A Comparative Analysis of Brain Tumor Detection From MRI Images By Using Segmentation, SVM and ANN

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Abstract - In this paper we propose adaptive brain tumour detection, Image processing is used in the medical tools for detection of tumour, only MRI images are not able to identify the tumorous region in this paper we are using K-Means segmentation with pre-processing of image. Which contains denoising by Median filter and skull masking is used. Also we are using object labeling for more detailed information of tumor region. To make this system an adaptive we are using SVM (Support Vector Machine), SVM is used in unsupervised manner which will use to create and maintain the pattern for future use. Also for patterns we have to find out the feature to train SVM. For that here we have find out the texture feature and color features. It is expected that the experimental results of the proposed system will give better result in comparison to other existing systems.

Keywords: MRI images, K-means segmentation, Median filter, SVM, Unsupervised, Brain tumor.

I. INTRODUCTION

Image classification is one of classical problems of concern in image processing. There are various approaches for solving this problem. The aim of this paper is bring together two areas in which are Artificial Neural Network (ANN) and Support Vector Machine (SVM) applying for image classification. Firstly, we separate the image into many sub-images based on the features of images. Each sub-image is classified into the responsive class by an ANN. Finally, SVM has been compiled all the classify result of ANN. Our proposal classification model has brought together many ANN and one SVM. Let it denote ANN &SVM. ANN& SVM has been applied for Roman numerals recognition application and the precision rate is 86%. The experimental results show the feasibility of our proposal model.

It is an important to find out tumor from MRI images but it is somewhat time-consuming and difficult task sometime performed manually by medical experts. Large amount of time was spent by radiologist and doctors for identification of tumor and segmenting it from other brain tissues. However, exact labeling brain tumors is a time-consuming task, and considerable variation is observed between doctors [2].

Subsequently, over the last decade, from various research results it is being observed that it is very time consuming method but it will get faster if we use image processing techniques [3]. Primary brain tumors do not spread to other body parts and can be malignant or benign and secondary brain tumors are always malignant. Malignant tumor is more dangerous and life threatening than benign tumor.

The benign tumor is easier to identify than the malignant tumor. Also the first stage tumor may be malignant of benign but after first stage it will change to dangerous malignant tumor which is life threatening [12]. Different brain tumor detection algorithms have been developed in the past few years. Normally, the automatic segmentation problem is very challenging and it is yet to be fully and satisfactorily solved. The main aim of this system is to make an automated system for detecting and identifying the tumor from normal MRI.

II. SYSTEM MODEL

COMPARISION METHODES IN BRAIN TUMOR DETECTION:

1. ARTIFICIAL NEURAL NETWORK (ANN):

A brain-style computational model has been used for many applications. Researchers have developed various ANN's structure in accordant with their problem. After the network is trained, it can be used for image classification. Multi Artificial Neural Network (MANN) [4], applying for pattern or image classification with parameters (m, L), has m Sub-Neural Network (SNN) and a global frame (GF) consisting L Component Neural Network (CNN). In particular, m is the number of feature vectors of image and L is the number of classes. This model uses many Neural Networks so that the training phrase is complex and long. Besides, it is not suitable in case the number of classes L is high. MANN is the 2-layers classifier model using Neural Network.

2. *SUPPORT VECTOR MACHINES:*

Recently, particular attention has been dedicated to Support Vector Machines as a classification method. SVMs have often been found to provide better classification results that other widely used pattern recognition methods, such as the maximum likelihood and neural network classifiers (Melgani and Bruzzone 2004, Theodoridis and Koutroumbas 2003). Thus, SVMs are

very attractive for the classification of remotely sensed data.

The SVM approach seeks to find the optimal separating hyper plane between classes by focusing on the training cases that are placed at the edge of the class descriptors. These training cases are called support vectors. Training cases other than support vectors are discarded. This way, not only is an optimal hyperplane fitted, but also less training samples are effectively used; thus high classification accuracy is achieved with small training sets (Mercier and Lennon 2003). This feature is very advantageous, especially for remote sensing datasets and more specifically for Object-based Image Analysis, where object samples tend to be less in number than in pixel based approaches.

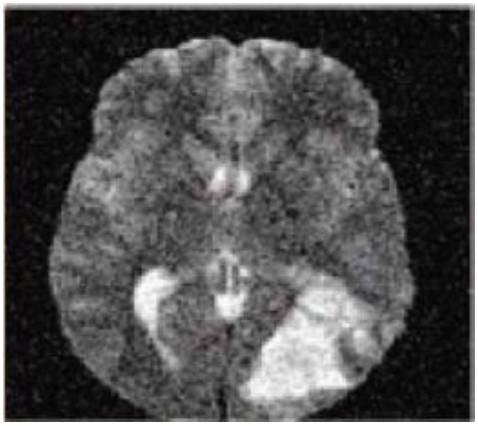
A complete formulation of Support Vector Machines can be found at a number of publications (Vapnik 1995, 1998, Cortes and Vapnik 1995, Theodoridis and Koutroumbas 2003). Here,

the basic principles will be presented and then their implementation and application to Object Based Image Analysis will be evaluated.

3. *K-MEANS BASED SEGMENTATION:*

A cluster is a collection of objects which are similar between them and are dissimilar to the objects belonging to other clusters. It deals with finding a structure in a collection of unlabeled data. A loose description of clustering could be the process of organizing objects into groups whose members are similar in some way. K-Means clustering is an algorithm to group objects based on attributes/features into k number of groups where k is a positive integer. The grouping (clustering) is done by minimizing the Euclidean distance between the data and the corresponding cluster centroid.

Thus the function of K-Means clustering is to cluster the data. Commonly used initialization methods are Random Partition [20]. The Forgy method randomly chooses *k* observations from the data set and uses these as the initial means. The Random Partition method first randomly assigns a cluster to each observation and then proceeds to the update step, thus computing the initial mean to be the centroid of the cluster's randomly assigned points. The Forgy method tends to spread the initial means out, while Random Partition places all of them close to the center of the data set. According to Hamerly [10] the Random Partition method is generally preferable for algorithms such as the Kharmonic means and fuzzy *k*-means. For expectation maximization and standard *K-Means* algorithms, the Forgy method of initialization is preferable [17].



III. PREVIOUS WORK

In this section author should discuss about related research has been done in the same domain or related domains with the name of the researcher and should be mentioned in the references.

IV. PROPOSED METHODOLOGY

The main purpose of this paper is to identify the region of tumor and to do the detailed diagnosis of that tumor which will used in treating the cancer patient the detailed about the proposed system is given below. Threshold is a specific intensity value which contents a predefined intensity value; it is used to separate object or Region of Interest (ROI) from the image background, chosen in the range of 0 to 255 [13]. But it is detected that clustering methods followed by threshold cannot notice tumor correctly from MRI image, because the image consist of several nonbrain tumor tissue. For this reason we express the proposed method using K-Means algorithm followed by Object Labeling algorithm also, some preprocessing steps (median filtering and morphological operation) is used for tumor detection purpose [14].

V. CONCLUSION

Brain tumor detection is done by preprocessing which is first step in that median filter and by using diagonal, anti diagonal masks segmented images get preprocessed and skull masking is done here. After skull masking fatty tissues and other unwanted details get smoothen.

Preprocessed image is segmented with the K-Mean segmentation and Object Labeling with HOG, HOG is friendly with feature extraction. So the texture feature and color feature are extracted here in the system which is use to find out the region of interest and SVM is use for pattern mapping and pattern matching process. Also use to learn Neural Network. Image processing has become a very important task in today’s world. Today applications of image processing can be originated in number of areas like medical, remote sensing, electronics and so on. If we focus on medical applications, and image segmentation is widely used for diagnosis purpose.

In this paper, we have proposed a system that can be used for segmentation of brain MR Images for Detection and identification of brain tumor. We find area of tumor and its type of tumor. Future scope for detection and segmentation of brain tumor is that if we obtained the three dimensional image of brain with tumor then we can also find out its tumor size and also can evaluate its tumor type and also its stage of tumor.

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