AbstractID: 12832 Title: Designing Custom Radiation Therapy Phantoms using Contoured Regions-of-Interest

Purpose: As radiation therapy planning and delivery systems get more complex, the medical physicist must take greater care and be more thorough in the commissioning of the planning/delivery system. The system's performance must be assessed and risks understood over a wide range of clinical parameters such as target volume/shape, patient size/shape/surface, and critical structure arrangement. Currently there are commercially available 3D phantoms and solid water arrangements, but these designs are not especially customizable. This work introduces a very easy way to use contoured regions-of-interest (ROIs) from DICOM RT Structure Sets to make custom phantoms that can be manufactured by a 3rd party milling company.

Materials and Methods: A prototype software system reads DICOM RT Structures and allows the user to select which structure(s) they would like to render and mill as a three-dimensional object. Construction parameters include material and rescale size (to allow solids to be magnified or shrunk vs. the real size in the patient). The system will compute the optimal base plane angle which minimizes any regions on the 3D surface that would be un-millable due to complex concavities or smallness.

Results: Custom phantoms will be exhibited, each made from a patient DICOM RT Structure Set and using various materials (high melting temperature wax, acrylic, other plastics) and in various rescale sizes.

Conclusions: Custom phantoms can be made very accurately to mimic three-dimensional anatomic shapes defined by DICOM RT Structure Sets. Patient external contours can be used to generate a patient-shaped phantom, or internal contours can be used to render solid organs. It is possible to make anatomic surfaces that can be temporarily fixed to commercial 3D dosimetry phantoms.

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