

AbstractID: 2023 Title: Noise simulation in Cone Beam CT (CBCT) imaging with parallel computing

**Objective:** To report on our research efforts in developing techniques to simulate noises in projection images in a parallel computing environment and in using them to investigate the noise properties in cone beam CT imaging.

**Method:** 3-D phantoms were mathematically modeled and used to create analytic projections which were then sampled into digital image data. Noises were simulated and added to the projection image data which were then filtered to simulate detector and focal spot blurring. 3-D images of the phantoms were reconstructed using the Feldkamp algorithm. A PC cluster was used to compute the projection images and filtered backprojections in parallel with each CPU processing 10 projection views for a total of 450 views. Results of the backprojections were transferred to the master node and integrated into the final reconstructed image. Based on this simulation system, simulated CBCT images were generated for various phantoms and technique settings. Images of low contrast objects were generated for perception studies. Noise Power Spectra in projection and reconstructed images of uniform density objects were computed to characterize and study the noise properties.

**Results:** We have developed a noise simulation technique for the parallel computing environment. The technique is capable of generating uncorrelated noisy projection views. It has been demonstrated that noise correlation between different projection views could result in fixed pattern noise in the reconstructed images.

This research work is supported in part by a research grant EB00117 by the National Institute of Biomedical Imaging and Bioengineering.

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