

AbstractID: 10832 Title: 4D IMRT planning using a direct aperture morphing method

Purpose: To propose a 4D IMRT planning method that accounts for both rigid and non-rigid respiration related target motion based on the 4DCT datasets.

Methods and Materials: The set of MLC aperture sequences optimized on a reference phase of 4DCT is morphed to the rest of the phases according to the anatomical changes of the target projection in the beam's eye view (BEV) at each beam angle, and thus ensured the continuity of the MLC aperture between adjacent phases. This method does not need complex computation or couch motion, only simple geometric relationship of target projection between different phases are employed. Three different planning schemes were evaluated. 1) Individually optimize each breathing phase should theoretically generate the best dose distributions, although such plans cannot be delivered because the apertures in different plans are not connected geometrically. This scheme is used as a benchmark of plan quality for the other schemes. 2) Optimize treatment for a reference phase and shift the optimized apertures to other phases based on a rigid-body image registration. 3) The proposed scheme of optimizing treatment for a reference phase and deforming the optimized apertures to other phases based on the deformation and translation of target contours.

Results: Direct aperture morphing method (scheme 3) illustrated comparable plan quality compared to scheme1; and demonstrated the improved target coverage and conformity compared to the scheme2 that only considers the rigid motion and comparable dose in normal tissue.

Conclusion: Direct aperture morphing method can be used for 4D IMRT planning and it has equal or better plan quality compared to the method that only considers the rigid body motion.