Abstract ID: 15662 Title: Accurate patient dose reconstruction from on-treatment EPID images

Purpose: This work presents an iterative algorithm that reconstructs delivered patient dose from the planning CT/CBCT and portal images obtained during treatment. This approach provides a mechanism for fully three-dimensional in vivo patient dose verification. The strength of this dose reconstruction technique is that the patient doses are reconstructed with delivered beam fluences measured during patient treatment.

Methods: Using an initial estimate of fluence upstream of the patient, a prediction model is used to predict fluences at the plane of the EPID, which are then converted to dose using EPID dose deposition kernels. The predicted dose is compared to the actual measured dose and a correction to the initial fluence estimate is applied. After convergence, a convolution/superposition algorithm is then employed to determine patient dose from the converged estimate of upstream fluence. An especially unique feature of this algorithm is the general physics-based model used to accurately predict portal dose images over a variety of treatment conditions.

Results: The method is demonstrated for a seven beam IMRT step-and-shoot prostate cancer treatment. The results of the patient dose reconstruction were compared to the patient dose obtained from a Pinnacle treatment planning system. Gamma comparison between the two dose distributions indicates 99.2% of voxels satisfying gamma<1 within the PTV, and 87.9% within the CT patient volume.

Conclusions: Preliminary results indicate that the patient dose reconstruction model is successful in predicting dose to the PTV region. We are working to improve agreement for lower dose regions. With further improvements, this technique may become a routine tool for in-vivo patient dose verification.

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