CLASSIFICATION OF TUMORS AND ITS STAGES IN BRAIN MRI

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Abstract
Brain acts as a controlling unit in living beings which plays a vital role. Tumor is caused by the growth of unwanted cells which spread uncontrollably and cause severe harm to humans. These spreading can be in a manner rapidly if not cured. MRI(magnetic resonance image) is used for the classification of the tumor and it is a better method of imaging technique. The image taken from MRI helps the doctor to diagnose much precisely by seeing the condition of the brain image. Sometimes the patient needs to be treated surgically. These paper include preprocessing stages which is bias field correction and tumor region segmentation by patch extraction. Features used is texture and shape with neural network classifier for classifying the image as tumor and non tumor image.
Keywords: MRI, NN, segmentation, MRI images, feature, patch extraction.

I. INTRODUCTION

Tumor is the growth of the cells which is classified into primary and secondary type. Brain include glial and neuron cell. Glial cells supports neuron, also maintain blood brain barrier. There include different types id glial tumor which include astrocytoma, oligodendroglioma, and glioblastoma. Gliomas are very aggressive and harmful in nature. Among the cells primary tumor begins in the glial cell. Symptoms include headache, numbness, weakness[1]. To improve the quality of life of the patient treatment is to be done. There is a need for the identifying the tumor caused region. Intention of this paper is to differentiate the tumor into abnormal and normal type.

Imaging technique used is MRI. There are different type of imaging technique which include X-Ray, MRI, CT (computed tomography), ultrasonic and thermal. MRI is a technique similar to CT imaging. The use of MR imaging technique helps in providing a detailed image information of the soft tissues. Images in MRI have good contrast between the different soft tissues. Powerful magnetic field is used in aligning the nuclear magnetization of the hydrogen atoms of water present in the body[2].

MR imaging technique doesn't produce any harmful ionizing radiations[3]. Segmentation can also be done using TKFCM (Temper based K-means and modified Fuzzy Cmeans) and classification using SVM (support vector machine),where image enhancement is done in the preprocessing stage. Uses first and second order statistics as features. Preprocessing stage include filteration, increase in luminosity and adjustment of contrast[4].

Treatments include surgery, chemotherapy, radiotherapy or combination of these treatments[5]. Segmentation can be done manually as well as automatically. Automatic segmentation can be done using CNN (convolutional neural network) with includes the use of kernals[6]. Fully automatic method for segmentation is done, used appearance and context features[7]. Segmentation is done from the MRI images which includes subregions of four different modalities. Segmentation is done into healthy and tumor regions. Healthy region include cerebrospinal fluid (CSF), gray matter (GM), white matter (WM).Tumors are divided into necrotic, active, edema subregions. Mapping to each voxel corresponds to classification task in a multidimensional feature vector. First order feature includes mean, variance, skewness, kurtosis, energy, entrophy. Soft margin SVM classifier is used and regularization is done using CRF (conditional random field)[8].

In this paper dataset used is BRATS2013 MRI images. Incorporation of bias correction is the primary step. Tumor region is segmented by the help of patch extraction. Feature includes texture

and shape shown in Figure 1. Feature vector is loaded in the trained images where as classification is done by the help of neural network.

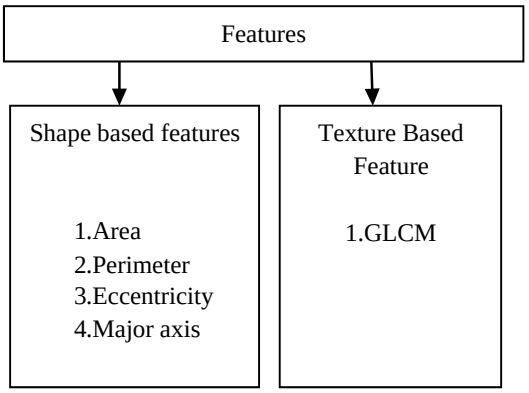

Figure 1:Extracted features

II. METHODOLOGY

Segmentation of the tumor helped in sustaining the life of effected people in the diagnosis. There are variety of algorithms used in case of segmentation which is worthwhile for the researchers. The output which is segmentation is give to the feature extraction part.

Irrespective of age, tumor leads death in which brain tumor is the most standing one . Image processing techniques helped doctors to diagnose and analyse the size, location , intensity of the tumor present. There includes preprocessing algorithms, feature extraction, classification and segmentation algorithm.

General block diagram for the proposed method for classification and segmentation is shown in Figure 2.The test image used undergo various process, which include preprocessing, segmentation by patch extraction, feature extraction and classification of the test image.

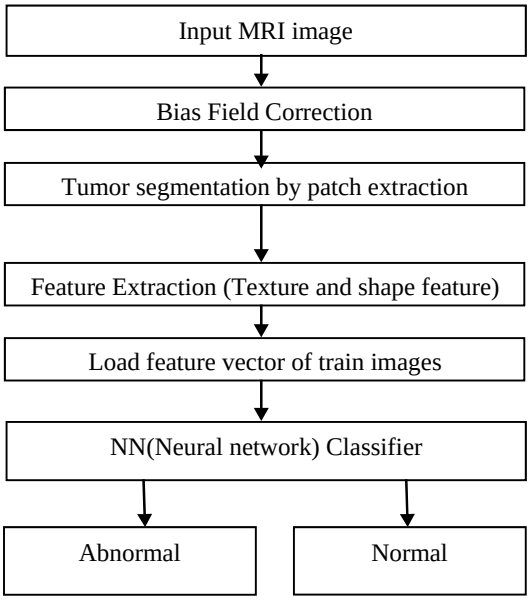

Figure 2. Block Diagram

A. Input Image

Image used is BRATS2013 image which is DICOM (.DCM) type MRI image.

B. Preprocessing

Bias field is produced by the improper image acquisition. Bias field produced non uniformity in the intensity[9]. Correction of bias field helped to get intensified image and patch extraction is done for the segementation.

C. Feature Extraction

Feature include texture and shape .Texture feature includes GLCM (Gray Level Co-occurrence matrix). GLCM defines co-occuring pixel values of the gray scale image. Other type of texture feature include wavelet transform, model fitting. Shape feature include eccentricity, area, perimeter, major axis.

D. Neural Network Classifier

Neural network is similar to the humar brain.It is basically prediction based on the strength of the signal which transmits. When neuron join together neural network is formed. Here there is an input, two hidden layer and output.Neural network classifies the given MRI input image into normal or abnormal classes.

III. RESULT AND DISCUSSION

The Figure 3.1shows the Input Image which MRI medical image in DICOM format.The input given is then estimated the bias field as shown in Figure 3.2 Estimated BiasField. After the estimation Figure3.3 shown below is the bias corrected image.Patch extraction of the given input image after bias correction is shown in

Figure 3.4.Segmented image is shown in Figure 3.5.The classifier output Figure3.6 shown is the abnormal image.The figure3.7 represents the histogram plot.

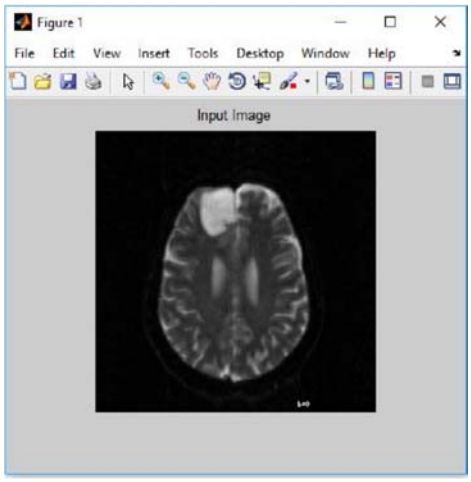

Figure 3.1 Input Image

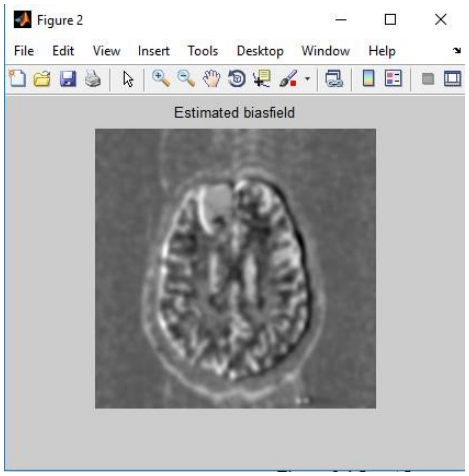

Figure3.2 Estimated BiasField

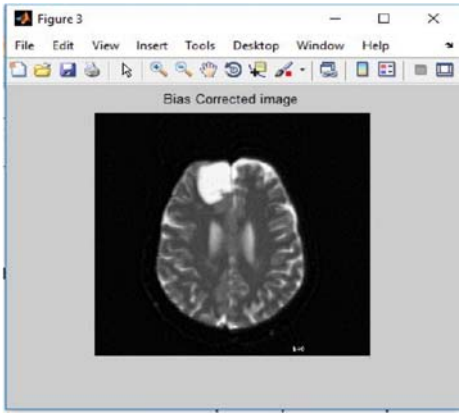

Figure 3.3 Bias Corrected Image

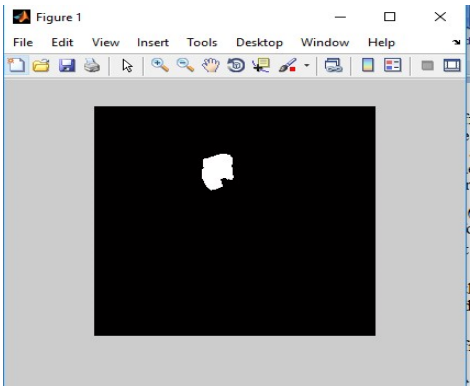

Figure 3.4 Patch Extraction

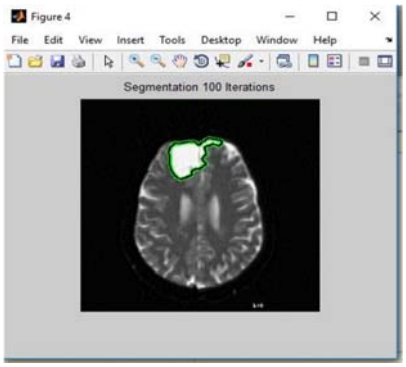

Figure3.5 Segmented image

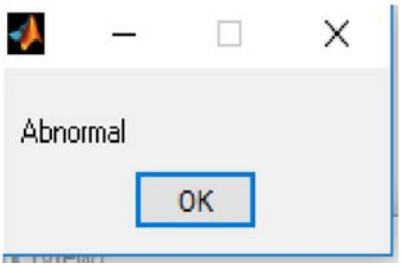

Figure 3.6 Classifier Output

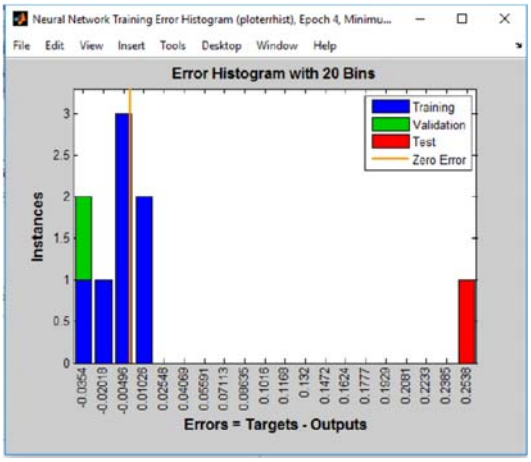

Figure 3.7 Histogram plot

IV. CONCLUSION

This work is proposed is about segmentation and classification of the medical MRI images. Bias field correction is done and after that segmentation done using patch extraction. Feature extraction is based on texture and shape .Testing of image is done using the features and trained images obtained a feature vector of the given input image. Classification is done by the help of neural networks. This work was implemented by the help of MATLAB 2014a. Future work include robust development of the preprocessing stage and classification.

V. REFERENCES

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