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MRI Image Processing Using Different Techniques

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Abstract: A Wavelet Transform based image decomposition algorithm is proposed to identify the areas of interest in the brain related to in oxidation problems. The significant brain activations can be observed in Magnetic Response Imaging (Images) & EEG signals related various brain functions/ disorders. The image de-noising using wavelet transform and subsequently feature extraction for classification is the way of many researchers for classification of medical images. In this paper, the study of the brain feature extraction in MRI images using various techniques has been given. The different classifier has been reported in literature for the improvement of classification performance. The comparison of the different classification methods of the medical image database is also given in the paper.

Keywords: Wavelet transforms MRI, GLCM, PCA, etc.

I Introduction

Magnetic Resonance Imaging (MRI) has become a widely employed high quality medical imaging nowadays in the field of tumor detection. Brain tissue and tumor segmentation in MR images have become a vital area of discussion. For accurate image segmentation, some good features have to be extracted. The brain is comprised of different tissues such as the White Matter (WM), Cerebrospinal Fluid (CSF) and Gray Matter (GM). During the segmentation of the MR brain images, variability in certain aspects such as, tumor shape, location, size, intensity and textural properties makes the segmentation process difficult. In tumor segmentation, intensity feature plays a vital role in differentiating tumor from other brain soft tissues. But, intensity alone is not sufficient, therefore other texture based features such as Local Binary Pattern (LBP), gray level based features, Gray Level Co-occurrence Matrix (GLCM), wavelet features are extracted This is medical imaging techniques analysis tools enable both doctors and radiologists to arrive at a specific diagnosis process. Medical Image Processing has emerged as one of the most important tools to identify as well as diagnose various disorders. Imaging helps of the doctors to visualize and analyze the image for understanding of abnormalities in internal structures. In brain images data obtained from Bio-medical Devices which use imaging techniques like Magnetic Resonance Imaging (MRI), Computed Tomography (CT) and mammogram function, which indicates the presence or absence of the lesion along with the patient history, of important factor in the diagnosis process. Magnetic Resonance Imaging (MRI) is a scanning device that uses magnetic fields and computers to capture images of the brain on film (brain, image). It does not use x-rays. The provides pictures from various planes and process, which permit doctors to create a three-dimensional image of the tumor. MRI are brain image detects signals emitted from normal and abnormal tissue detects, and providing most tumors images. The become a widely-used method of high quality medical image, brain imaging where soft tissue contrast and non-invasiveness are clear advantages. Brain images have been selected for the image reference for this research because the injuries to the brain tend to affect large areas of the organ process. The brain controls and coordinates most movement, homeostatic body functions such as heartbeat and behavior, fluid balance, body temperature, or blood pressure. In the functions of the brain are responsible in different category for example cognition, memory, motor learning and other sorts of learning, emotion. The classifications of brain MRI data as normal and abnormal are important to prune the normal patient and to consider only those who have the possibility of having abnormalities or tumor.

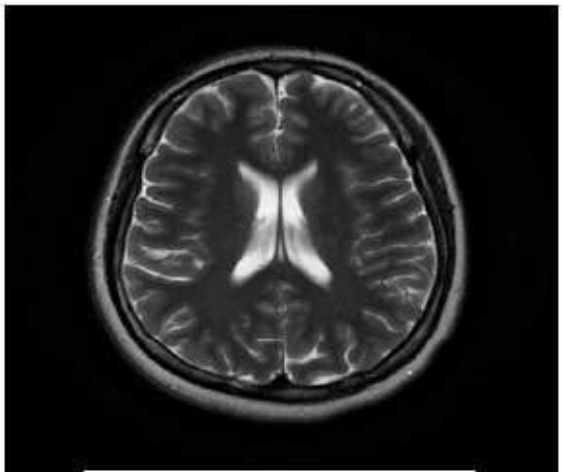

Fig. 1 Normal Brain MRI Image

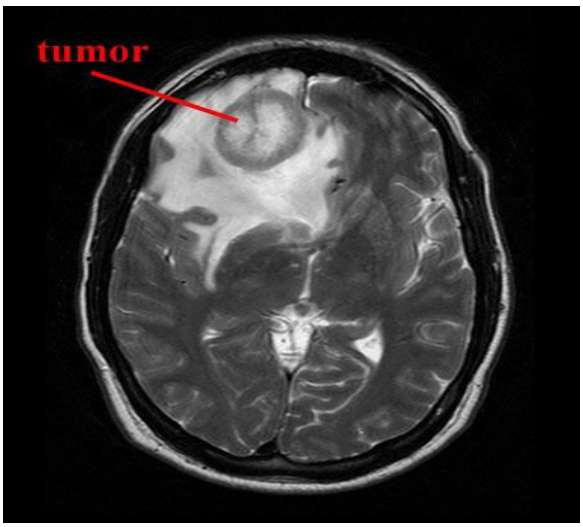

Fig 2 An Abnormal Brain MRI Image

MRI is commonly used imaging technique uses magnetic fields and radio waves to produce high-quality two or three dimensional images of body, it is a non-aggressive, non-radioactive and pain-free technique for visualizing and detecting the brain tumors without any human involvement. It gives the detailed information regarding normal and abnormal tissue. Accurate brain diagnosis can be done automatically with more accuracy in feature extraction and classification of disease.

Approaches used for classification falls into two categories. The first category is supervised learning technique such as Artificial Neural Network (ANN), Support Vector Machine (SVM) and K-Nearest Neighbor (KNN) which are used for classification purposes.

Another category is unsupervised learning for data clustering such as K-means Clustering, Self Organizing Map (SOM). In this paper, are used different method for example Support Vector Machine (SVM) and Wavelet Transform etc, for classification as it gives better accuracy and performance than other classifiers etc.

II .Related Work

The many researchers have been done in field of economic dispatch problem some of the work is described in this paper.

exact location and size of tumor. MRI images consist of gray and white matter and the region containing tumor has more intensity.

Bauer et al. [2], a tumor growth modeling combined with registration algorithms was employed. The tumor was grown in the atlas based on a new multi scale, multi physics model including tissue deformation. Large-scale deformations are handled with an Eulerian approach for finite element computations, which can operate directly on the image voxel mesh. Consequently, dense correspondence between the modified atlas and patient image was established using non-rigid registration. Their technique provides atlas-based segmentation of tumor bearing brain images as well as for improved patient specific simulation and diagnosis of tumor progression.

Tirpude and Welekar [3], has provided an accurate demarcation of the boundary of the tumor, along with correct visual location of the tumor with the help of a bounding circle. This study has also provided a diagnosis decision whether the tumor is present or absent along with the exact size of the tumor. This decision can assist as a supportive aid which can be used at the doctor's discretion in finally declaring a decision.

Daljit Singh, Kamaljeet Kaur [1], in this paper, accurate automatic detection and classification of images is very challenging task whether they are medical images or other natural images. This paper presents a hybrid technique for automatic classification of MRI images as well as natural images. The proposed method consists of two stages: feature extraction and classification. It is first case; features are extracted from images using PCA and GLCM. In the next stage, extracted features are fed as input to SVM method. It classifies the images between normal and abnormal along with type of disease depending upon features. Also it classifies between natural images. For Brain MRI images; features extracted with GLCM gives

100% accuracy with SVM -RBF kernel function. Similarly for natural images; features extracted by GLCM classifier gives 91.67% accuracy with SVM-RBF kernel classifier. In this paper, is automatic classification technique is developed to classify between normal and abnormal images as well as to classify between author‟s images and other natural images. The image features are extracted from images using feature extraction algorithms GLCM and PCA and classified further using SVM classifier. GLCM using SVM for linear and quadratic kernel functions gives classification accuracy of 96.15% and 100% with execution time of 10.4848 seconds and 10.3837 seconds respectively. This method helps to reduce the burden of medical practitioners when large amount of data is available. But the final decision is made after consultation with specialist. Similarly for natural images; features extracted by GLCM gives maximum accuracy of 91.67% with all kernel functions but there is difference in their execution times. Execution time for SVM-RBF is 4.3987 seconds. PCA with same kernel function gives maximum accuracy of 75%.

Rosy Kumari [2], done study in their paper, magnetic resonance imaging (MRI) is an imaging technique that has played an important role in neuro science research for studying brain images. In the deferent classification is an important part in order to distinguish between normal patients and those who have the possibility of having abnormalities or tumor. In consist of two type's stage in method: feature extraction and classification. The first stage, extracted features are fed as input to SVM classifier. In next stage, features are extracted from images using GLCM. It classifies the images between normal and abnormal along with type of disease depending upon features.
Brain MRI images; features extracted with GLCM gives 98% accuracy with SVM-RBF kernel function. The proposed approach using SVM as a classifier for classification of brain images provides a good classification efficiency as compared to other classifiers. The sensitivity, specificity and accuracy is also improved. The proposed approach is computationally effective and yields good result. In this automated analysis system could be further used for classification of images with different pathological condition, types and disease status. The future work is to improve the classification accuracy by extracting more features and increasing the training data set.

Josephine Sutha.V, Dr.P.Latha [3], An approach for automatic classification of Magnetic Resonance Image (MRI) is presented in this paper. The modern hospitals a vast amount of MR images are produced in the day to day life.there are input image based automatic medical image retrieval system is now a necessity. This is extracted features are classified using Support Vector Machine (SVM) with Radial Basis Function (RBF). The performance of Support Vector Machine (SVM) for varying parameters is investigated function. In proposed system showed high classification accuracies (on an average >99%) for all the datasets used in the experiments. in simulation results and performance comparisons with state-of-the-art techniques show that the proposed scheme is efficient in brain MR image classification. This paper gives a boon to computerized decision system for the MR Image using SVM with SIFT. SIFT confirms to be the capable one as it is invariant to transformation, scale and rotation. Also, its implementation is quite simple and the expenditure is also very low. The final faltering result shows that the technique is effective with greater accuracy. Proposed method is compact in implementation and effective in classification. Above said result will be of great reputation for brain tumor detection and classification. Hence this technique can be used for data supervision in hospitals and for tele-radiology.

J Umamaheswari1 and Dr.G.Radhamani [4], In this paper, an efficient Computer Tomography (CT) image classification using Support Vector Machine (SVM) with optimized quadratic programming methodology is proposed. In due to manual interpretation of brain images based on visual examination by radiologist/physician that cause incorrect diagnosis, a large number of Computer Tomography (CT) images are analyzed system. To avoid the human error, which automated optimized classification system is proposed for abnormal CT image identification. SVM classifier can accurately train up the data's as normal and abnormal brains interpreted manually by the user. Computer Tomography system can retrieve more number of images present in the query data base. Proposed classifier is analyzed with existing Sequential Minimal Optimization (SMO) and K Nearest Neighbour classifier (KNN). This is an automated system for content based image retrieval with better classifier accuracy and prediction time. The proposed approach using SVM as a classifier for classification of brain images provides a good classification efficiency of 96.6% during training phase and 95% efficiency during testing phase. The sensitivity, specificity and accuracy is also improved. In the approach is computationally effective and yield good result. In improve the classification accuracy by extracting more features and increasing the training data set.

Khushboo Singh, SatyaVerma [5], this research paper proposes an intelligent classification technique to identify anomalies present in brain MRI. The manual interpretation of anomalies based on visual examination by radiologist/physician may lead to missing diagnosis when a large number of MRIs. To avoid the human error, an automated intelligent classification system is proposed which caters the need for classification of image slices after identifying abnormal MRI volume, for anomalies identification. In this paper, advanced classification techniques based on Support Vector Machines (svm) are proposed and applied to brain image classification using features derived. SVM is a artificial neural network technique used for supervised learning of classification. This classifier is compared with other pre store images for detecting the anomalies. From this analysis, the performance of svm classifier was evaluated in terms of classification accuracies and the result confirmed that the proposed method has potential in detecting the tissue. This experiment can detect the first object of class which is fail to identify the other abnormalities present in the image. The focusing of various features of the object or anomalies.

III .Conclusion

The various papers and literature has been studied for MRI image classification. The comparisons of the methods have been given in the form of table. The Support Vector Machines (SVM) perform better in the recognition but required higher computation time. In feature, the Neural network and fuzzy classification with various other feature extraction techniques may be useful. The parallel processing may also the option to use the multi-core processer to reduce the time of computation.

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