AbstractID: 7312 Title: Three Dimensional Regularized Tomosynthetic Image Restoration

Tomosynthetic image reconstruction allows for the production of a virtually infinite number of slices from a finite number of projection views of a subject. If the reconstructed image volume is viewed in toto, and the three-dimensional (3D) impulse response is accurately known, then it is possible to solve the inverse problem (deconvolution) using canonical image restoration methods (such as Wiener filtering or solution by conjugate gradient least squares iteration) by extension to three dimensions in either the spatial or the frequency domains.

This poster presents modified direct and iterative regularized restoration methods for solving the inverse tomosynthetic imaging problem in 3D. The significant blur artifact that is common to tomosynthetic reconstructions is deconvolved by solving for the entire 3D image at once. The 3D impulse response is computed analytically using a fiducial reference schema as realized in a robust, self-calibrating solution to generalized tomosynthesis.

Twenty-five projections of a radiographic hand phantom were produced using using a direct digital x-ray detector in a conventional C-arm configuration. Spatial transformations based upon the fiducial points in the projections served as the basis for the original tomosynthetic 3D reconstruction. Blur removal of the entire volume was accomplished by 3D deconvolution algorithms. Computation times were measured and the reconstruction results were displayed. Results show that the direct Wiener filter is the most computationally efficient of the methods tested. This algorithm computed a solution comparable to that of a 2D multiplane iterative restoration method in 1% of the time.