

AbstractID: 3607 Title: Coordinate Transformation of kV Cone Beam CT Acquired with Prototype Flat Panel Mobile C-arm for Patient Positioning Applications

Purpose: A prototype mobile C-arm capable of kV cone beam CT has been proposed to evaluate patient setup accuracy. To facilitate this, the location of the C-arm's reconstructed image volume in the treatment room must be known.

Method and Materials: A calibration procedure to make the necessary transformation between image coordinates and room coordinates has been developed using a commercial optical tracking system. Markers are placed on both the C-arm and a calibration phantom. After the initial calibration procedure, only the markers on the C-arm need to be located at the time of image acquisition to make the final transformation. The calibration procedure was evaluated using the optical tracking system and a phantom with attached reflective markers. After imaging, the markers were located in the reconstruction and then transformed into world coordinates. These positions were then compared to the markers location according to the tracking system (assumed true world coordinates). Movements were made to the C-arm, subsequent images acquired, and the analysis was repeated. Calibrations done on different days were also used to analyze the same data set.

Results: The max error of any of the markers after the movements was below 1.4 mm, the mean absolute error below 0.9 mm, and the RMS error below 1.0 mm. The other calibrations had slightly larger errors but no marker out of any of the calibrations had a max error greater than 2.3 mm, a mean absolute error greater than 1.6 mm, or an RMS error greater than 1.6 mm.

Conclusion: The results show that using an optical tracking system can provide an accurate transformation of the reconstructed coordinates of a mobile C-arm into room coordinates.

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