AbstractID: 11090 Title: Improvements to the Histogram Analysis in Radiation Therapy Open-Source Software System

Purpose:
The histogram analysis in radiation therapy (HART) software has been widely used for the research in intensity modulation radiation therapy (IMRT) treatments in cancer. The common application of HART is the precise and efficient dose volume histogram (DVH) analysis of structures in IMRT plans as presented earlier (Med Phys.35(6), p.2812 (2008)). The tool has been further developed with additional features, such as multi-dimensional dose histogram (MDH) computational module, dose response modeling (DRM) and plan-specific outcome analysis (POA) features.

Methods and Materials:
Matlab based codes were designed to read RTOG data formats exported from the Pinnacle^3 treatment planning system (TPS; Philips Healthcare, Best, Netherlands), and to write into a simpler HART format. HART computes the MDH differential data utilizing the information on the raw dose values and the co-ordinates of the primary dose grids for a given structure in the TPS. The DRM utilizes the polynomial models for cumulative DVH in order to simulate the optimal dose response models for structures. The POA feature can also be used for evaluations of IMRT plans using various biological modeling. DVH analysis results extracted by HART, can also be exported into customizable output formats.

Results:
HART offers MDH computational capability, DRM simulations, a simpler POA feature, and the DVH analysis module for IMRT plans. MDH computations and DRM simulations for an IMRT plan were accomplished relatively in 15-30 minutes with the clock speed of 1.8 GHz and 2 GB RAM support. The MDH and DVH analysis results were validated with the Pinnacle^3 data.

Conclusions:
Several applications have been incorporated into a simpler, user-friendly, and automated software package (HART). We have also implemented an open-source mechanism for various users. We expect to develop HART for various applications in radiotherapy research, and its expansion to other TPSs. This work was partially supported by NIH/NIDCD grant.