Adaptive Image Segmentation and Three Dimensional Reconstruction for MRI Brain Images

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ABSTRACT

Magnetic resonance imaging (MRI) is a non-invasive and useful tool in diagnosing cerebral disease. 3D visualization of MRI brain images can improve the quality of preoperative evaluation and diagnosis. The image segment is essential for 3D image reconstruction. In this thesis, we combine the Pulse Coupled Neural Network (PCNN) with Expectation Maximum (EM) to develop an adaptive and automatic image segmentation algorithm, namely Adaptive EM-Based PCNN (AEBP). By combining the EM algorithm used as the objective function to estimate the intensity distribution parameters of White Matter (WM), Gray Matter (GM) and Cerebrospinal Fluid (CSF), the PCNN is used to segment brain tissue into WM, GM and CSF. An adaptive mechanism is used to adjust the PCNN ’ s threshold time constant to automatically adjust the segment to increase the accuracy of segment. The segmentation performance of the AEBP is compared with the Bias Corrected Fuzzy C-Mean (BCFCM) and EM-Based PCNN (EBP). Experimental results show that the AEBP out performs both BCFCM and EBP, especially in low noise images.

Keywords : Magnetic Resonance Imaging ; Image Segmentation ; Pulse Coupled Neural Network ; Expectation Maximum

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