AbstractID: 11595 Title: Automatic Image and Contour Warping Based on 3D Salient Points for Assessing the Need for Replanning in IGRT

Purpose: To help assess the need for RT replanning by automatically warping the CT image and patient contours from planning onto the current fraction Cone-Beam CT image. **Method and Materials:** A non-rigid auto-registration scheme has been developed which uses anchor interest points in images. It involves four steps: a) Extract a patient-specific compressed model in terms of multiscale distinctive salient points from the planning CT image, using a 3D SIFT detector adapted for both bony and soft tissue features; b) Retrieve these points in the current CBCT image, via multiscale template-matching maximizing local correlation; c) Derive a thin-plate-spline non-rigid transformation from point pairs; d) Warp the CT image and/or ROIs therein onto the CBCT image. The auto-warped CT gray-value densities are then useful as surrogate density attenuation parameters to update the dose map according to the treatment beams planned; along with the auto-warped delineations, this leads to up-to-date DVHs, helping decisions. Four patients showing significant changes through 35-fraction head-and-neck treatments were selected retrospectively, with their planning ROIs and several recontoured critical/node structures in the mid-treatment CBCT. **Results:** For each patient, over 1000 truly salient points were extracted and retrieved within 2 minutes; the corresponding registration map was computed and applied within five minutes. Unlike rigid alignment, the warped image and contours clearly adapt to the deformed anatomy highlighted by the mid-treatment CBCT, typically neck shrinking, node shifting, and spine flexions. This reveals e.g. that a gross node coverage planned at mean dose 2.1Gy/fraction can decrease to less than 1.8Gy/fraction at fraction 35. **Conclusion:** Image and ROI warping based on salient points is feasible, and recommendable for updated dosimetry checks. In replanning events, the delineations warped to a newly acquired CT may provide a starting point to support time-efficient re-contouring. **Conflict of Interest:** Research sponsored in part by Philips Healthcare corporation.