

**AbstractID: 1115 Title: A new MLC segmentation algorithm for step-and-shoot IMRT without tongue-and-groove error**

A new MLC segmentation algorithm, denoted by SLSNOTG (Static Leaf Sequencing with NO Tongue-and-Groove error), for step-and-shoot IMRT delivery is presented. SLSNOTG aims to shorten the treatment times of IMRT plans by minimizing their numbers of segments. The input to SLSNOTG is the intensity maps produced by current planning systems, and its output is (modified) optimized leaf sequences without tongue-and-groove error. SLSNOTG is based on graph algorithms in computer science. It formulates the segmentation as a mathematical problem of computing a weighted minimum-cost path in a directed graph, such that the weight of the path specifies the number of segments, and the cost of the path indicates the associated amount of tongue-and-groove error. The input intensity map is modeled by the directed graph through solving a set of minimum-cost flow problems.

Our comparisons of SLSNOTG with CORVUS indicated that for the same intensity maps, the numbers of segments computed by SLSNOTG are up to 50% less than those by CORVUS 5.0 on the Elekta LINAC system. Our Monte Carlo simulations showed that the dose distributions of the SLSNOTG plans match those of the corresponding CORVUS plans and confirmed the correctness of SLSNOTG. Comparing with existing segmentation methods, SLSNOTG has two additional advantages:

- (1) SLSNOTG can compute leaf sequences whose tongue-and-groove error is minimized subject to a constraint on the maximum allowed number of segments.
- (2) SLSNOTG can be used to minimize a more general type of error called the tongue-or-groove error.