A Modified Clarkson Integration (MCI) for IMRT

A typical IMRT fluence map resembles a mosaic. We propose a simple and accurate dose calculation algorithm that can be used to determine dose for a given non-uniform fluence map. Briefly, we first exploit the rotational symmetry of scattered dose. We than introduce a variation of the Clarkson integration in which scatter contribution is summed over annular sectors, instead of over the traditional pie sectors. Because of its simplicity, the algorithm can be implemented on a desktop computer.

Method:
A code using MCI was written to calculate doses from an IMRT fluence. As a test of the algorithm, CORVUS IMRT plans were generated for five cases. Doses to target volumes calculated with the MCI algorithm was compared with doses calculated by CORVUS, which uses 1cmx1cm pencil beam model. As an approximation skin contour variations and inhomogeneities were neglected. The code reads in MLC sequence files and utilizes beam data (TPR, Sc, and Sp). To calculate a dose to a point, the code requires user input information for a depth in tissue, SSD, and photon jaw sizes.

Result:
The doses calculated with the algorithm agreed within +/- 3% with the doses calculated with a pencil beam model. We discuss improvements of the MCI algorithm for off axis and skin contour variations..