AbstractID: 3514 Title: Software tools for 4-D and adaptive treatment planning data visualization and manipulation (CERR version 3)

Purpose: Open-source tools are needed to facilitate the use of multiple imaging datasets for adaptive and 4-D treatment planning. Commercial systems do not yet provide effective solutions for reviewing, manipulating, and comparing multiple scan datasets taken at different times of with different imaging modalities. Our research treatment planning system, CERR ("computational environment for radiotherapy research," pronounced 'sir'), provides a convenient and powerful basis for constructing adaptive and 4-D treatment planning tools.

Method: The flexible Matlab-based system CERR was modified and extended. A fast algorithm for image registration was developed and integrated with CERR.

Results: We have added support in CERR for: (1) multiple patient image sets, which can be combinations of CT, MRI, or PET scans, and corresponding anatomical structure datasets, (2) rapid image registration (by hand as well as by using an automated method), (3) visualization tools appropriate to review anatomic structure changes with different scan sets, and (4) linked-storage of multiple scan sets, eliminating memory limitations. In addition, many smaller features have been added to CERR, such as interactive profile plots of dose and/or image values. This version of CERR also provides support for IMRT treatment planning simulations. Local data storage in a sub-directory or network scan data storage we integrated. Flexible reporting tools allow for structures defined on one dataset to be combined with dose distributions computed for another scan, and resulting dose-volume-histograms can be easily derived. The latest release can be downloaded from radium.wustl.edu/cerr.

Conclusions: CERR version 3 provides foundational tools for research in adaptive and 4-D treatment planning. This framework provides a powerful basis for experimenting with deformable imaging methods, as well as other adaptive radiotherapy challenges, such as re-optimization research.