AbstractID: 10584 Title: A total variation based iterative reconstruction algorithm for cone beam breast CT with under-sampled projection views

Purpose:
To implement and investigate a total variation based reconstruction algorithm for cone beam breast CT. The algorithm is focused on reconstruction using under-sampled projection views.

Method and Materials:
The implementation of the algorithm includes two major steps. In the reconstruction step, an algebraic reconstruction method is adopted. In the next step, the total variation is calculated and minimized. The initial image is updated and the iteration repeats.

A segmented breast model was used to test the algorithm in this study. The cone beam CT images of a mastectomy breast specimen were corrected, filtered and segmented to form a breast model which consists of a 3D map of dense tissue structures. Re-projection of the model was conducted with 9 degree angular increment to generate 40 projection images over 360°. The total variation based algorithm was then used to reconstruct the breast model with the under-sampled projection views. The reconstructed images were compared with the original breast model and the percentage deviation was computed for the evaluation.

Results:
Iterative reconstruction with total variation minimization was performed on under-sampled re-projections of the breast model. The structures of the breast were satisfactorily reconstructed, compared to the breast model. The percentage deviation was found to be 7.0%. Further improvement and optimization of the algorithm are under progress.

Conclusion:
The preliminary reconstruction result of a breast model demonstrates that under-sampled breast CT projections can be reconstructed using the total variation iterative method, which provides novel opportunity for breast CT study.