ABSTRACT

The abnormalities in brain cells are the main causes for forming lesions in brain. These abnormal lesions in brain lead to the formation of tumors in brain. Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) are the two different brain image scanning methods. In this research work, MR images are used to scan the brain internal regions. Benign and Malignant are the type of abnormal lesions in brain in which, benign can be treated by radiation methods; where as malignant lesions are treated through proper surgery by expert radiologist.

Tumor is defined as an uncontrolled growth of cancerous cells in any part of the body. Tumors are of different types and possess diverse characteristics and require different treatments. At present, brain tumors are classified into primary brain tumors and metastatic or malignant brain tumors. The primary tumors begin in the brain and are inclined to stay in the brain; the metastatic or malignant tumors begin as a cancer elsewhere in the body and then start to spread into the brain region. Due to the large amount of brain tumor images that are currently being generated in the clinics, it is not possible for physicians to manually annotate and segment these images in a practical time. Hence, the automatic tumor detection and segmentation technique has become inevitable. In conventional methods, brain tumors are detected and diagnosed manually by expert radiologist. It is time consuming and error probe process. Hence, it is not suitable for high population developing countries. Therefore, a computer aided automatic brain tumor detection and diagnosis methods are preferred.

In the Existing, the optimal smoothing filter and threshold methods are used as tumor edge detecting approaches. The contrast agent accumulation model and Fuzzy connectedness based intensity non uniformity correction model are used as preprocessing techniques in existing methods in order to smooth and

enhance the internal regions of the brain MRI image. The conventional methods extracted mostly wavelet and texture features from the spatial transformed brain MRI image. Neural networks and its modifications are used as conventional classification techniques to classify the brain images into normal and abnormal. Local Independent Projection classification technique and morphological functions are presently used as the segmentation techniques for brain tumor detection.

The proposed Heuristic histogram equalization technique in this research work enhances the abnormal regions in MRI brain image which is further used to segment the tumor region. In order to improve the classification accuracy, then the features are extracted from the enhanced brain image for tumor detection using Local Ternary Pattern (LTP) features and Grey Level Co-occurrence Matrix (GLCM). The performance of the classification is determined by classification accuracy which is defined as the ratio between numbers of images correctly classified to the total number of images. In this research work, the performance of the brain image classification is improved using Co-Active Adaptive Neuro Fuzzy Inference System (CANFIS) classifier. Further, the Normalized Graph cut segmentation algorithm is used to segment the tumor region in the classified Glioma brain image, the performance of the tumor segmentation algorithm is analyzed using the parameter such as sensitivity, specificity and accuracy. From the experimental result, the performance evaluation parameters sensitivity, specificity and accuracy are evaluated as 97.28%, 98.16% and 99.14% respectively.

In the retrieval module, a query image (Tumor segmented region from test brain image) is input to the retrieval system, the energy feature is extracted from the query image and it is compared with the energy features in the database images. This can be carried out by measuring the Euclidean distance between the query image with the database images. The performance of the retrieval technique is evaluated in terms of precision and recall. From the experimental

result, the performance evaluation of the retrieval system parameters, precision and recall are evaluated as 97.29% and 98.16% respectively. Hence, the second work of this research is used to detect the stroke region in brain images.

The Heuristic histogram equalization technique enhances the abnormal regions in MRI brain image which is further used to segment the tumor region. The morphological features are extracted from the curvelet transformed brain image. In order to increase the classification accuracy by selecting the optimum features from the extracted features, Genetic Algorithm (GA) is used as feature selection process for selecting the optimal set of features from the extracted feature set. Classifier is used to classify the source test brain MRI images into either normal or abnormal images based on the feature extracted. Adaptive Neuro Fuzzy Inference System (ANFIS) classifier is proposed to classify the test brain MRI image into either stroke free or stroke brain images to achieve high classification accuracy. Further, the Normalized Graph cut segmentation algorithm is used to segment the stroke region in the classified brain image, the performance of the segmentation is analyzed using the parameter such as sensitivity, specificity and accuracy. From the experimental result, the performance evaluation parameters sensitivity, specificity and accuracy are evaluated as 97.19%, 98.28% and 98.76% respectively. There is a requirement for analyzing the impact of stroke in brain tumor in order to emphasize the early detection of disease process.

Further, this research work proposes a methodology to analyze and diagnose the stroke possibility on tumor affected brain MRI images. Initially, the images are classified into either normal or abnormal using Adaptive Boosting (AdaBoost) classification methodology. Then, Normalized Graph cut segmentation technique is applied on the abnormal classified brain Magnetic Resonance (MR) image in order to detect and segment the tumor regions. The segmented tumor images are diagnosed for the possibility of brain stroke by segmenting and analyzing the relation between the brain tissues. The brain

tissues are segmented using K-means classification algorithm. The possibility of stroke is diagnosed on brain tumor affected image into mild, moderate or severe cases. The mild and moderate stages of stroke are identified as 'Early' diagnosis and severe case is identified as 'Advance' diagnosis.

Although the research work has widely covered the topic subjective to various analysis and validations yielding fruitful conclusions, the scope of work in the field need not be limited to this part of the study. The work can be extended in terms of detection of abnormal tumor regions in thermogram brain images. There are possible connections in extending the scope of this research study, such that diagnosing of epilepsy disease basis the analysis of brain tissues is also possible. Earlier diagnosis of other brain related diseases such as the Parkinson disease can be one another area of interest to deep dive on same lines of the research work. Effectively all such works may lead to solve unsolvable problems in the advanced medical disciplines.