AbstractID: 7392 Title: Auto-Recontouring of CBCT images for Adaptive Therapy

Purpose: Organ delineation on CBCT is an indispensable step in using CBCT data to adaptively modify treatment plan online or offline. With the goal of automating the process, we develop a method to map the existing contours from a patient's treatment plan to his/her CBCT images.

Methods: Two head-and-neck and two prostate patients were selected. For each case, 3~5 on-treatment CBCTs were acquired during the course of radiotherapy. The organs were manually segmented on the planning CT for treatment planning. A narrow shell of width ~1cm was created to encompass the contour surface. The shell captures the image features of the neighborhood of the contours and acts as a "signature" of the surface in searching for its best correspondence in CBCT. Deformation of the shell is permissible and is modeled by a spline algorithm. The shell was first mapped rigidly from CT to CBCT, followed by an adjustment of shell shape to adapt any anatomy change. The influence of CBCT reconstruction artifacts on the accuracy and reliability of the proposed algorithm was also studied.

Results: Despite that CBCT is noisier and often contains reconstruction artifacts, contour mapping calculations for a total of 16 sets CBCTs showed no single failure, as judged by an inaccuracy anywhere on the boundary larger than 3mm**.** For the head-and-neck patients, high fidelity mapping is achievable with a rigid mapping of the shells. Other than the femoral heads, deformable adjustments of the contours after rigid mapping are found to be necessary for the prostate cases. Noteworthy, the algorithm performs well even in the presence of an unusually large shape change of the bladder in one of the treatment sessions.

Conclusions: A contour mapping technique has been developed for CBCT image segmentation. The method provides a useful tool for future adaptive radiation therapy.