

Model-based Segmentation of the Prostate using CNN-based Boundary Detection

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1 Introduction

Model-based segmentation (MBS) [1] has been very successful for the segmentation of anatomical structures in medical images (e.g., segmentation of the left heart ventricular and whole heart segmentation) due to its ability to incorporate prior knowledge about the organ shape into the segmentation method. This allows for robust and accurate segmentation, even when the detection of organ boundaries is incomplete. However, MBS approaches typically use rather simple features for detecting organ boundaries such as strong gradients and a set of additional constraints [3], which are often tuned for a specific acquisition protocol. In this paper, we propose solving the boundary detection problem using a deep learning approach, where a neural network is trained to predict the organ boundary. The boundary detection network can be trained on a variety of images that were acquired with different acquisition protocols in order to learn a boundary detector that is more robust with respect to the types of images than previously used boundary detectors.

2 Planned Experiments

We are planning to evaluate our new approach on the task of prostate segmentation in T2-weighted MR images as provided by the Prostate MR Image Segmentation 2012 (PROMISE12) challenge¹ [2]. The data provided by the challenges shows a large variability in image characteristics such as contrast, noise level and bias fields due to the use of different acquisition protocols (e.g., with and without endorectal coil) and the use of different MR scanners, which makes it a suitable dataset for showing the robustness of the proposed boundary detection method towards varying acquisition protocols.

¹<https://promise12.grand-challenge.org/>

References

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