Brain Tumor Detection and Classification Techniques in Image Processing: A Review

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Abstract : A Brain Cancer is very serious disease causing deaths of many individuals. The detection and classification system must be available so that it can be diagnosed at early stages. Cancer classification has been one of the most challenging tasks in clinical diagnosis. At present cancer classification is done mainly by looking through the cells' morphological differences, which do not always give a clear distinction of cancer subtypes. Unfortunately, this may have a significant impact on the final outcome of whether a patient could be cured effectively or not. We have proposed a methodology to segment and classify the brain MRI image using k-means clustering algorithm and Genetic algorithm.

IndexTerms **- Brain Tumor, classification, image classification.**

I. INTRODUCTION

Automated classification and detection of tumors indifferent medical images is motivated by the necessity of high accuracy when dealing with a human life. Also, the computer assistance is demanded in medical institutions due to the fact that it could improve the results of humans in such a domain where the false negative cases must be at a very low rate. It has been proven that double reading of medical images could lead to better tumor detection. Conventional methods of monitoring and diagnosing the diseases rely on detecting the presence of particular features by a human observer. Due to large number of patients in intensive care units and the need for continuous observation of such conditions, several techniques for automated diagnostic systems have been developed in recent years to attempt to solve this problem. Such techniques work by transforming the mostly qualitative diagnostic criteria into a more objective quantitative feature classification problem. In this project the automated classification of brain magnetic resonance images by using some prior knowledge like pixel intensity and some anatomical features is proposed. Currently there are no methods widely accepted therefore automatic and reliable methods for tumor detection are of great need and interest. The application of PNN in the classification of data for MR images problems are not fully utilized yet. These included the clustering and classification techniques especially for MR images problems with huge scale of data and consuming times and energy if done manually. Thus, fully understanding the recognition, classification or clustering techniques is essential to the developments of Neural Network systems particularly in medicine problems.

Segmentation of brain tissues in gray matter, white matter and tumor on medical images is not only of high interest in serial treatment monitoring of "disease burden" in oncologic imaging, but also gaining popularity with the advance of image guided surgical approaches. Outlining the brain tumor contour is a major step in planning spatially localized radiotherapy (e.g., Cyber knife, iMRT) which is usually done manually on contrast enhanced T1-weighted magnetic resonance images (MRI) in current clinical practice. On T1 MR Images acquired after administration of a contrast agent (gadolinium), blood vessels and parts of the tumor, where the contrast can pass the blood–brain barrier are observed as hyper intense areas. There are various attempts for brain tumor segmentation in the literature which use a single modality, combine multi modalities and use priors obtained from population atlases.

II. LITERATURE REVIEW

Glioma Segmentation with a Unified Algorithm in Multimodal MRI Images

In this paper, author first use spatial fuzzy c-mean clustering to estimate region-of-interest in multimodal MRI images, and then extract some seed points from there for region growing based on a new notion ''affinity''. In the end, author design a two-step strategy to refine the glioma border with region merging and improved distance regularization level set method

An Automatic Brain Tumour Extraction System using Different Segmentation Methods

Arashdeep Kaur suggested that method used an approach to detect brain tumor using four different methods namely Otsu, K-means, Fuzzy-c-Means and thresholding. The main objective of this paper is to develop a fully automated brain tumor detection system that can detect and extract tumor from MR Image of brain. This paper also gives the comparison between the algorithms presented [2]**.**

Artificial Neural Network based Brain Cancer Analysis and Classification

Aniket A. kathalkar suggested that deals with such a system which uses computer based procedures to detect tumor blocks and classify the type of tumor using Artificial Neural Network Algorithm for MRI images of different patients. Different image processing techniques such as histogram equalization, image segmentation, image enhancement, morphological operations and featureextraction are used for detection of the brain tumor in the MRI images of the cancer affected patients[3]

Detection of Tumour in MRI Images Using Artificial Neural Networks

Aqhsa Q. Syed1,K.Narayanan introduced one automatic brain tumor detection method to increase the accuracy and yield and decrease the diagnosis time. Here, it is tried to give clear description from brain tissues using Multi-Layer Perception Network, energy, entropy, contrast and some other statistic features such as mean, median, variance and correlation. It is used from a feature selection method to reduce the feature space too. This method uses from neural network to do this classification.[4]

A survey on artificial intelligence approaches for medical image classification

S. N. Deepa and B. Aruna Devi introduced a survey has been made on the applications of intelligent computing techniques for diagnostic sciences in biomedical image classification. This study gathers representative works that exhibit how AI is applied to the solution of very different problems related to different diagnostic science analysis. It also detects the methods of artificial intelligence that are used frequently together to solve the special problems of medicine. SVM neural network issued in almost all imaging modalities of medical image classification. Similarly fuzzy C means and improvements to it are important tool in segmentation of brain images. Various diagnostic studies like mammogram analysis, MRI brain analysis, bone and retinal analysis etc., using neural network approach result in use of back propagation network, probabilistic neural network, and extreme learning machine recurrently. Hybrid approach of GA and PSO are also commonly used for feature extraction and feature selection [5]

Summary

Gliomas are the most common and malignant brain tumors with the short life expectancy. Only 5% patients suffering glioblastoma (GBM) survive more than five years after diagnosis. The severity and popularity make glioma segmentation become one of the crucial procedures in surgery and treatment. Up to now, glioma segmentation in clinical tumor images is mostly performed manually. However, manual delineation is time-consuming and depends on the individual operator. Thus, a semi-automatic or automatic glioma segmentation method is demanded greatly to assist the glioma diagnosis. Nevertheless, glioma segmentation is given many difficulties by isointense (the same signal intensity as that of brain tissues), hypointense (darker than brain tissues) property of gliomas, and fuzziness of tumor margins.

Although many imaging pre- or post-processing techniques have been applied to refine tumor tracking, such as multimodal MRI images which can provide various data and reveal different parts on tumors, it is still a challenging task..

III. CONCLUSION

Here several existing brain tumor segmentation and detection methodology has been discussed for MRI of brain image. All the steps for detecting brain tumor have been discussed including pre-processing steps. Pre-processing involves several operations like non local, Analytic correction methods, Markov random field methods and wavelet based methods has been discussed. Quality enhancement and filtering are important because edge sharpening, enhancement, noise removal and undesirable background removal are improved the image quality as well as the detection procedure. Among the different filtering technique discussed above, median filter suppressed the noise without blurring the edges and it is better outlier without reducing sharpness of the images, mean filter are much greater sensitive than that of median filter in the context of smoothing the image. Gaussian reduces the noise; enhance the image quality and computationally more efficient than other filtering methodology. After the several image quality improvement and noise reduction discussion here, some possible segmentation methodology like intensity based binarized segmentation, Region based, classification based, texture based, clustered based, neural network based, fuzzy, edge based, atlas, knowledge based, fusion, probabilistic segmentation has been described above with short description, advantage and disadvantage to detect or segment a brain tumor from MRI of brain image. In the threshold intensity based binnarized segmentation Kapur method is best methods and produce very effective results. Most of the binarized fails due to large intensity difference of foreground and background i.e. the black background of MRI image. In region growing methodologies are not standard methods for validate segmentation; the main problem is quality of segmentation in the border of tumor. This methods are good for homogeneous tumor but not for heterogeneous tumor. Classification based segmentation segment tumor accurately and produce good results for large data set but undesirable behaviours can occurs in case where a class is under represented in training data. Clustered based segmentation performs very simple, fast and produce good results for non-noise image but for noise images it leads to serious inaccuracy in the segmentation. In neural network based segmentation perform little better on noise field and no need of assumption of any fundamental data allocation but learning process is one of the great disadvantages of it.

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