磁振影像腦血管分割與三維重建

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摘 要

腦部磁振造影雖提供三維空間之資訊，但仍以二維影像格式顯示。若要以三維視覺化方式顯示顱內血管部分，則需自二維磁振造影影像中分割出顱內血管部分之資訊，再加以重建。但腦部磁振造影所產生的龐大資訊量，使得以手動方式執行影像分割成為一實際上不可行之工作。因此有效之顱內血管分割演算法，為腦部磁振影像處理三維視覺化中不可或缺之分析工具。 本論文探討三種分割演算法，分別為Bias Corrected Fuzzy C-Mean（BCFCM），期望值最大化估計法（Expectation Maximum，EM），等位函數演算法（Level Set）來分割腦血管部分。最後使用Connected Components去除非血管的部份，並將其分割結果以三維視覺化的方式呈現顱內血管。 使用Level Set分割腦血管，以Jaccard Similarity衡量分割品質可達77.127 %，優於EM之75.45%與BCFCM之64.034%。針對三種演算法使用信賴度95%單尾成對樣本t檢定，檢定結果為：Level Set分割結果顯著優於EM與BCFCM。 執行三種分割演算法之CPU時間部分，EM對腦血管分割之執行時間優於Level Set與BCFCM，並且Level Set分割之執行時間優於BCFCM。

關鍵詞 : Bias Corrected Fuzzy C-Mean ; Expectation Maximum ; Level Set ; MRA ; 三維視覺化

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