Brain Tumor Detection using Local Features Extraction and Fuzzy Approach from MRI Images

Abstract:

The segmentation of the tumor or abnormal area in the brain's MRI images can play an important role in cancer research and clinical operations. Although the exact segmentation of the tumor is ideal by radiologists, it is very time consuming. Experience has shown that approximate segmentation can be sufficient to index MRI databases. Detecting abnormal areas, such as brain tumors, in MRI images can help to categorize and regulate the program. Most research in this area is for MRI images. In recent years, the use of MRI images has been considered for clarity and high quality to determine the tumor and its characteristics. Tumor diagnosis is done automatically, and different results are achieved. The steps involved in these algorithms can be divided into three categories, segmentation of the tumor area, specification extraction, and classification of samples.

In this research, an automated method for finding the exact range of the abnormal brain region in an MRI image has been investigated. This algorithm is based on fuzzy fragmentation that is used to detect a tumor in a brain medical device. The fuzzy fragmentation algorithm has the ability to quickly diagnose areas with heterogeneous and asymmetric tissue in a medical image. In order to extract the feature from the Gabor filter, it is a powerful method for extracting image texture. The PCA algorithm has been used to select useful features. In the end, SVM has been used to categorize the extracted features and tumor detection. The results of our experiments on the BRAINX and clinical databases show that the proposed method has high efficiency and accuracy than the previous methods.
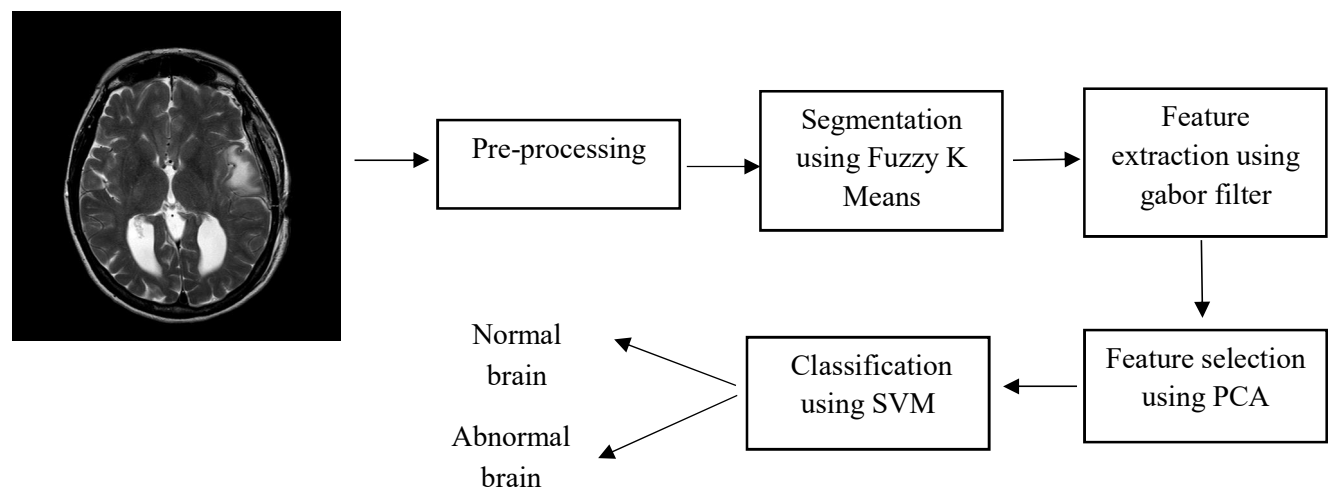
1. Proposed method

Figure 1. Proposed diagram

1-1- Pre-processing and segmentation
- Resizing to 300×300
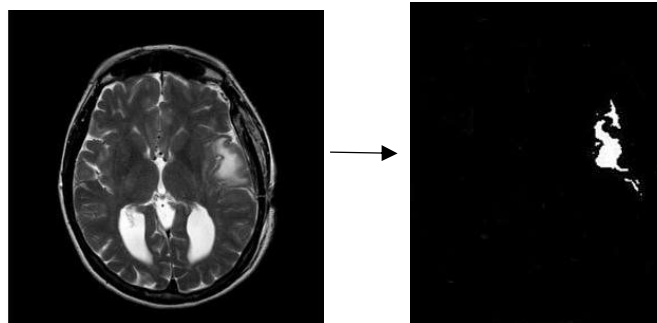- Segmentation using fuzzy k means (FCM)

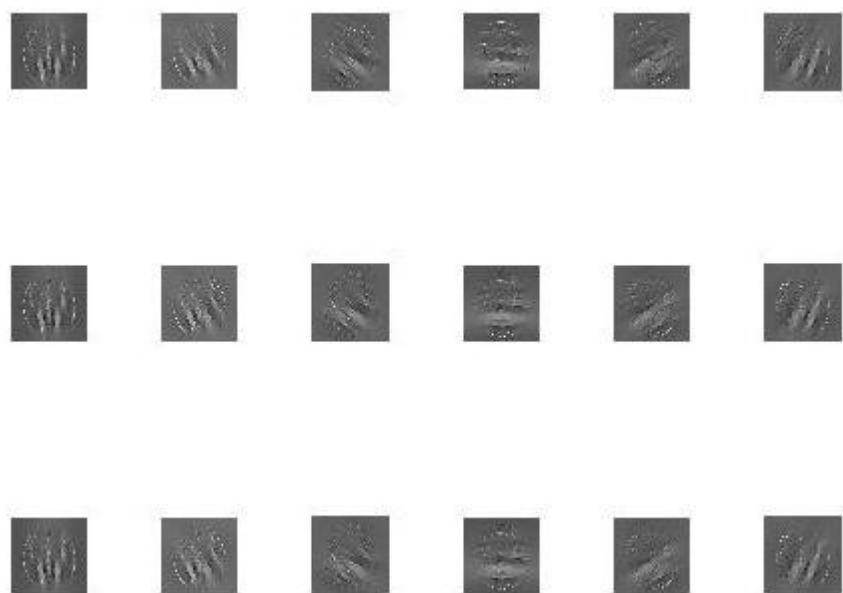Figure 2. Segmentation

1-2- Feature extraction using Gabor filter

Figure 3. Output of Gabor filter on segmented image

1-3- Feature selection using PCA (principal component analysis)
1-4- Feature classification and detection using SVM (support vector machine)

2- Experimental results
2-1- Clinical dataset (1000 MRI normal images, 1000 MRI abnormal images, 70% for training, 30% for testing)

Table 1. Evaluation metrics of the proposed method

	Abnormal brain	Normal brain
Abnormal brain	TP=893	FN=107
Normal brain	FP=99	TN=901

Table 2. Evaluation metrics of the proposed method

	Sensitivity	Specificity	Accuracy
Test %30-Train %70	90.01%	90%	89.70%

Table 3. Evaluation metrics of the proposed method

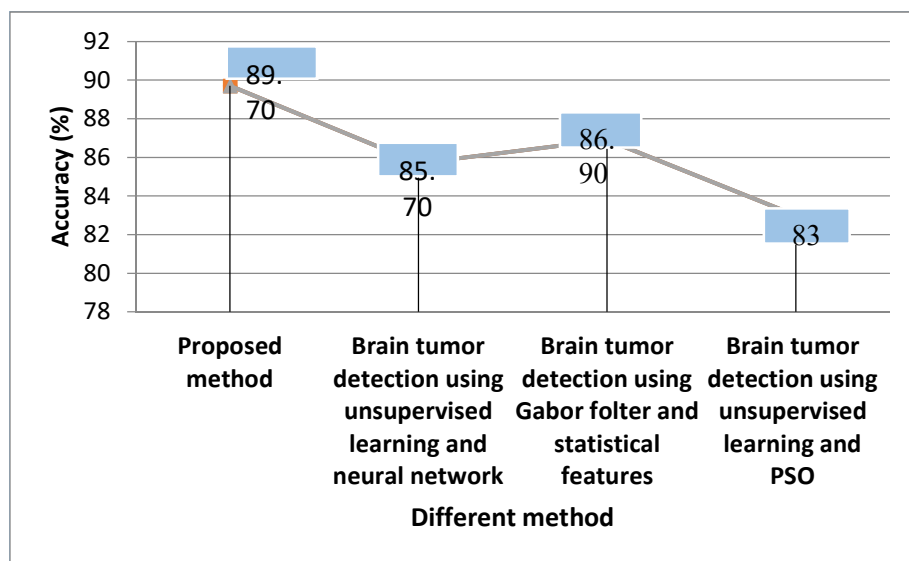|	Sensitivity	Specificity	Accuracy
Proposed method	90.01%	90%	89.70%
DWT+PCA+K-NN	%89	%87	86%
DWT+PCA+NN	%82	84	81
PCA+SVM	89%	84%	85%

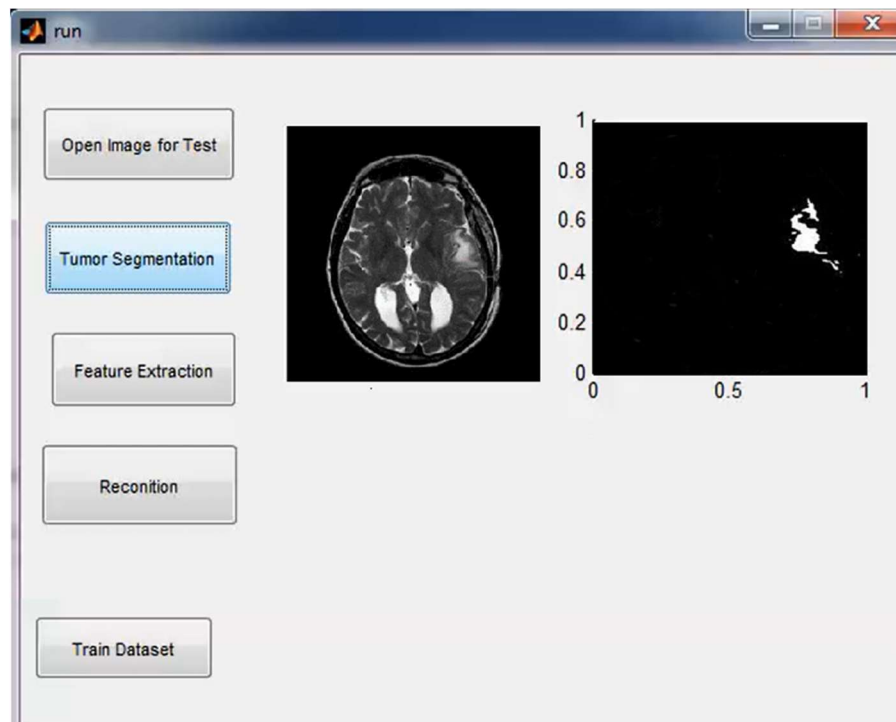Figure 4. Comparing the accuracy of the proposed method with other methods

Figure 5. Output

How to run:
1. Press train dataset button
2. Then click open image for test
3. Click tumor segmentation button
4. Click feature extraction button
5. Finally click recognition button