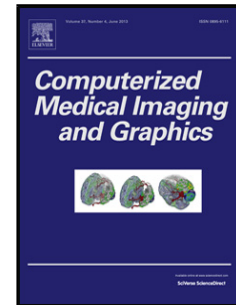


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Intensity-based volumetric registration of magnetic resonance images and whole-mount sections of the prostate

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Abstract

Objective Magnetic Resonance Imaging (MRI) of the prostate provides useful *in vivo* diagnostic tissue information such as tumor location and aggressiveness, but *ex vivo* histopathology remains the ground truth. There are several challenges related to the registration of MRI to histopathology. We present a method for registration of standard clinical T2-weighted MRI (T2W-MRI) and transverse histopathology whole-mount (WM) sections of the prostate.

Methods An isotropic volume stack was created from the WM sections using 2D rigid and deformable registration combined with linear interpolation. The prostate was segmented manually from the T2W-MRI volume and registered to the WM section volume using a combination of affine and deformable registration. The method was evaluated on a set of 12 patients who had undergone radical prostatectomy. Registration accuracy was assessed using volume overlap (Dice coefficient, DC) and landmark distances.

Results The DC was 0.94 for the whole prostate, 0.63 for the peripheral zone and 0.77 for the remaining gland. The landmark distances were on average 5.4 mm.

Conclusion The volume overlap for the whole prostate and remaining gland, as well as the landmark distances indicate good registration accuracy for the proposed method, and shows that it can be highly useful for registering clinical available MRI and WM sections of the prostate.

Keywords: Image registration, MR imaging, Prostate cancer, Whole-mount sections

1. Introduction

Magnetic Resonance Imaging (MRI) is used increasingly for detection, characterization and staging of prostate cancer (PCa) [1, 2, 3, 4]. Histopathology is regarded as the ground

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