AbstractID: 3093 Title: Linac based kV cone-beam CT for extended field of views: evaluation of an approximate reconstruction strategy

Purpose:
To evaluate an approximate image reconstruction method for a kV-cone-beam CT system with an increased field-of-view (FOV) obtained by an asymmetric detector placement.

Method and Materials:
An approximate reconstruction method for width-truncated projections based on projection weighting was implemented and tested on both synthetic and real CT-projection data. Real data were taken with a 40.96cm x 40.96cm (1024x1024 pixels) flat panel detector, which was shifted by 8.4cm from its central position to achieve an asymmetric detector design corresponding to a detector width of 57.76cm, increasing the theoretical FOV at the isocentre-plane from 28.8cm to 40.7cm. For the tests on real data an anatomical phantom of the abdomen and a spherical contrast phantom with inserts of different densities and differently sized holes were used. With synthetic data created for a cylindrical contrast phantom, the quality of the reconstructed images was examined for larger distances from the central slice and for different detector offsets (8.4cm, 12cm and 16cm), corresponding to FOV sizes of 40.7cm, 45.7cm and 51.4cm.

Results:
For the spherical contrast phantom, the measured absorption coefficients differed on average by 3% from those obtained in the normal cone-beam reconstruction, with a slightly higher standard deviation. The spatial resolution was equally good.
The anatomical phantom showed good results for the internal structures, with the outer contours missing because of detector saturation effects.
For synthetic data, deviations in measured density increased with larger detector offset (from 1.4% to 2.7% in the central slice) and with larger distance from the central slice (up to 3.1% at z = 12.2cm for a 16cm detector offset).

Conclusion:
The investigated method to increase the FOV in cone-beam CT showed promising results both on synthetic and real data. The achievable FOV allows for full-size images even of the extra-cranial region.

Conflict of Interest:
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