Image Segmentation and Three Dimensional Reconstruction in MRA Imaging

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ABSTRACT

Though Magnetic Resonance Imaging contains the three dimensional information, the images are still presented as the two dimensional format. 3D visualization of Magnetic Resonance Angiography (MRA) images can improve the quality of clinical diagnosis. The image segmentation is essential for 3D image reconstruction. Since MRA images generate the huge amount of information, manual segmentation is virtually impracticable. There, the effective segmentation algorithm to extract the vascular tree from MRA is highly desired. In this thesis, we use three segmentation algorithms to extract the vascular tree from MRA images. They are Bias Corrected Fuzzy C-Mean (BCFCM), Expectation Maximum (EM), and Level Set. After segmentation, a connected component algorithm is applied to link the tree-like structured vascular system. A 3D visualization tool, VTK, is used to present the reconstructed output. The segmentation performance of the Level Set is compared with the BCFCM and EM. The results showed that the Level Set outperforms the BCFCM and the EM in terms of segmentation quality. For computational time, the EM segmentation algorithm is superior to Level Set and BCFCM, and the Level Set is superior to BCFCM.

Keywords : Bias Corrected Fuzzy C-Mean ; Expectation Maximum ; Level Set ; MRA ; visualization

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