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Automatic Deep Deformable Registration using Domain Adaptation and Run-Time Optimisation

Augmented reality from preoperative 3D model registration is promising to assist navigation in minimally-invasive liver surgery. The current registration methods are either accurate, but require surgeon interactions to annotate anatomical landmarks, or are fully automatic, but inaccurate. We propose a two-step automatic and accurate registration method. Step 1) segments the registration landmarks with a neural method. Step 2) estimates the 3D model deformation from the landmarks. The task is challenging because of the defects of the automatically segmented landmarks and the impossibility to label registration for training. We handle it by combining supervised training from synthetic transformations with domain adaptation and a novel robust Run-Time Optimisation (RTO). Our method outperforms existing ones, both with manual and automatic landmark segmentations, improving both automation and accuracy.

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Classification de Session: Poster Flash Talks