AbstractID: 7709 Title: Reduction of in-plane breathing motion artifacts using optimized-angle sinogram reconstruction

Purpose: Breathing motion mapping utilizes 4-dimensional computed tomography (4DCT) which is typically acquired either in ciné or helical mode. Even with rapid CT scanners, tissues can move across a space of multiple pixels during image acquisition, causing motion artifacts. We are investigating a method to reduce the in-plane motion artifacts using 180º reconstruction with CT gantry angles whose orientation is matched to the tissue motion vectors.

Method and Materials: To model vessels and bronchial branches, CT scans were simulated with small cylindrical targets. The targets were moved at constant velocities during image acquisition and both 360º and 180º filtered back projection reconstructions were employed. The start angles of the 180º reconstructions were varied to examine the effect of the relative orientation between the start gantry angle and the motion vectors. Single and multiple targets were examined, including targets that moved orthogonally.

Results: In all but static cases, 360º reconstruction provided the worst image quality. 180º reconstruction quality depended heavily on the relative orientation of the motion vector and the start CT gantry angle (α). When α was 0º (parallel), the image quality was good and when α was 90º (perpendicular), the image quality suffered. The image quality remained high when α was less than 45º. When multiple non-parallel moving targets were studied, each was imaged well when its motion vector was parallel to the gantry start angle. A single good quality image could be pieced together from multiple image reconstructions created using multiple gantry start angles.

Conclusion: Improving the quality of reconstruction for CT scans acquired during free breathing is possible using tuned gantry start angles even when using multiple patched image datasets. It is possible to compensate for potentially increased statistical noise due to the sub-360º reconstruction by increasing the scanner's mA. This work supported in part by NIHR0196679.