AbstractID: 8151 Title: A Technique for Removing Motion Related Image Artifacts in kV Cone-Beam CT from On-Board Imager: 4D-CBCT Implications

Purpose: To correct motion related image artifacts in kV cone-beam CT (CBCT) by tracking a seed marker in cone-beam projections obtained from an on-board imager (OBI).

Material and methods: The motion of metal markers attached to the CATPHAN phantom mounted on a moving platform was measured by tracking the marker positions in kV cone-beam projections. The motion tracking algorithm is based on a normalized cross-correlation algorithm that determines the position of the marker in each projection. The position of the marker was determined from 650 projections (0^o-360^o) acquired for about a minute in a single CBCT scan. The motion cycle of the moving platform was set at 15cycles/min, with 1.75 cm amplitude, in order to mimic respiratory motion. The marker motion track was used to map cone-beam projections to eliminate motion shifts. Pre-processed projections were used to reconstruct CBCT using Feldkamp back-projection. The CATPHAN was used to evaluate image quality parameters such as contrast, position resolution, uniformity and linearity of CBCT reconstructed before and after motion correction.

Results: A new technique was developed and tested to track the motion of seed markers in cone-beam projections acquired in a kV CBCT scan with no additional dose other than that for imaging. We were able to successfully remove motion related image artifacts such as blurring, spatial distortion and improve contrast and position resolution from CBCT reconstructed from motion-corrected projections. Besides motion correction, this technique also allows to extract information about seed marker motion that can be used to correlate internal and external marker motion providing possible usage for beam gating implications.

Conclusion: This technique eliminates motion artifacts in CBCT. Combining 3D volumetric CBCT with motion tracks of one or more markers may provide a method to perform four-dimensional CBCT where anatomical information and dynamic positioning of the tumor can be utilized.