

AbstractID: 13947 Title: Automatic Region-of-Interest Delineation of Cone-Beam CT Images for Adapting Treatment and Assessing Response in Head-and-Neck Cancer

Purpose:

As the use of image guided therapy becomes more common, cone-beam CT images taken during treatment are now often available. These images can potentially be used for on-line adaptive radiation therapy if automatic ROI delineation can be implemented. We have developed an automatic region-of-interest delineation method based on deformable image registration of cone-beam CT images for adaptive treatment and assessing response in head-and-neck cancer.

Method and Materials:

Six head-and-neck cancer patients were initially imaged with conventional CT and daily/weekly CBCT during 5-7 week treatment period. Contours of regions-of-interest on the CT images obtained from a commercial planning system was used as atlas and mapped onto the reference daily/weekly CBCT images via deformable image registration. The deformable image registration is based on Thirion's 'demons' method and was implemented with multiple resolution strategy. For each of six patients, three daily/weekly CBCT images were delineated by this method. Manually drawn contours on the CBCT images were used as reference to evaluate the performance of this automatic delineation method.

Results:

Examination of the difference image between the reference CBCT image and the registered CT image validated the feasibility of the deformable image registration method. For the 18 CBCT images collected from 6 patients, the overlap index (defined as the ratio of $A \cap B / A \cup B$, where A represents automatically delineated GTV volume and B represents manually drawn GTV volume) has a mean value of 0.303 with standard deviation of 0.086. For the left neck nodes, the overlapping index has a mean value of 0.163 with standard deviation of 0.1133. For the right neck nodes, the overlapping index has a mean value of 0.105 with standard deviation of 0.09.

Conclusion:

Automatic atlas based ROI delineation was demonstrated as a promising tool for on-line adaptive treatment of head and neck patients using daily/weekly cone-beam CT images.