Certain Investigation on Image Classification and Segmentation using Different Techniques

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***Abstract**: A brain cancer is a tissue that structured by an addition of anomalous cells and important to detect and classify brain tumors from MRI (Magnetic Resonance Imaging) for treatment. Brain tumor segmentation and classification is considered to be more important tasks in medical imaging. MRI is used for the study of the human brain. A fully automated method plays an important role in the prediction of brain cancer. In this review paper, different classification and segmentation techniques are discussed.*

***Index Terms:** Image segmentation, Classification and mining techniques.*

I. INTRODUCTION

In medical imaging modalities, the Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) provides more accurate information about brain tissues, from a various excitation sequences, and this is a standard and most available technique for a brain tumor diagnosis. There imaging techniques allows the medical practitioners and researchers to evaluate disorders within the brain and surgery is performed. An efficient and automated diagnosis of medical images is very crucial task. Segmentation and Classification are the two methods, very much useful in medical image processing. MRI tool is essential in the surgical environment due to superior soft tissues differentiation, high spatial resolution and it does not use any harmful radiation. Image preprocessing methods used to improve the image quality and remove the noises present in the images. Mean and Median filter are simple to understand. It preserves the position of boundary and also brightness differences resulting in minimal blurring of regional boundaries.

Feature extraction process refers to various quantitative measurement of medical images used for decision making regarding the structure or tissue. In this process, the input data set is transformed into the set of features. The features sets will extract the information from the input data in order to perform the task using this reduced representation instead of the full size input. Preprocessing steps also includes the segmentation process,

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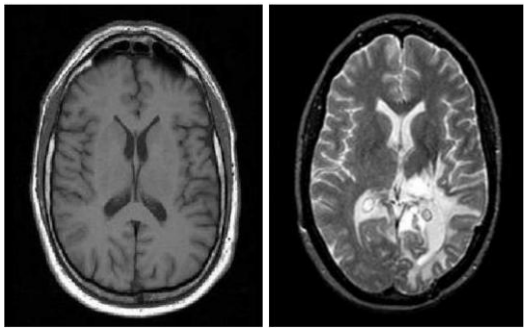
Which is performed to the separate the affected regions. There are different types of classifiers are used, such as SVM (Support Vector Machine), k-nearest neighbor (KNN), Artificial Neural Network (ANN), Probabilistic Neural Network (PNN) etc., for various applications such as identification of object, identification of speakers, text classification and also for medical application.

This paper presents a different classification and segmentation methods. Literature has a wide range of various detection techniques used in brain tumor and main purpose of this paper is to review related work on various classification and segmentation techniques for brain tumor detection.



[1] **[2]**

Fig [1]- Normal Image [2]- Abnormal Image

II. LITERATURE SURVEY

Segmentation process is used to extract the information from complex medical images like brain cancer and nodules. The set of features and feature space decision surface are done in classification process. This process also includes feature extraction process and classifiers.

[1] Hong zeng et al proposed a stationary matrix logistic regression approach that directly optimizes the discriminative classifiers and robustness against the non-stationary of the ECG data. This method optimizes the robustness of the classifier in a single objective function. It improves the performance, in particular for the subject which have difficulty in controlling BCI (Brain Computer Interface) and also weakens the influences of non-stationaries.

[2] Saif Dawood Salman Al-Shaikhi et al suggested a Dictionary learning and sparse coding classification using K-SVD algorithm. This Novel approach combines the texture features to build and learn a dictionary. The topological feature provides information about normal or abnormal based on the topology of normal brain is fixed. Compare to other

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methods, this sparse coding based classification outperforms and achieves the higher classification accuracy.

[3] Sergio Pereira et al proposed a Convolutional Neural Networks as a automatic segmentation method. The concepts in the context of CNN are Initialization, Activation Function, Pooling, Regularization, Data Augmentation and Loss Function. This CNN based segmentation method proves to be very effective for brain tumour segmentation.

[4] V.Anitha et al presented a two tier classifier with adaptive segmentation technique which classified the brain tumors in double training process. In this system, initially the brain images are preprocessed to removes the noise and K-Means clustering algorithm are used. By using this new two-tier classification system, it increases the overall system performance and accuracy than other classification techniques.

[5] Hari Babu Nandpuru et al proposed an classification technique with a support vector machine to identifies normal and abnormal brain images. Support Vector Machine uses the trained image and test image to classify the tumor. This classifiers improves the accuracy rate and gives an lower error rate.

[6] Shang-Ling Jui et al suggested the 3-Dimensional non-rigid intracranial structure deformation features for brain tumor segmentation. This method used to extract deformation features more relevant to the tumor growth region. Artificial Neural Networks and Support Vector Machine also used with this new method. This method gains high accuracy performance.

[7] Xiao feng yang et al presented a classification method based on multi block Fuzzy C-means. This method is fully automatic , multiscale classification methods uses the intensity correction for brain MRI images. Here, bilateral filter is used for removing noise in the images and preserves the edges between the different types of tissues. In multiblocks, the every block done with classification along with the scale space to add the local information in next step. This method results in more accurate and robust for noise images.

[8] Walaa Hussein Ibrahim et al presented a Neural networks method for MRI images classification. This method proposed with three stages, they are preprocessing, dimensionality reduction and classification. Principles Component Analysis are used to obtain the dimensionality reduction. Finally classification process classifies the normal or abnormal MRI images. This method shows the classification accuracy improved to 96.33%.

[9] Dipali M.Joshi et al suggested Artificial Neural Network for detection and classification of Brain cancer. This method used with the histogram equalization, Image Segmentation and Image Enhancement process. Gray level co-occurrence matrix are used for extracting the feature of texture to detect tumor. Neuro-Fuzzy classifiers are also used to identify the types of brain. This method improves the efficient and classification accuracy.

[10] Mohd Fauzi Bin Othman et al presented a new technique support vector machine (SVM) for MRI brain classification. This SVM method is an advanced kernel based techniques used to classify the brain images. Classification process is to group the items which have same features values into same group. Based on these values, SVM classify the abnormal and normal images and improves the performance accuracy.

[11] Marzena Boberek et al proposed an algorithm for automatic detection of brain tumor image. These process consists of two stages : Preprocessing and segmentation. In this paper, Preprocessing seperates the skull, Cerebro Spinal Fluid(CSF) and brain. Wiener Filtering is used for noise reduction. Segmentation process are used to distinguish WM(White Matter), GM(Grey Matter) and tumor. From the proposed algorithm, the reliable results are achieved for MRI images.

[12] Zexuan Ji et al introduced a Fuzzy Local Gaussian Mixture Model (FLGMM) for segmentation of brain images. Gaussian Mixture is used to satisfy the local image data in each voxel's neighbourhood. This algorithm takes the spatial information and uncertainty of data into considerations and incorporates into the GMM to improve the segmentation results. Also this method overcomes the difficulties raised by low contrast, noise and bias fields and produce more accurate segmentation results.

[13] Malsawn Dawngliana et al presented a new method called Hybridized multilevel thresholding and level set for Automatic brain tumor segmentation. Level set method with morphological operations is to interface the early segmentation from multilevel thresholding and to extract fine portrait. This proposed method improves the segmentation accuracy with the shape of the deformation feature.

III. CONCLUSION

In this paper, the various image processing and data mining techniques are discussed. Different existing techniques have been employed for the prediction and diagnose of brain tumor at initial stage. This survey paper analyzes the different algorithms for brain tumor detection. The main focus is on various segmentation and classification process. It summarizes the accuracy and performance improvement of brain tumor detection techniques.

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