

AbstractID: 9087 Title: Implementation and evaluation of fully automatic segmentation of pelvic structures for RT planning

Purpose: Delineation of target structures and organs at risk is still a very tedious and one of the most time consuming steps during RT planning. We present a system which fully automatically delineates prostate, bladder, rectum and the femoral heads from Computed Tomography (CT) data for RT planning of prostate patients.

Method and Materials: After acquisition of a new planning CT the data gets automatically processed. First bladder and prostate center, two points delimiting the rectum part to be segmented and the tips of the femoral heads are detected automatically using landmark detection based on boosting algorithms. Detectors were trained on 82 datasets. Starting from the detected center points statistical shape models are fit onto the prostate and the bladder and the rectum is segmentation afterwards. Finally mean surface models of the femoral heads are fitted into the dataset starting from the detected tip positions.

Results: Processing time on a standard PC is below 2 minutes. We evaluated the landmark detection on 18 test cases which were not included in the detector training data and compared the results to the shape model segmentation with seeds placed by an expert. Qualitative and quantitative results show high stability of the landmark detection. In cases of very small bladder volumes detection of the bladder center becomes instable. Furthermore we observed decreasing accuracy in datasets with a slice thickness of 5 mm.

Segmentation accuracy itself strongly depends on the quality of image data. We observed instability for patients with prosthesis or prostate catheters.

Conclusion: Fully automatic segmentation of pelvic RT planning cases is feasible and can be used to generate initial organ segmentations. The automatic seed detection furthermore reduces inter-observer variability and improves stability and reproducibility of segmentation results.

Conflict of Interest: -