

AbstractID: 14157 Title: Automatic contour propagation between planning Computed Tomography (CT) and Cone Beam CT (CBCT) scan for in-room adaptive planning: a feasibility study on nasopharyngeal cancer patients

Purpose: The purpose of this study is to demonstrate the substantial equivalence of deformable registered planning CT images and propagated planning contours on CBCT dataset with replanning volume CT and manually adapted structures of interests.

Method and Materials: The study includes two nasopharyngeal cancer patients, imaged with a helical mode CT scan before starting the therapy (CTsim). The patient also underwent CBCT scans on a Varian On-Board Imager (OBI) after 40Gy dose delivery and a replanning CT scan (CTrepl). We performed a B-Spline intensity based deformable registration between CTsim and CBCT with the in-house software Plastimatch. The output deformation field was used to propagate the structures of interest on the CBCT volume. A rigid registration between CTrepl and CBCT was also necessary to obtain surrogate contours for the CBCT volume. The registered images were evaluated in terms of increment of Mutual Information(MI) and of mean overlap between the propagated structures by means of Dice coefficient (DSC).

Results: The MI shared by the warped CTsim and CBCT in comparison with the MI shared by CTsim and CBCT before registration showed an increment of 35% and 33% for patient 1 and 2 respectively, quantitatively assessing the goodness of deformable registration as supposed after visual inspection. The rigid registration outputs showed residual anatomical discrepancies between the CTrepl and CBCT volumes. DSC value were well above 0.80 for all the structures of interests but right eye for patient 1, while difference in contouring, poor rigid registration and/or different image quality caused the DSC to be lower in most structures for patient 2.

Conclusion: The developed algorithm is able to propagate contours to a CBCT dataset acquired either before or after a CTrepl. This method represents the first step towards a full in-room adaptation of a previously calculated plan.