AbstractID: 9248 Title: Improvements for fully automatic lung segmentation from RT planning scans

Purpose: Segmentation of pulmonary X-ray computed tomography (CT) images is a primordial step to most pulmonary image analysis applications. Many approaches have been presented in the past mainly focusing on lung extraction from high resolution CT data. Looking towards RT planning one has often to deal with low image quality, artifacts and pathological changes of the anatomy. We present a fully automatic method for delineation of the lungs and the trachea in three-dimensional RT planning scans for thorax and breast patients.

Method and Materials: The method consists of several steps. First, lung region is extracted automatically computing an optimal threshold method. Then, the trachea is separated from the lungs by fast marching. Next left and right lungs are separated in each slice by computing a minimal path in the area where separation is suspected from the information of the neighboring slices. Finally the 3D segmentations of the left and right lungs are refined running the random walker algorithm with foreground and background seeds automatically calculated from the intensity-based pre-segmentation.

Results: Processing time is below one minute and does not require any user input. Several 3D CT Datasets from different patients were used to evaluate the methods. The algorithms can segment the trachea and separate the left and right lung. In comparison to previous publications stability could be improved. Still in some cases result are not satisfying, e.g. trachea segmentation reaches into the lungs and lesions or emphysema are not included in the lung segmentations.

Conclusion: The presented algorithm allows for fully automatic lung segmentation. One major improvement could be to employ a shape model as recently published by other groups as a shape-constrained segmentation method could help to overcome the observed problems with exclusion of pathologies.