AbstractID: 4815 Title: Reducing metal artifacts in Cone-beam CT by tracking and eliminating metal shadows in raw projection data

Purpose: CT streaky artifacts, caused by metallic implants such as fiducial markers or dental fillings, remain a challenge for automatic processing of image data. The effect of these metal artifacts is magnified in cone-beam CT (CBCT) images due to the fact that the soft tissue contrast is usually lower in these images and therefore is more sensitive to the artifacts. The goal of this study is to develop an effective offline processing technique to minimize the effect.

Method and Materials: The geometry calibration cue of the CBCT system was used for tracking the position of the metal implant in the raw projection data. The 3D representation of the metallic object can be established from only two user-selected viewing angles. The position of the shadowed region in any view can be accurately tracked by re-projecting the 3D coordinates of the metal object. Then automatic image segmentation was performed to obtain a binary mask of the shadow at each projection angle. Finally, a Laplacian diffusion filter was used to replace the pixels in the masked region with the boundary pixels. The modified projection data were then sent back to the CBCT reconstruction engine to create a new CBCT image. Varian's Trilogy system was used in this study. The procedure was tested phantoms and patient cases.

Results: It was demonstrated that this procedure can significantly minimize the metal artifacts and at the same time restore soft tissue contrast near the metallic object, even for the more difficult head and neck case with irregularly shaped dental fillings. Soft tissue visibility was improved drastically. Although not designed for on-line applications, the processing time is approximately 1-2 second per projection on an Intel Pentium processor at 2.6GHz.

Conclusion: We have implemented an effective metal artifact suppressing algorithm to improve the quality of CBCT images.