

AbstractID: 5848 Title: Automatic registration of EPI and DRR images for treatment planning and delivery verification

Purpose: To automatically register electronic portal images (EPIs) and digitally reconstructed radiographs (DRRs) for the verification of treatment planning and delivery based on Average Intensity Projection (AIP) imaging.

Method and Materials:

AIP 4D CT images are obtained by averaging 4D CT images acquired for lung tumors using multi-slice CT simulation. The AIP images are used to represent tumor motion during treatment planning and delivery in extracranial stereotactic radiotherapy (ESRT). Planning DRR images are created for each treatment field. Cine EPIs are collected for each treatment field. The apertures are segmented from EPIs by thresholding, and then used to register the EPIs and the associated DRRs. The segmented EPIs are enhanced to highlight the tumor area. Then enhanced EPIs and DRRs are fused together in the aperture to produce a fusion movie. Cine EPIs are averaged to produce an average EPI. The tumor movement in each EPI is enhanced by subtracting the average EPI from the original Cine EPI. A sequence of tumor movement images is sorted to form a subtraction movie.

Results:

The registration procedure is performed automatically without user supervision. Fusion movies show the target motion against the static background of DRR, providing a visual perception of the moving anatomy around the target. Subtraction movies show clearly the track of the target motion inside the aperture. Periodic displacement of the tumor reflects respiratory movement. The size, deviation, and deformation of the tumor can be observed.

Conclusions:

This technology will benefit the verification of treatment planning and delivery, the evaluation of the patient set up, and the visual inspection of the tumor movement during ESRT.

Conflict of Interest:

Part of this work was funded by Elekta, Inc., Norcross GA.