AbstractID: 9692 Title: Applications of High Definition Volume Rendering in Radiotherapy: Investigation of Radiotherapy Treatments Using Accurate Three and Four Dimensional Volume Rendering

Current tools used to construct and analyze radiotherapy treatment plans involves the reduction of a volumetric CT/MRI/PET datasets into a series of 2D planes used by the physician and physicist to define treatment volumes and describe final radiation dose distributions. While convenient for the user, such reduction of what is naturally a highly connected, complex three-dimensional volume, introduces significant loss of relevant anatomic detail, important for the final analysis of any treatment. Through the use of accurate, highly interactive volume rendering of the patient anatomy, target delineation, radiotherapy port selection and final dosimetric analysis can be significantly enhanced. Such appreciation of the true anatomical map underlying the artificial construction of 2D radiotherapy contours improves the clinical understanding of any given treatment plan, and may lead to improved modeling of treatment outcome.

A new, high definition volume rendering engine produced by Fovia, Inc. allows for the creation of accurate three and four dimensional images from dicom data sets. This rendering engine has been adapted for the purposes of radiotherapy treatment planning and analysis, incorporating target volume definition in three and four dimensions, the projection of the planned radiotherapy treatment ports through the volume and fusion of the dose distribution map to the true anatomical rendering.

The inherent four-dimensional capability of this volume rendering engine allows for incorporation of change detection as viewed over the treatment cycle. Further, follow-up scan data may be incorporated to develop long term 3D models for local control, helping to illustrate disease growth patterns associated with observed recurrences. Several case studies including CNS, cardiac and lung treatment sites will serve to further illustrate the advantages of regular use of anatomic volume rendering in radiotherapy.