Brain Tumor Detection and Identification using Support Vector Machine

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Abstract - *In this paper the work is related to the detection and identification of brain tumor with the help of LBF SVM. Proposed system helps doctors to find its region, size and identify the disease. The brain software is having embedded with graphical user interface for the tranquil and contented use of the system by a non-technical person. Proposed system is designed and developed for radiologist and neurologist. After experimental result, we conclude that implemented Brain Tumor identification strategy with LBF SVM optimize the performance of doctors for detecting the brain disease meritoriously. Proposed system experimental result tested after rigorous experimentation, and the results are evaluated on the basis of evaluation metrics,*

Key Words: SVM (Support Vector Machine), LF SVM (Linear Function).

1. INTRODUCTION

The brain disease brain tumor is required to quantify as early as possible right from first stage of its occurrences. The Neurologist takes help regarding the quantification & rectification of such disease from the radiologist. In this aspect radiologist is the expert for taking the images of brain and also rectifies the data, which is forwarded to neurologist for treatment. In this paper a methodology to detect, quantify and also identify brain disease using the digital image processing is presented. The results are shown in order to clarify the methodology & experimental outputs which will be used by the radiologist, thus giving a second opinion to doctors for making the decisions.

1.1 INDICATION OF BRAIN TUMOR

A brain tumour is nothing but abnormal growth of cells in the brain. There are different types of brain benign which are non-cancerous tumour type and second malignant tumour which is a cancerous type. The change to a high-review tumour happens more regularly among grown-ups than kids. The CT scan images of the tumour show the white spots in the middle of the grey matter when the tumour is of Grade I, and it is impossible to find this tumour in the brain by using the radiologist expertise as shown in figure 1.
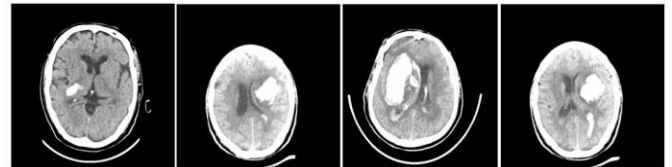

Fig -1: CT scanned images of brain tumor formed in human brain.

2. LITERATURE REVIEW

The conventional strategy for distinguishing the tumour ailments in the human MRI cerebrum pictures is done physically by a doctor. Programmed grouping of tumours of MRI pictures requires high precision, since the non-exact finding and putting off conveyance of the exact determination would prompt increment the commonness of more certain sicknesses. To maintain a strategic distance from that, a programmed arrangement framework is proposed for tumour order of MRI pictures. Their work demonstrates the impact of neural system (NN) and K-Nearest Neighbor (K-NN) calculations on tumour arrangement. The present study utilized a benchmark dataset MRI mind pictures. The exploratory outcomes demonstrate that used in present methodology accomplishes 100% arrangement exactness utilizing KNN and 98.92% utilizing NN [1].

A novel calculation was done by Bhattacharjee and Chakraborty (2012) to include out the tumor from sick mind with the help of Magnetic Resonance (MR) pictures. The research enlightens the value parameter correlation of two channels, a versatile middle channel is chosen for de-noising the pictures. Picture cutting and distinguishing proof of critical planes are finished. Coherent activities has been connected on chosen cuts to acquire the handled picture demonstrating the tumour locale. An epic picture remaking calculation was created dependent on the use of Principal Components Analysis (PCA) [2].

Chandra, Bhat and Singh (2009) has proposed a grouping calculation dependent on Particle Swarm Optimization (PSO). The calculation finds the centroids of many bunches, where each group clusters together cerebrum tumour designs, got from MR Images [3].

The research propsed by Dvorak, Kropatsch and Bartusek (2013) has been manages programmed mind

tumour location in attractive resonant pictures. The identification depends on checking the left-right symmetry of the cerebrum, which is the suspicion for a solid mind. The calculation was tried by fivefold cross-approval system on 72 pictures of mind containing tumours and 131 images of the sound cerebrum. The proposed strategy achieves the true positive rate of 91.16% and the true negative rate of 94.68% [4].

In present investigation, a digital method for defining tumour region using Magnetic Resonance Imaging (MRI) images in the brain was presented. A classification of a tumor is done depending upon the normal and abnormal then further they have classified into a malignant and benignant tumour. It incorporates different algorithms for preprocessing, image segmentation, feature extraction and image classification using neural network techniques. Finally, the tumor area is specified by region of interest technique as a confirmation step [5].

3. PROPOSED SYSTEM DESIGN

The dataset of CT Scan images of normal and abnormal images are collected. Total of 1.5 lakh images are collected from which 70:30 ratio is used for training the linear function support vector machine. The following figure 2 shows the proposed system design of the software developed.
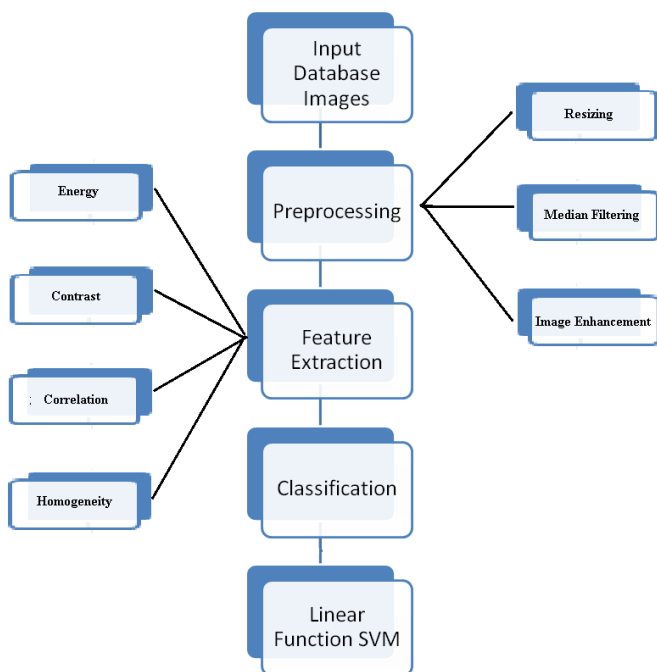

Fig - 2: Block diagram for training of classifiers.

The input database image is preprocessed. Preprocessing like resizing, grayscale conversion, median filtering, image enhancement is carried out on the images. The process is shown in below block diagram figure 3.

Fig – 3: Block diagram of preprocessing.

Next stage is to extract the features from the database images. In all for the quantification of brain tumor 14 features are extracted from which 4 features shows the prominent change which can be used for the identification of brain tumor. The training of the classifiers is done with the database processed image and out of bag classification is done as shown in figure 4.
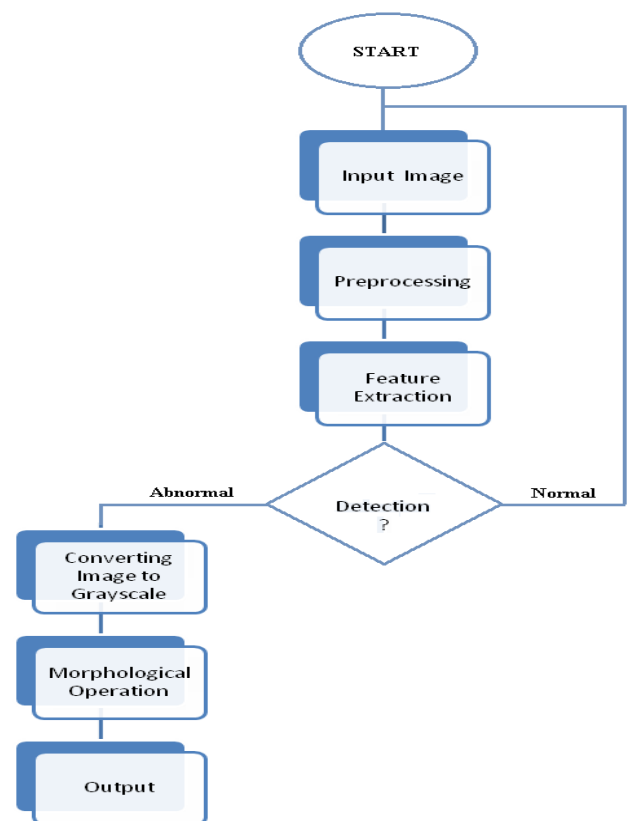

Fig – 4: Testing of classifiers block diagram.

4. EXPERIMENTAL RESULT AND DESIGN

The classifiers used in the research work are LF SVM which is trained by using the 30 normal images of human brain and 70 different images having brain images. The identification of the normal images given as an input to classifiers 60 such images are used to check the performance of the classifiers. The detection of all the 60 normal CT scan images is detected as normal brain having no diseases in the brain. The accuracy and precision rate on this input database image is nearly 100%. First 30 images are used in the training itself and another 30 images are out of bag classification as shown in table 1

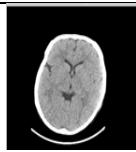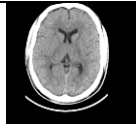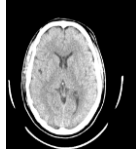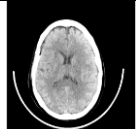**Table -1:** LF SVM Results on normal brain images.
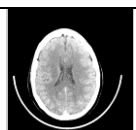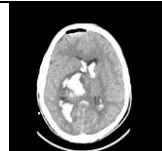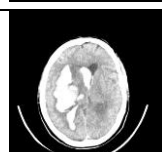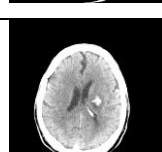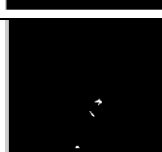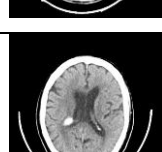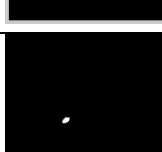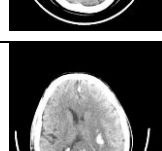
Images	LF SVM	Other Classifiers
	Normal Image	Normal Image
	Normal Image	Abnormal Image
	Normal Image	Normal Image
	Normal Image	Normal Image
	Normal Image	Normal Image

The system is checked with the abnormal images having brain tumor from the dataset. The results are tabulated as shown below in table 2. The classification and identification by LFSVM on such images are accurate and precise than any other classifier. Confusion matrix is generated for the calculation of various values for evaluation like Accuracy, True Positive Rate, False Positive Rate, Error Rate, Precision, Recall, Sensitivity and F-Score of LF SVM as shown in figure 5

Fig - 5: Total system performance confusion matrix for LF SVM classifier.

Table - 2: LF SVM Results on abnormal brain images.

Images	LF SVM	Detection of Brain Tumor
	Brain tumor	
	Brain tumor	
	Brain tumor	
	Brain tumor	
	Brain tumor	

5. CONCLUSION

Experimental result shows the accuracy rate of correctly identifying the brain tumour in the input CT scan image using Linear function Support Vector Machine 32 images out of the 50 images are correctly classified giving an overall accuracy of classifier as 64%. The time required for the detection shows the detection and identification time of classifier to find the disease. Time taken by LF SVM to detect the tumour is 0.3525 seconds. The proposed system with Linear Function Support Vector Machine classifier gives better and perfect result to doctors for detecting and discerning the brain disease.

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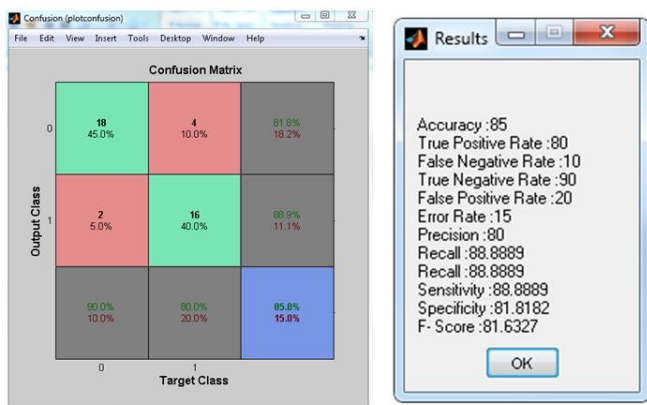
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BIOGRAPHIES

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