

Review on Brain Tumour Detection using Image Processing

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Abstract: The Automatic Support Intelligent System is used to detect Brain Tumor through the combination of neural network and fuzzy logic system. It helps in the diagnostic and aid in the treatment of the brain tumor. The detection of the Brain Tumor is a challenging problem, due to the structure of the Tumor cells in the brain. This project presents an analytical method that enhances the detection of brain tumor cells in its early stages and to analyze anatomical structures by training and classification of the samples in neural network system and tumor cell segmentation of the sample using fuzzy clustering algorithm. The artificial neural network will be used to train and classify the stage of Brain Tumor that would be benign, malignant or normal.

The Fast discrete curvelet transformation is used to analysis texture of an image. In brain structure analysis, the tissues which are WM and GM are extracted. Probabilistic Neural Network with radial basis function is employed to implement an automated Brain Tumor classification. Decision making is performed in two stages: feature extraction using GLCM and the classification using PNN-RBF network. The segmentation is performed by fuzzy logic system and its result would be used as a base for early detection of Brain Tumor which would improves the chances of survival for the patient. The performance of this automated intelligent system evaluates in terms of training performance and classification accuracies to provide the precise and accurate results. The simulated result enhances and shows that classifier and segmentation algorithm provides better accuracy than previous methodologies.

I. INTRODUCTION

Automated classification and detection of tumors in 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. But the cost implied in double reading is very high, that's why good software to assist humans in medical institutions is of great interest nowadays. 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 SURVEY

IMAGE SEGMENTATION

Segmentation problems are the bottleneck to achieve object extraction, object specific measurements, and fast object rendering from multi-dimensional image data. Simple segmentation techniques are based on local pixel-neighborhood classification. Such methods fail however to global objects rather than local appearances and require often intensive operator assistance. The reason is that the "logic" of an object does not necessarily follow that of its local image representation. Local properties, such as

textures, edginess, and ridgeness etc. do not always represent connected features of a given object.

III. REGION GROWING APPROACH

Region growing technique segments image pixels that are belong to an object into regions. Segmentation is performed based on some predefined criteria. Two pixels can be grouped together if they have the same intensity characteristics or if they are close to each other. It is assumed that pixels that are closed to each other and have similar intensity values are likely to belong to the same object. The simplest form of the segmentation can be achieved through thresholding and component labeling. Another method is to find region boundaries using edge detection. Segmentation process, then, uses region boundary information to extract the regions. The main disadvantage of region growing approach is that it often requires a seed point as the starting point of the segmentation process. This requires user interaction. Due to the variations in image intensities and noise, region growing can result in holes and over segmentation. Thus, it sometimes requires post-processing of the segmentation result.

IV. CLUSTERING

Clustering can be considered the most important unsupervised learning problem, so it deals with finding a structure in a collection of unlabeled data. A cluster is therefore a collection of objects which are “similar” between them and are “dissimilar” to the objects belonging to other clusters. Clustering algorithms may be classified as listed below

- (1) Exclusive Clustering
- (2) Overlapping Clustering
- (3) Hierarchical Clustering
- (4) Probabilistic Clustering

In the first case data are grouped in an exclusive way, so that if a certain datum belongs to a definite cluster then it could not be included in another cluster. On the contrary the second type, the overlapping clustering, uses fuzzy sets to cluster data, so that each point may belong to two or more clusters with different degrees of membership. In this case, data will be associated to an appropriate membership value. A hierarchical clustering algorithm is based on the union between the two nearest clusters. The beginning condition is realized by setting every datum as a cluster. After a few iterations it reaches the final clusters wanted

V. K-MEANS SEGMENTATION

K-means is one of the simplest unsupervised learning algorithms that solve the well-known clustering problem. The procedure follows a simple and easy way to classify a given data set through a certain number of clusters (assume k clusters) fixed a priori. The main idea is to define k centroids, one for each cluster. These centroids should be placed in a cunning way because of different location causes

different result. So, the better choice is to place them as much as possible far away from each other. The next step is to take each point belonging to a given data set and associate it to the nearest centroids. When no point is pending, the first step is completed and an early group age is done. At this point we need to re-calculate k new centroids as centers of the clusters resulting from the previous step. After we have these k new centroids, a new binding has to be done between the same data set points and the nearest new centroids. A loop has been generated. As a result of this loop we may notice that the k centroids change their location step by step until no more changes are done. In other words centroids do not move any more. Finally, this algorithm aims at minimizing an objective function, in this case a squared error function.

VI. HIERARCHICAL SEGMENTATION

A hierarchical set of image segmentations is a set of several image segmentations of the same image at different levels of detail in which the segmentations at coarser levels of detail can be produced from simple merges of regions at finer levels of detail. A unique feature of hierarchical segmentation is that the segment or region boundaries are maintained at the full image spatial resolution for all segmentations. In a hierarchical segmentation, an object of interest may be represented by multiple image segments in finer levels of detail in the segmentation hierarchy, and may be merged into a surrounding region at coarser levels of detail in the segmentation hierarchy. If the segmentation hierarchy has sufficient resolution, the object of interest will be represented as a single region segment at some intermediate level of segmentation detail.

A goal of the subject analysis of the segmentation hierarchy is to identify the hierarchical level at which the object of interest is represented by a single region segment. The object may then be identified through its spectral and spatial characteristics. Additional clues for object identification may be obtained from the behavior of the image segmentations at the hierarchical segmentation level above and below the level at which the object of interest is represented by a single region.

VII. THRESHOLDING

The simplest method of image segmentation is called the thresholding method. This method is based on a clip-level (or a threshold value) to turn a grayscale image into a binary image. The key of this method is to select the threshold value (or values when multiple-levels are selected). Several popular methods are used in industry including the maximum entropy method, Otsu's method (maximum variance), and k-means clustering. Recently, methods have been developed for thresholding computed tomography (CT) images. The key idea is that, unlike Otsu's method, the thresholds are derived from the radiographs instead of the (reconstructed) image.

VIII. CONCLUSION

This research was conducted to detect brain tumor using medical imaging techniques. The main technique used was segmentation, which is done using a method based on threshold segmentation, watershed segmentation and morphological operators.