AbstractID: 13686 Title: Verification of a Deformable Image Registration Algorithm for Head and Neck Cancer Therapy

Introduction: H&N cancer patients may require frequent CT imaging for re-planning due to significant anatomical changes to improve dosimetric accuracy. A challenging task is manual delineation of target(s) and normal structures on each image sets acquired on different days. The aim of this study was to verify a Small Deformation Inverse Consistent Linear Elastic (SICLE) deformable image registration for its ability to deformably-map contours on H&N image sets by comparing them to physician-drawn contours.

Methods and Materials: Six patients with H&N cancer who had frequent CT imaging were selected. GTVs, parotids, cord and brainstem were physican-drawn on both source and target image sets. Physician-drawn contours on source image set were deformed by the DVFs to produce deformably-mapped contours and dose on target images. Differences between the physician-drawn and deformably-mapped contours were compared using: "Differences in volumes(Vdiff)", "differences in center of mass(COMdiff)", "volume overlap index(VOI)", "3D-perpendicular-distance-maps". To evaluate the clinical usefulness, plans were generated based on the physician-drawn and deformably-mapped contours. Furthermore, the dose from source image was deformed to target images using the DVFs. Plans were compared for their coverage of physician-drawn contours.

Results: While GTV and NodalGTV VOIs ranged from 0.57 to 0.72 and 0.57 to 0.79 respectively, for parotids, brainstem and cord, it varied from 0.42 to 0.82. Up to 1.7cm and 2.9cm discrepancies were observed in esophagus and cord COM in z direction. Visual comparison of physician-drawn and deformably-mapped GTVcontours showed a reasonably well agreement. Dosimetric impact of contour differences was not very significant with <5% differences in PTV D_{95}.

Conclusion: SICLE algorithm can produce high quality contours on subsequent H&N image sets. However, manual modification of deformably-mapped contours may be necessary. Deformably-mapped contours can be used as a QA tool for inspecting manually-drawn contours, in addition to reducing or even eliminating the manual contouring workload.