AbstractID: 1546 Title: Evaluation of a Deformable Matching Algorithm for Automatic Segmentation of Lung Tumors from Respiratory correlated CT Data

We have examined an automated deformable registration algorithm for localizing lung tumors between CT image sets of the same patient at different respiratory phases acquired using a respiration-correlated CT technique (4D-CT). The algorithm produces a high-dimensional transformation to map voxels between CT data sets at end inspiration (EI) and end expiration (EE) and uses the transformation matrix to generate a model GTV at EI from the physician drawn GTV at EE. The model GTV is then compared with a manually drawn GTV at EI. The accuracy of the deformable algorithm was examined on 5 lung carcinoma patients. Comparison between the model prediction and manual contours at EI was done with an analysis tool that generates 3D surfaces from the contours and produces a 3D surface difference map along different latitude and longitudinal directions. A total of 70 angles were sampled when calculating differences between two GTVs. The analysis over all patients and all angles yields a mean ±SD of -0.4±1.2 mm. The SD increases to 3.3 mm in superior-inferior directions owing to the CT slice thickness of 2.5 mm. This is comparable to the uncertainty in manually drawn contours as determined from an inter-observer study where analysis over four observers and all angles produced a mean ±SD of -0.5±2.0 mm with SD increasing to 4.2 mm. We conclude that the algorithm shows promise for automating tumor definition in respiration-correlated CT data.