

AbstractID: 5774 Title: Motion artifact correction using a novel data consistency condition

Purpose: During diagnostic x-ray CT imaging procedures or image guided radiotherapy, image quality will be degraded if target organs move during the data acquisition. This can be caused by patients' occasional motion or by intrinsic motion like cardiac and respiratory motion. The inconsistency in the projection data is the major reason for the image quality degradation. We present and validate a method to improve the consistency of the projections using a novel Fan-beam Data Consistency Condition (FDCC) such that the image quality can be improved.

Method and Materials: Computer-simulated dynamic phantoms are generated and projection data are acquired from these dynamic phantoms. Using the FDCC, individual projection data from one view of fan-beam projections can be estimated from filtering all the other projection data acquired from different view angles. Then those projections contaminated by motion are re-estimated using the FDCC, resulting in a corrected sinogram. A standard Fan-beam Filtered Back Projection (FBP) reconstruction algorithm is then used to reconstruct images from the corrected sinograms. Motion artifacts can be alleviated using this procedure.

Results: Images are reconstructed from both the original sinogram where projections are contaminated by motion and the corrected sinogram after applying the FDCC. Strong motion artifacts are observed in the images reconstructed from the contaminated sinogram while improvement can be found in the reconstructed images using the corrected sinogram.

Conclusions: A novel method using the new FDCC is proposed to combat the motion artifacts due to the temporal inconsistency in the projection data. Numerical simulations were conducted to demonstrate the potential of this correction scheme to mitigate motion artifacts. Thus, the preliminary numerical results indicate that the FDCC has potential use in combating both cardiac and respiratory motion in CT imaging.