

AbstractID: 11583 Title: Improvement of patient setups with cone beam CT using contour-assisted matching in radiotherapy

Purpose: To improve consistency and efficiency of patient setups in image-guided radiotherapy using contour-assisted image matching. **Method and Materials:** It is onerous to evaluate accuracy of image registration in the Elekta kV cone beam CT (CBCT)-based patient setups due to lack of quantitative measures. A technique of automatic contour detection of bone and cavity structures was developed in the Philips Pinnacle³ system. Contours of the structures with 2 mm (bone) to 3 mm (trachea and prostate seeds) expansion in each 3-D direction were employed to evaluate image registration between planning CT and CBCT for patient setup correction. In the contour-assisted matching, the image registration was performed such that all bony and cavity structures of CBCT images were confined within contours of their structures with 2 mm and 3 mm expansion (3.4 mm and 5.1 mm in 3-D) from the planning CT. 5 prostate, 3 head and neck, and 1 lung patients were selected for this study. Efficacy and efficiency of the contour-assisted image registration was examined in terms of setup evaluation time and inter-user variations in actual clinical environment. **Results:** The automatic contour detection of bone and cavity structures required additional 10 minutes during treatment planning, which was reasonably acceptable compared to the whole planning time. Initial setup verification by physicians with the contour-assisted matching took generally no more than 5 minutes in actual clinical situations. Inter-user variations were 1.1 ± 0.4 mm and 2.8 ± 1.0 mm for prostate and H&N cases, respectively. The expanded contours also provided a great quantitative tool to evaluate the registration accuracy with maximum 3.4 mm (2 mm expansion) and 5.1 mm (3 mm expansion) uncertainty in 3D space. **Conclusion:** The contour-assisted image registration has high potential to improve efficiency of setup verification and reduce inter-user variations of patient setup in image-guided radiotherapy.