

## AbstractID: 1079 Title: 3D reconstruction from pilot views for CT based brachytherapy planning

Fully CT-based brachytherapy planning is frequently frustrated by metal artifacts in the reconstructed images caused by the brachytherapy applicators, which cause difficulty in accurate localization of the sources and in the definition of tissue volumes. Biplane radiographs are thus frequently used as a supplement, to reconstruct 3D coordinates of the sources and a small number of dose points, which must then be registered with the CT defined anatomy. We have developed a practical method for reconstruction of such 3D point coordinates directly from the CT localizer images ("pilot views", "scout views", "topograms") routinely acquired as part of the normal scanning process. These views are projection radiographs, but with a peculiar geometry - a linear source, a cylindrical detector and no divergence in the axial direction. They are inherently registered with the 3D CT coordinate system, eliminating a potential source of error. Knowing the source and detector configuration of the CT scanner, simple geometry can be used to solve for the 3D coordinates of a point just as with biplane radiographs. We demonstrate the accuracy of the method by comparing reconstructed coordinates of an array of point objects on the faces of a cube with both the known geometry of the phantom and the 3D coordinates as identified in the volumetric CT scan. Accuracy is limited by the uncertainty in locating the points on the images, and is on the order of 0.5mm. Use of the method with a Fletcher-Suit applicator is also presented.