neuron in concealed layer receives signals from all the neurons in the input layer. The strength of each signal and the biases are represented by weights and constants, which are calculated through the training phase. After the inputs are weighted and added, the result is then transformed by a transfer function into the output. The transfer functions used are Sigmoid, hyperbolic tangent functions or a step.

IV. PROPOSED METHOD

The proposed method used the MRI image as a Input. The input MRI image is pre-processed as follows noise of the images are removed by using median filter and histogram of the image is equalised by Histogram Equalization. Then this pre-processed image is enter into feature extraction. Discrete Wavelet Transform (DWT) is used for feature extraction in proposed system. It is a effective mathematical tool for feature extaction. It is used to extract the coefficient from brain images. After the feature extraction PCA is used to select the essential coefficients. Then the hybrid classification is used for classification of brain tumour. It give better accuracy than the other existing system.

GUI Interface contain the following steps:

- the MRI image
- Image pre-processing
- Segment the affected area
- Feature extraction to classify
- Reduce the dimension
- Finally classify the tumour type with high accuracy

The different types of MRI brain images collected and create a dataset. These images are used as a input. Figure 1 sample image

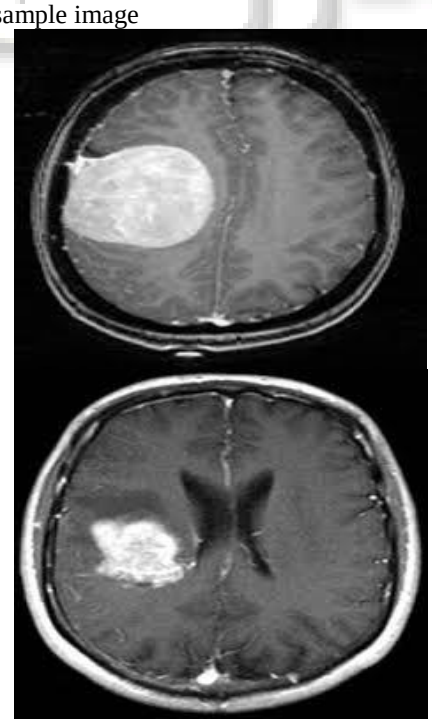

Fig. 1: Sample MRI Images

V. RESULT OF PROPOSED METHOD

The input image has to be preprocessed because images are corrupted by a type of multiplicative noise like light intensity and shadow on a cotton leaf images that may contain useful information about the brain tumor that can be used in the diagnosis.

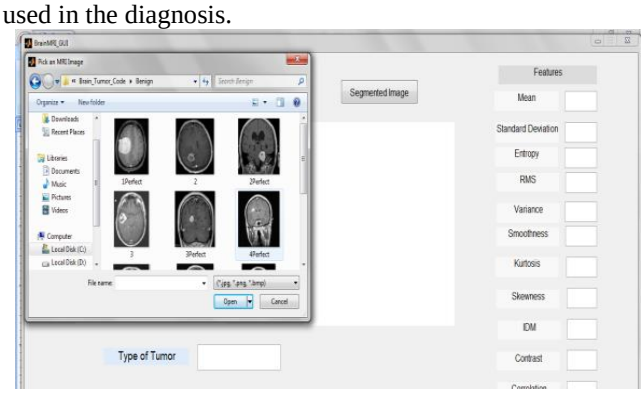

Fig. 2: Select the Brain image from dataset

Figure 2 shows the selection brain images from the dataset. Figure 3 shows the segmentation process. The affected area is separated from non affected area. Then this image is taken for classification. Figure 4 shows the classification of brain tumour. The benign type of tumour image is taken for process.

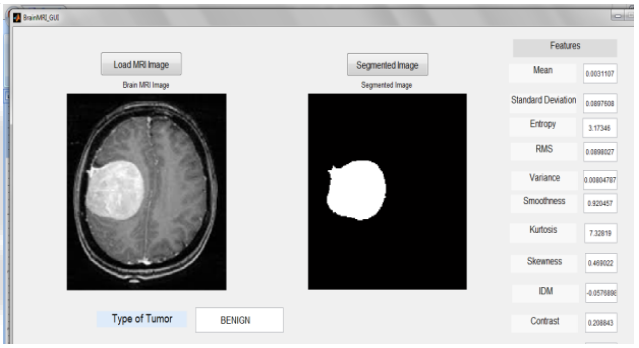

Fig. 3: Segmented Affected Area

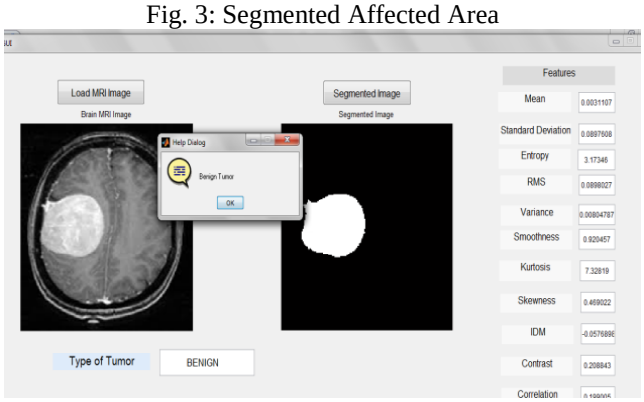

Fig. 4: Classfication using Hybrid Techique.

The table 1 shows the percentage of classification accuracy. KNN gives lower percentage of accuracy. Other techniques Naïve bayes and SVM gives almost same percentage. When compared with the other techniques the proposed system gives more accuracy.

S.no	Classification Techniques	Accuracy
1	KNN	87.8%
2	Naïve bayes	90.21%
3	SVM	90.32%
4	Hybrid	97.45%

Table 1: Comparison of Classification Techniques

VI. CONCLUSION

"Design and Development of an interface to detect the brain tumour" is used to automate the detection system and to get better accuracy. The proposed system classify the normal and abnormal type of brain tumour with high accuracy. The proposed system is compared with KNN,Naïve Bayes and SVM. The accuracy of proposed system is 97.45%. This system will help to diagnosis the tumour for the health centre with high accuracy.

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