AbstractID: 1285 Title: Asymmetric margin determination for mobile lung tumors through registration of fluoroscopy and free breathing fast CT scans

Respiratory motion may result in geometric misses and systematic errors in treatment of lung cancer. Our approach is to combine the information from free breathing fluoroscopic movies and a volumetric fast multi-slice CT to obtain the spatial probability distribution of the CTV, and an appropriate margin for tumor motion. AP and lateral fluoroscopic movies of the lung were obtained for 8-10 regular respiratory cycles. The radiation oncologist contoured the CTV on these movies. By combining these contours, a spatial probability distribution of the CTV was obtained. The extremum of this function defines the ITV, a combination of internal target motion plus CTV. Subsequently, the patient was scanned on a fast CT scanner that minimized the image artifacts by acquiring a large image volume over a short time period (16 slices per 0.4 second), i.e., taking a snapshot. AP and lateral DRRs were constructed from the CT. The DRRs were fused to the corresponding fluoroscopic movie by point matching stable landmarks (e.g. spinal cord). The phase where the CT was captured in the breath cycle was obtained given the best correlation of the tumor and diaphragm between the DRR and a specific frame of the fluoroscopic movie. Finally, the tumor spatial probability distribution was projected onto the DRR and an asymmetric 3-D margin around the CTV in the CT snapshot was determined accordingly. The probability distribution of the target can also be used to shape the dose distribution that incorporates tumor motion via IMRT.