AbstractID: 7751 Title: A systematic approach to practical multi-criteria IMRT planning

Purpose: To describe and demonstrate a new practical multi-objective
treatment planning procedure for intensity modulated radiation therapy
(IMRT) planning. The approach developed addresses the question of how
to generate a useful database of Pareto optimal treatment plans without
time consuming human iterations.

Method and Materials: The creation of a database of Pareto optimal
treatment plans proceeds in two steps. The first step solves an
optimization problem which finds a single treatment plan which is
close to a set of clinical aspirations. The results of this step are
then used to determine mutually satisfiable hard constraints for the
subsequent generation of the plan database. Healthy structures are
modeled with piecewise linear approximations of EUDs, and targets are
modeled with a linear underdose penalty term. Optimizations are done
using linear programming.

Results: The method is successfully applied to a variety of clinical
cases, including a brain, prostate, and lung case. It is shown that
the databases generated are both diverse and filled with predominantly
clinically interesting plans.

Conclusion: The proposed method brings Pareto surface-based multicriteria
IMRT planning closer to clinical usability. With this method, we begin to
fulfill the aims of multicriteria IMRT planning: reduce the human-iteration
time common in IMRT treatment planning and make the trade-offs involved in
treatment planning explicitly known.