

Segmentation of extrapulmonary tuberculosis infection using modified automatic seeded region growing.

ABSTRACT

In the image segmentation process of positron emission tomography combined with computed tomography (PET/CT) imaging, previous works used information in CT only for segmenting the image without utilizing the information that can be provided by PET. This paper proposes to utilize the hot spot values in PET to guide the segmentation in CT, in automatic image segmentation using seeded region growing (SRG) technique. This automatic segmentation routine can be used as part of automatic diagnostic tools. In addition to the original initial seed selection using hot spot values in PET, this paper also introduces a new SRG growing criterion, the sliding windows. Fourteen images of patients having extrapulmonary tuberculosis have been examined using the above-mentioned method. To evaluate the performance of the modified SRG, three fidelity criteria are measured: percentage of under-segmentation area, percentage of over-segmentation area, and average time consumption. In terms of the under-segmentation percentage, SRG with average of the region growing criterion shows the least error percentage (51.85%). Meanwhile, SRG with local averaging and variance yielded the best results (2.67%) for the over-segmentation percentage. In terms of the time complexity, the modified SRG with local averaging and variance growing criterion shows the best performance with 5.273 s average execution time. The results indicate that the proposed methods yield fairly good performance in terms of the over- and under-segmentation area. The results also demonstrated that the hot spot values in PET can be used to guide the automatic segmentation in CT image.

Keyword: Computed Tomography; Dual Modality Imaging; Positron Emission Tomography; Seeded Region Growing; Segmentation.