AbstractID: 14154 Title: Reduce Artifacts for Helical 4D CT Image

Purpose Four dimensional CT (4D CT) provides a way to reduce positional uncertainties caused by respiratory motion**.** Due to the inconsistencies of patient breathing, images from different periods may be misaligned and the acquired 3D data may not represent the real anatomy. We propose a method to reduce the artifacts present in helical 4D CT images.

Method and Material 4D-CT data are formed by temporal concatenation of 3D phase-specific datasets, with artifacts occurring between adjacent stacks acquired from successive respiratory periods. Our general approach to removing these artifacts is to find a surface in one stack and computing the corresponding surface in the next stack, then align the two surfaces by deformation. The proposed method includes five steps: (1) Initial non-rigid registration using a B-Spline registration technique; (2) Searching a surface in the first stack with the graph search method; (3) Finding the surface flow in the second stack with the graph cut method; (4) Propagation the flow to the rest of the second stack by solving a Laplace equation; (5) Warping the stacks with linear interpolation to produce the artifact-reduced image.

Ground truth was established and the method tested with five 3D CT image data sets with seven landmarks in each. The results on clinical 4D CT images are compared to commercial software and judged by the medical observers.

Results The landmarks distances errors from ground truth were reduced by 42% from 2.7 mm to 1.5 mm by the proposed method. All observers identified fewer artifacts in the images created with the proposed method.

Conclusion The proposed method provides a way to reduce the magnitude of artifacts directly from the reconstructed images.