Abstract

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BRAIN MASS DETECTION USING FUZZY C-MEANS BASED ON ADAPTIVE CLUSTERING TECHNIQUE

Accurate detection of brain tumor is very essential for treatment planning. Brain tumor detection is one of the applications that requires brain image segmentation. Image segmentation can be defined as partitioning the image into a set of non- overlapping regions based on different parameters of an image like gray-level, color, texture distribution, etc. A well-known problem in brain image segmentation is the accurate labeling of the tissue type which may be White Matter (WM), Grey Matter (GM), Cerebrospinal Fluid (CSF) and sometimes pathological tissues like tumor. Segmentation of brain tumor images is mainly based on the gray-level value of pixels, as most of the medical images are gray-scale images. In this thesis, the focus is on Magnetic resonance images (MRI) which are gray level images that are characterized by having a clearer contrast between soft tissues than the other medical imaging techniques like computerized tomography (CT), positron emission tomography (PET) and ultrasound (US). Due to the complex nature of brain MRI images, manual segmentation has many disadvantages such as the long processing time and the variation of results from one expert to the other. Hence the accurate computer aided detection (CAD) system for brain tumor segmentation is essential for accurate tumor detection. In this thesis, new accurate brain tumor detection techniques are proposed using the clustering and thresholding approaches. In particular, a novel automatic tumor detection technique is proposed using Fuzzy C-means (FCM), where the number of clusters is determined automatically, and a conformed threshold is used instead of the commonly used global threshold. A hybrid technique combining the thresholding and the image labeling methods is proposed. The performance of the proposed method is evaluated and is shown to give promising results from the points of view of completeness, correctness, accuracy of detecting tumors in brain MRI images as well as the condensed processing time. Also, a comparison between the clustering techniques and thresholding techniques is presented.