

Many different optimization methods have been described in the intensity modulated radiation therapy treatment planning (IMRTP) literature. Using that literature to draw conclusions about the relative merits of the approaches, however, is usually not possible, primarily due to two related problems: (A) patient datasets (images, anatomical structures, dose calculation algorithms) are used which are typically unique to that research group, and (B) other researchers have no after-the-fact convenient access either to the patient datasets or to detailed solution information (beam weights, dose distributions). Even if (A) and (B) were not problems, there is the additional problem (C) of choosing patient datasets which reliably demonstrate the effects of interest (requiring patient datasets which may need to be different in subtle ways). Based on the work of the Operations Research Applications in Radiation Therapy Collaborative Working Group (funded by the NCI and NSF), and our research treatment planning system (Computational Environment for Radiotherapy Research) we at least partially address problems (A), (B), and (C). CERR (based on Matlab) and the ORART Toolbox provide: (i) construction of shared, expert-reviewed, IMRTP datasets (CT scans, structure definitions, prescriptions), (ii) routines for generating common dosimetric data (beamlets, including scatter), which can then serve as the basis for fair comparisons of the efficacy of user-defined optimization engines, and (iii) a common framework for storing, reviewing, sharing, and comparing optimized dose distributions combined with the planning data. CERR and the ORART Toolbox are cross-platform, open-source, and freely available for non-clinical and non-commercial use (see <http://deasylab.info>). The use of standardized test input datasets has served a crucial role in many areas of optimization research. We believe such standardized datasets, which admittedly cannot be applied to every IMRTP issue, can nevertheless enable truly scientific comparisons of the efficacy of different approaches to IMRT plan optimization research.

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