

AbstractID: 5502 Title: Registering the planning CT to the treatment geometry in IGRT, using a limited reconstructed volume derived from planar images

A set of megavoltage (MV) and kilovoltage (kV) images are obtained during a patient's image-guided radiotherapy treatment (IGRT). The kV images are acquired prior to treating the fields using an on-board x-ray imager. However, The MV images can be acquired both prior and during the actual treatments. Fan-beam reconstruction of back-projected kV images obtained at four or more gantry angles can be used to orient the planning CT to match the treatment geometry.

Registering the planning CT to the treatment geometry is necessary if one is to perform dose reconstruction using the multi-planar images and the planning CT, in the absence of a cone beam CT. The MV and kV images provide the exit fluence information for 3D dose reconstruction. Using these 2D treatment images along with the 3D planning CT volume provides adequate information about the treatment anatomy that is needed for the dose reconstruction process. This system might alleviate the need for cone beam CT for patient positioning and/or dose reconstruction. The planar treatment images provide adequately sampled sinogram planes in the spatial dimension, but not in the radial direction. Nonetheless, there is enough data in the sinogram space for registering the treatment geometry to the planning CT.

Canny edge finding method is used to decipher anatomical structure in the limited reconstructed volume as well as in the CT volume. This technique can detect both strong and weak edges; and it is less likely than the other edge finding techniques to be fooled by noise. The resulting edge maps are registered to each other by affine transformations. The transformation matrices are then applied to the CT volume in order to register it to the treatment geometry.