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Object segmentation by template matching and its related techniques

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Automatic object segmentation is one of the most important tasks in image analysis. While a universal schema for this task is seemingly not shortly attainable, practical solutions under different circumstances have been developed in the past couple of decades. Most of the previous works were based on machine learning. In contrast, our agenda differs from them in that we try to achieve satisfactory segmentation with a limited number of examples. Our idea is to leverage object matching in the segmentation model, thereby object segmentation is automated or object matching becomes precise in pixel level. In this talk, I'll introduce two of my recent works in this direction. Specifically, I'll introduce how object matching model can be integrated with two different types of segmentation models, namely the Markov random field model and the active contour model, to achieve automatic object segmentation. Discussions on their uses in radiographic image analysis would be encouraged.

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The prognostic utility of pre-treatment 18F-FDG-PET for salvage re-irradiation in head and neck cancer patients

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Background: Statistical image features of tumor metabolism from pretreatment 18F-FDG-PET/CT scans were studied for their potential to predict clinical outcome of salvage re-irradiation with intensity modulated radiotherapy (IMRT) for recurrent squamous cell carcinoma of head and neck (HNSCC).

Materials and Methods: Pretreatment PET/CT scans and after treatment PET/CT scans of patients who underwent IMRT re-irradiation for recurrent HNSCC, were retrospectively evaluated. Metabolic response was assessed using PET response criteria for solid tumors (PERCIST). Multiple statistical image features related to the standard uptake value (SUV) were computed: metabolic tumor volume, maximum SUV, mean SUV, total lesion glycolysis (TLG). The correlation between the image features and local control and overall survival was calculated.

Results: Complete tumor metabolic response (CMR) was achieved in 5 patients (45.5%). Six patients failed to achieve CMR: progressive metabolic disease was in 4 patients (36.4%); stable metabolic disease in one patient (9.1%); one patient had partial metabolic response (9.1%). The median follow-up time was 18.2 months. Out of the calculated image features, only pre-treatment tumor TLG (individual tumor volume multiplied by its mean SUV) correlated with tumor metabolic response in the early PET/CT follow-up. Also dividing the patient population based on the median tumor TLG showed a split of the Kaplan-Meier survival curves.

Conclusions: The tumor TLG of pre-treatment PET/CT scans has important information on the failure risk to achieve CMR in recurrent HNSCC patients. It is necessary to obtain additional patients data to validate these results.

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