Background subtraction from X-Ray projection images using prior information: a phantom study

Purpose: Kilovoltage image guidance is increasingly available for daily imaging in radiotherapy departments. Improving image quality on the projection of a section of the anatomy can be of interest for some imaging techniques. Our purpose is to investigate a proof-of-principle background subtraction technique that improves contrast resolution in x-ray projection images, by isolating the structures belonging to a selected slice of the anatomy, using prior CT information. **Method and Materials:** we acquired X-ray projection images of a phantom with a CBCT Varian On-Board Imager over a full gantry turn, using a standard CBCT acquisition technique. The CBCT scanner was equipped with antiscatter grid, without a bowtie filter. The dataset was comprised of a reconstructed CBCT image and the set of 2D projections used to reconstruct the CBCT image using the standard FDK algorithm. In the reconstructed CT image we selected sets of slices parallel to the axis of gantry rotation on the CBCT reconstructed images, and obtained a background image by forward projecting the full CBCT image minus the voxels belonging to the selected slice. No denoising was applied to the background image. The background was subtracted from the full projection to give an attenuation map of the selected slices. **Results:** the background-subtracted X-ray projections of selected slices of the Catphan phantom show a higher contrast than the projections of the full phantom. The CNR of the imaged slices improved by a factor of two with respect to the full projection. **Conclusion:** Background-subtracted X-ray projection images could show enhanced low contrast resolution when imaging pre-selected slices of a previously imaged anatomy.

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