AbstractID: 1437 Title: Evaluation of simultaneous Non-linear/linear feasibility algorithms for beamlet-based inverse optimization

Simultaneous projection algorithms for feasibility inequalities have been implemented in solving inverse planning problems (e.g. Cimmino's algorithm, CIM). Beamlet-based IMRT inverse optimization problems require computations with large datasets. One advantage of using simultaneous projection algorithms for solving these inverse problems is the reduced computational time with parallel computing technology. CIM algorithm is also found to arrive at least-square smooth solutions. Smoothness of intensity patterns affects delivery efficiency. A recent implementation of dose-volume-histogram objectives for the algorithm (CIM-DVH) adds additional flexibility in definition of dose objectives for tumor coverage and critical structure sparing. This study evaluates using these algorithms to solve clinical beamlet-based inverse problems for comparison against a commercial inverse planning system (CORVUS). Included in the evaluation are plan quality, computation time, intensity pattern smoothness, number of monitor units, and segments. For the cases studied, all systems generated quality inverse plans that meet all the prescribed dose objectives. The optimization time taken for solving the same clinical problems ranges from a few minutes for the commercial system (CORVUS), around 1 minute for CIM to 13 seconds for CIM-DVH on comparable computer hardware. It is shown that using these projection algorithms allows us to arrive at smoother intensity patterns. Including non-linear terms in CIM-DVH does not seem to compromise this property. The required segments and monitor units are much lower (approximately one-third) with algorithms CIM and CIM-DVH as compared with those from the commercial system. CIM and CIM-DVH are suitable algorithms for solving large scale beamlet-based inverse problems.