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AN EFFICIENT BRAIN TUMOR DETECTION USINGMODIFIED K-MEANS CLUSTERING BASED ON SVM

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ABSTRACT

Automatic defects detection in MR images is very important in many diagnostic and curative applications. Because of high quantity data in MR images and blurred boundaries, tumor segmentation and classification is very hard. This work has introduced one automatic brain tumor detection method to increase the accuracy and to decreases the diagnosis time. The main goal is to classify the tissues into normal, benign and malignant. In MR images, the amount of data is too much for manual clarification and analysis. In Medical imaging system, brain tumor segmentation in magnetic resonance imaging (MRI) has become an emergent research area in the field for past few years. In diagnosis method detecting the location and size of tumor places a vital role. This method consists of four stages, pre-processing of MR images, feature selection, feature extraction, classification and clustering. Image segmentation is based on Watershed Transform and Feature extraction is based on GLCM. Support vector machine (SVM) is employed to classify the Normal and Abnormal brain. After that, support vector machine (SVM) result is compared with probabilistic neutral network to show the efficiency. At last if the output is abnormal it moves to k-means clustering.

KEYWORDS: Brain, Magnetic resonance imaging, Support vector machine, Watershed Transform, GLCM, Probabilistic neural network, k-means clustering.

1. INTRODUCTION

In Human body, Brain is the most complex organ. Human body is made up of many types of cells which have their specific function. Any abnormal tissue growth inside the brain is called brain tumor, which can be cancerous(Malignant) or non-cancerous(Benign). Brain tumors usually causes problems by pressure they exert on the normal brain. This can cause brain damage. Brain tumor arecategorized as primary and secondary. A Primary brain tumor originates inside the brain. Secondary tumor are cancers that spread to the brain from another part of the body. Brain tumor may have different types of syndrome ranging from headache to stroke, so symptoms will vary depending on tumor location. Different location of tumor causes different functioning disorder. Different type of scans were used to diagnosis the brain tumor such as Magnetic Resonance Imaging, Angiogram, Computer Tomography, Positron Emission Tomography. Here, Magnetic Resonance Imaging, is the best imaging technique to detect the brain tumor, but usually it is difficult to determine the type of tumor with visual observation. GLCM is a technique which extracts a feature from gray as well as binary images. In this paper, we apply machine learning concept to perform automated brain tumor classification using MRI images. Support vector machine (SVM) is mainly used for classification. A Machine learning technique as Support vector machine (SVM) generates both input and output mapping functions using a set of labeled training data. For grouping the elements K-means clustering is used which is simplest unsupervised algorithm. This technique helps to find the exact location of brain tumor.

2. IDENTIFY, RESEARCH AND COLLECT IDEA

Saif D. Salmam & Ahmed A. Bahrani "Segmentation of tumor tissue in gray medical images using watershed transformation method" For helping the surgeon in distinguish the involved area precisely a new method of tumor line detection and segmentation is described in this paper. It is used to separate the abnormal from the

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normal surrounding tissue to get a real spot of involved and non-involved area. Watershed method is used and image processing is done by using MATLAB 7.1 to detect the tumor boundaries in MRI and CT image for different cases. A physician is very clear in distinguish the area of tumor through the result for surgical planning. Drawbacks in this is damage for surrounding tissue from the brain image. Mrs.Mamata S. Kalas "An Artificial Neural Network for Detection of Biological Early Brain Cancer" Human analysis on medical images is a difficult task due to very minute variations. Due to co-resemblance between affected & original biological part & due to larger data set for analysis. In brain cancer, prediction of tumor is more complicated. But in this paper the affect is predicted. An automated recognition system is designed which could process on a large information of patient and provide a correct estimation. For MRI images, an automated cancer recognition system is developed. The classification is implemented using neuron fuzzy logic and estimation of cancer effect on given MRI image. Drawback in this is poor edge detection and less accuracy.

3. MATERIALS AND METHODS

The proposed work is mainly based on watershed transform and support vector machine. A watershed is a transformation defined on a gray scale image. The watershed transformation treats the imageand it operates upon like a topographic map, each point having illumination and it helps to representing its height, and finds the lines that run along the top of ridges. The image of the brain is obtained from MRI scanning. The experiment has been implemented using MATLAB R2013b.

There are different stages: Pre-processing, Feature Selection, Feature Extraction and Classification using Support vector machine.

3.1 Input image

MRI scan is given as the input data to the system. MRI scan gives the detail pictures of the tissues and its gives better result when compared to CT scans.

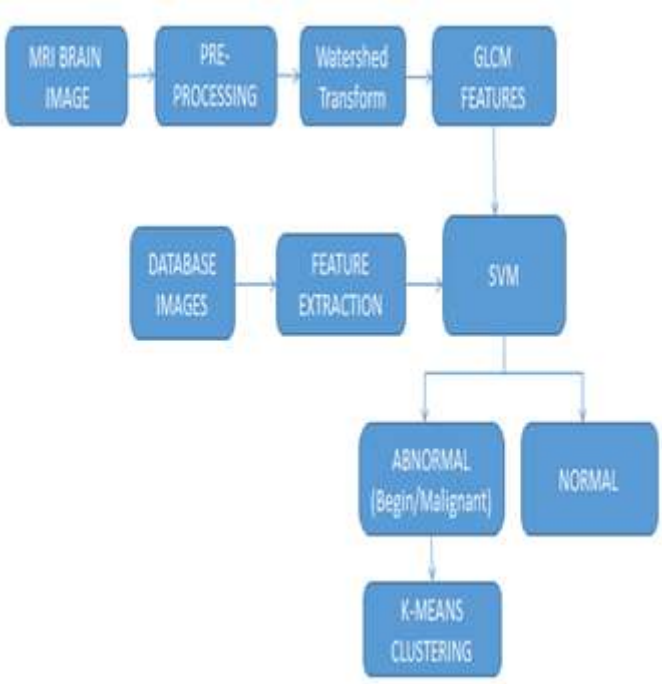

Figure 1.Block Diagram

3.2Pre-processing

Pre-processing strategies point the upgrade of the picture without change in the data content. Pre-processing refers to the transformation which is applied to the data before providing it to the algorithm. In this stage, image

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is enhanced in the way that details are improved and noise is removed from the image. Enhancement will result in more important edges and a sharpened image is obtained, noise will be decreased thus minimizing the blurring effect from the image. The improved and enhanced image will help in detecting edges and improving the quality of the overall image. Edge detection will lead to find the accurate position of tumor.

3.3 Feature Selection

Feature selection is the process commonly used in machine learning, wherein a subset of the features available from the data is selected for application of a learning algorithm. The best subset contains the least number of dimensions that contributes to high accuracy and decreases the complexity and computational time. Here, Watershed transform is used for the feature selection. Watershed transform produces a complete division of the image in separated regions even if the contrast is poor.

3.4 Feature Extraction

Feature extraction is methodology of extracting meaningful features from the input image such as shape, texture and contrast. We extract degenerated tissue from the selected image with the presence of minimal superfluous elements and it represents reduction of dimensionality. Gray-level co-occurrence matrix (GLCM) is algorithm used to extract a feature from gray image. In GLCM, Texture analysis differentiates normal and abnormal tissues easily for visual perception and machine learning. It also provides variation between malignant and benign which is invisible to human eye. It improves the accuracy by choosing beneficial quantitative features for early diagnosis. The statistical features were extracted using gray-level co-occurrence matrix(GLCM).The features are

1. Contrast
2. Correlation
3. Energy
4. Entropy

3.5 Classification

Tissue classification technique, classify the tissue intonormal and abnormal using support vector machine (SVM). It has recently gained eminence in the field of pattern classification and machine learning. SVM is a fast iterative algorithm for identifying the support vectors of a given set of points. The performance metrics are sensitivity, specificity and accuracy. After that, support vector machine (SVM) result is compared with probabilistic neutral network to show the efficiency.

4. RESULTS

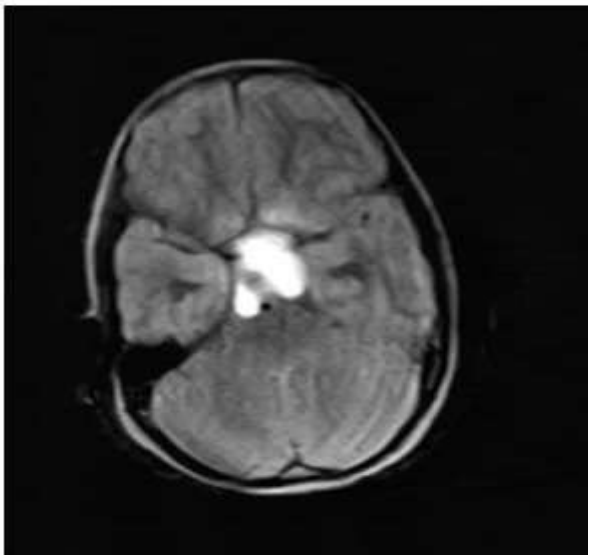

Figure 2: Input image

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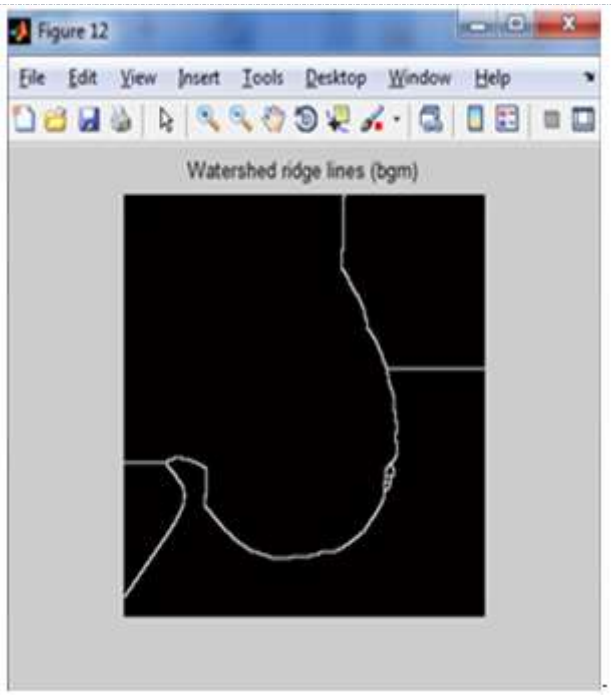
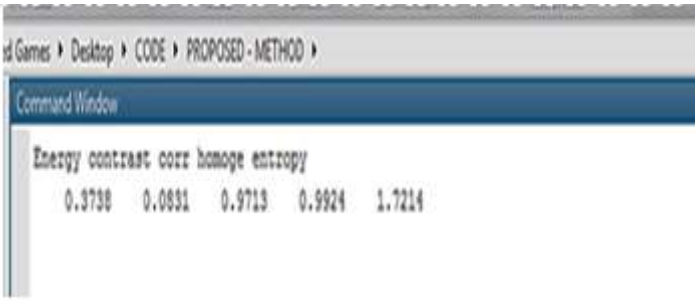


Figure 3. Watershed Transform



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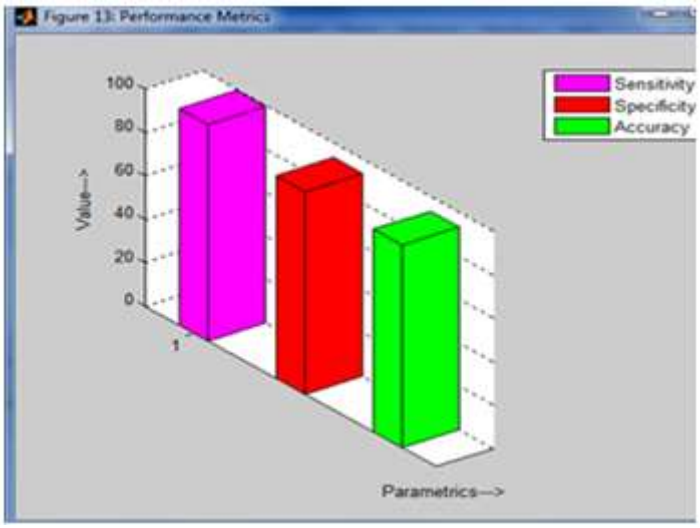
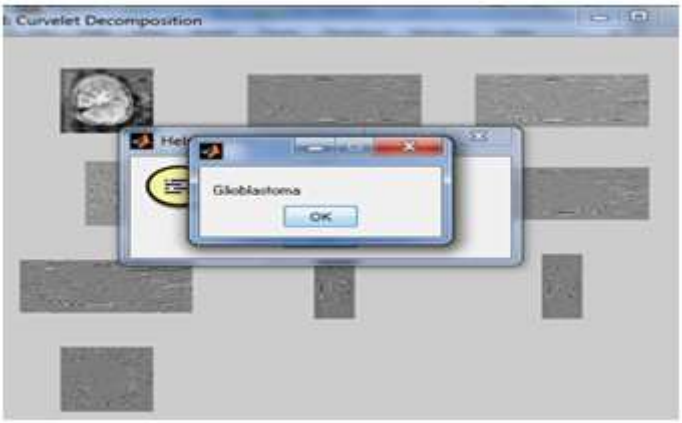



```
Sensitivity:
   100

Specificity:
   93.3529

Accuracy:
   93.4299
```

Figure 5. SVM classifier



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*****Classifier Performance******
Sensitivity(%):
    75

Specificity(%):
   100

Accuracy(%):
    80
```

Figure 6: Probabilistic neural network

5. CONCLUSION

In this paper we have describe about Brain tumor detection. Feature Selection is done by watershed transform, the feature extraction is obtained by using GLCM. SVM is used for classifying the tumor tissue. Achieved results are shown in the upper section which shows the efficient brain detection. Probabilistic neural networks is also employed in this project to show SVM is efficient. We are going to group the elements using k-means clustering at the last stage.

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