

AbstractID: 13706 Title: Deconvolution approach to robust fluence in intensity modulated radiation therapy

Purpose: To develop a deconvolution algorithm to obtain the robust fluence for external beam radiation treatment under geometrical uncertainties and to demonstrate the feasibility of this deconvolution approach for clinical robust IMRT planning. **Method and Materials:** Usually, the geometrical uncertainty is incorporated in the dose optimization process for inverse treatment planning to determine the fluence which is robust to the geometrical uncertainty. Most of these approaches rely on the dose-convolution which is subject to the error caused by patient surface curvature and internal inhomogeneity. In this work, based on a 1D deconvolution algorithm developed by Ulmer and Kaissl, a fluence-deconvolution approach was developed to obtain the robust fluence through the deconvolution of the nominal static one given by any treatment planning system. It incorporates the geometrical uncertainty outside the dose optimization procedure. **Results:** Robust fluences were calculated for a 4×4 cm flat field, a prostate IMRT and a head & neck IMRT plan in a commercial treatment planning system. The corresponding doses were simulated for 30 fractions with random Gaussian distribution of the iso-centers showing good agreement with the nominal static doses. **Conclusion:** The clinical applicable robust IMRT fluence can be obtained through this deconvolution approach. Because it is separated from the dose optimization procedure, the advantages of this approach are 1) the error of dose-convolution is avoid; 2) it is more flexible and easier to be integrated into different existing treatment planning systems to obtain robust fluence.