AbstractID: 9223 Title: Optimal Field Splitting in IMRT

Introduction Today one of the most advanced tools for delivering intensity maps in IMRT is the multileaf collimator (MLC), which is subject to a *maximum leaf spread*. Due to this constraint, a large field needs to be split into several sub-fields each being delivered separately. Different from previous approaches in which the size of the sub-fields is fixed, our method produces sub-fields of flexible sizes subject to the maximum leaf spread constraint, which may potentially improve the delivery efficiency. In this work, we propose to optimally split an intensity map into sub-fields while minimizing the total complexity of the sub-fields.

Method and Material The optimal field splitting problem is solved efficiently by using dynamic programming with an observation that the problem expresses the optimal substructure. To evaluate the performance of our method, we implemented our algorithm and experimented on 2000 randomly generated intensity maps with various field sizes and maximum intensity levels, and 21 sets of clinical intensity maps obtained from the Department of Radiation Oncology of the University of Iowa. Our results are compared with theoretical optimal lower bounds and those from the Pinnacle system.

Results Phantom experiment results showed that for all tested cases with various field sizes and intensity levels, our method yielded results close to the optimal bounds. For the clinical data, out of 21 intensity maps, both our method and Pinnacle system got optimal results in 14. For the 7 with room for improvement, our method outperformed Pinnacle in 3 cases and equally performed on the remaining 4 cases.

Conclusion We developed an optimal field splitting method literally with no constraint on the sub-fields, which is proved to outperform current commercial software.