

AbstractID: 5571 Title: Evaluation of segmenting anatomical sub-regions for deformable registration of patient lung 4DCT

Purpose: To evaluate the advantages of segmenting the moving and less-moving tissues for deformable registration of lung 4DCT data.

Method and Materials: Deformable registration based on B-spline optimization is used to register lung 4DCT data from end-inhalation to end-exhalation phase. The moving tissues (lungs, mediastinum, and abdomen) and less-moving tissues (the rest) are segmented at each respiratory phase. Deformable registration between phases was conducted in two different ways and compared. The first method registers the entire CT volume at once. The other method registers the moving and less-moving tissues separately, and merges the resultant vector fields together.

Results: The performance of the registration methods with and without segmentation was evaluated on two lung 4DCT data sets. The deformation vector field near the chest wall as generated by the registration with segmentation demonstrates a discontinuity of deformation along the plural interface. Quantitative analysis shows that the vector fields produced by the two methods are comparable in most of the areas, but have significant differences along the plural interface.

Conclusion: Our experiments suggest that registering the anatomical sub-regions separately allows the registration to properly account for motion discontinuity along the plural interface. While the two methods produce similar overall warping, the segmentation will generate a more realistic registration in the vicinity of the plural interface.

Conflict of Interest: research was supported in part by Varian Medical Systems.