AbstractID: 9340 Title: Automatic extraction of salient interest points in 3D images for contour propagation in IGRT

Purpose: To efficiently propagate patient contours to multi-fraction Cone-Beam CT volumes. **Method and Materials:** An auto-segmentation scheme was developed which uses anchor points to propagate structure delineations from one image to another, accounting for the changing patient anatomy. Four patients involved in 35- or 40-fraction Head-and-Neck treatment schemes were selected retrospectively. The 8-12 Organ-at-Risk contours drawn in their initial planning CT included spinal cord, brainstem, optic structures, and parotids, to be propagated to the CBCT image acquired at each fraction.
Our method involves three steps: a) Generate a *patient-specific compressed model* in terms of *salient points* from the planning CT image. The automatic extraction of these uses a developed 3-dimensional extension of the SIFT algorithm; b) Retrieve this model in every CBCT dataset, via automatic block-matching maximizing the local correlation between neighborhoods around the interest points; c) Propagate the original contours based on the thin-plate-spline warping transformation derived from salient point pairs. **Results:** For each patient, over 500 salient points were extracted in 5-7 minutes, and subsequently retrieved within 45 seconds in every CBCT image, into which the 8-12 contours were propagated in 10 seconds. The results show clear improvement, compared to contours obtained by both a mere copy and voxel-based rigid registration; the typical neck shrinking and spine flexions especially are followed. Our method is more robust and computationally affordable than voxel-based deformable image registration. **Conclusion:** The contours can be successfully propagated to all fractions based on significant salient anchor points extracted to summarize one patient's gray-level information and geometry. The thus highlighted deformations of the critical structures i) can help determine a safe dose map and be reflected in Planning organ at Risk Volume (PRV) margins, ii) may be used to support time-efficient re-planning in adaptive radiotherapy. **Conflict of Interest:** This research is partially supported by Philips Healthcare.