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Review on Brain Tumor Segmentation and Classification Techniques

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Abstract:- **Magnetic resonance imaging (MRI) is an advanced medical imaging technique providing rich information about the human soft tissue anatomy. Segmentation plays the vital role in the medical image processing. There are several typical MRI segmentation approaches such as Thresholding techniques, Edge-based methods, Region-based segmentation, Cooperative hierarchical computation approach, Statistical approaches, and ANN image segmentation techniques. One more important phase in the medical sciences is Brain tumor classification, the images acquired from different modalities such as CT, MR that should be verified by the physician for the further treatment, but the manual classification of the MR images is the challenging and time consuming task. The main aim of this research and review paper is to explore the existing segmentation and classification techniques in the medical image processing.**

Keywords: MRI, ANN, CT.

I. INTRODUCTION:

Segmentation subdivides an image in to number objects from which we can find the Region of Interest (ROI) for the specific task to perform. Also, Segmentation of MR images into different tissue classes, especially gray matter (GM), white matter (WM) and cerebrospinal fluid (CSF), is an important task[1] .There are several typical MRI segmentation approaches as follows:

Threshold techniques: where the classification of each pixel depends on its own information such as intensity and color information. Those techniques are efficient when the histograms of objects and background are clearly separated.

Edge-based methods: which are focused on detecting contour, they fail when the image is blurry or too complex to identify a given border.

Region-based segmentation: in which the concept of extracting features (similar texture, intensity levels, homogeneity or sharpness) from a pixel and its neighbors is exploited to derive relevant information for each pixel.

Cooperative hierarchical computation approach: Use pyramid structures to associate the image properties to an array of father nodes, selecting iteratively the point that average or associate to a certain image value.

Statistical approaches: This type of method labels pixels according to probability values, which are determined based on the intensity distribution of the image. With a suitable assumption about the distribution, statistical techniques attempt to solve the problem of estimating the associated class label, given only the intensity for each pixel. Such an estimation problem is necessarily formulated from an established criterion.

ANN image segmentation techniques: originated from clustering algorithms and pattern recognition methods. They usually aim to develop unsupervised segmentation algorithms. For sometimes the above segmentation approaches are overlapped and can be combined [2].

II. SEGMENTATION TECHNIQUES:

Xiao Xuan, Qingmin Liao (2007) have presented Statistical Structure Analysis in MRI Brain Tumor Segmentation in which a statistical structure analysis based tumor segmentation scheme is presented, which focuses on the structural analysis on both tumorous and normal tissues. Firstly, 3 kinds of features including intensity-based, symmetry-based and texture-based are extracted from structural elements. Then a classification technique using AdaBoost that learns by selecting the most discriminative features is proposed to classify the structural elements into normal tissues and abnormal tissues. Experimental results on 140 tumor-contained brain MR images achieve an average accuracy of 96.82% on tumor segmentation [3].

Shan Shen et.al.(2005) have given MRI Fuzzy Segmentation of Brain Tissue Using Neighborhood Attraction With Neural-Network Optimization in which they have presented A robust segmentation technique based on an extension to the traditional fuzzy c-means (FCM) clustering algorithm. A neighborhood attraction, which is dependent on the relative location and features of neighboring pixels, is shown to improve the segmentation performance dramatically. The degree of attraction is optimized by a neural-network model. Simulated and real brain MR images with different noise levels are segmented to demonstrate the superiority of the proposed technique compared to other FCM-based methods. This segmentation method is a key component of an MR image-based classification system for brain tumors, currently being developed [4].

Tao Wang et.al. (2009) have proposed Fluid Vector Flow and Applications in Brain Tumor Segmentation in which they call the “fluid vector flow” (FVF) active contour model to address problems of insufficient capture range and poor convergence for concavities. With the ability to capture a large range and extract concave shapes, FVF demonstrates improvements over techniques like gradient vector flow, boundary vector flow, and magnetostatic active contour on three sets of experiments: synthetic images, pediatric head MRI images, and brain tumor MRI images from the Internet brain segmentation repository [5].