

AbstractID: 5767 Title: A method of online MLC aperture adjustment for treatment of patients with set up variations

Purpose: To investigate MLC aperture adjustments to compensate patient setup variations, replacing couch shift methods for precision treatment delivery.

Method and Materials: Patient setup variations can be described by 3-D translational shifts. A scheme of adjusting MLC apertures to compensate for translational displacements of the patient has been developed. Patient shift information, such as provided by commercial image matching software, establishes the aperture shift vector. The projection of this vector into and orthogonal to the BEV plane was used to determine the displacement vector and divergence for the aperture. Modified beam apertures were generated and MLC leaf positions were determined through a polynomial interpolation.

Dosimetric plan comparisons were made within Pinnacle 7.6c. Static field and segmented IMRT patient plans were investigated for pelvic as well as head and neck sites. Arbitrary shift vectors ranging from 3 mm up to 30 mm have been investigated. Non-integral MLC leaf width shifts parallel to the leaf bank face to characterize leaf width effects.

Results: Conformal plans show dose variations from the original plan of up to 3% in the pelvis for shifts of up to 30 mm. Dose coverage of the PTV was maintained except in the superior-inferior direction, where coverage in the last 3 mm of target fell as low as 92% of the prescribed dose. Results for prostate and oropharynx IMRT plans showed little increase in maximum critical structure doses, and small increases in mean doses. DVH's for IMRT plans confirmed minimal impact on critical structure doses.

Conclusion: An alternative method of on-line adaptive treatment delivery has been explored which eliminates the need to adjust the patient position. This can potentially increase treatment accuracy and efficiency through minimizing patient disturbances and reducing the time between imaging and treatment.