AbstractID: 1573 Title: Motion-Encoded Dose Calculation Through Fluence / Sinogram Modification

Radiotherapy treatment planning systems rely on a static CT image for planning and evaluation. The intra /inter-fraction patient motions may result in significant differences between the planned and the delivered dose.

We present a method to incorporate *a priori* knowledge of patient motion directly into dose calculation. By decomposing the motion as parallel (to beam direction) component and perpendicular (to beam direction) component, we show that motion effects can be accounted for by simply modifying the fluence map (sinogram). After such modification, dose calculation is the same as those based on a static planning image. This method is superior to the well-published "Dose-Convolution" method because it does not based on "shift invariant" assumption. Therefore, it can deal with material heterogeneity and surface curvature very well, as demonstrated by the extensive tests.

Treatment planning system that based on "motion-encoded dose calculation" does not require a PTV to be specified, since it already accounts for the intra / inter-fraction motion variations and it automatically optimizes the cumulative dose rather than the single fraction static dose. In addition, if the motion is predictable, then the resulting plan based on "motion-encoded dose calculation" can be more accurately delivere the dose to the target while avoiding the sensitive structure. In both situations, neither extra optimization strategy nor extra optimization time is needed.