

AbstractID: 5729 Title: Digital tomosynthesis mammography (DTM) : Dependence of reconstruction image quality on number and angular range of projection views

Purpose:

We have previously found in a phantom study that a simultaneous algebraic reconstruction technique (SART) could achieve similar image quality to maximum likelihood reconstruction, but with fewer iterations. In this study, we applied SART to patient and breast phantom images and evaluated the reconstructed image quality when the number and the angular range of the projection views (PVs) were varied.

Method and Materials:

A second generation GE prototype DTM system was used for image acquisition. PVs are acquired from 21 angles in 3° increments over a $\pm 30^\circ$ range in less than 8-sec. The DTM system uses an Rh/Rh x-ray source for all exposures. The total dose of the 21 PVs is set to be about 1.5X of that of a single-view mammogram at the corresponding breast thickness. The phantom is composed of four 1-cm-thick breast-shaped slabs of heterogeneous or homogeneous mixtures of fibroglandular-and-fatty-tissue-mimicking material with embedded masses. A 5x6 array of contrast-detail disk-shaped holes were drilled on one of the homogeneous slabs. DTMs were reconstructed with all 21 PVs, or subsets of the PVs to simulate different angular ranges and increments. The use of subsets of PVs resulted in a reduction in the total dose of the reconstructed DTM in this study. The image quality of the reconstructed DTMs under different conditions was compared.

Results:

For both the phantom and patient DTMs, image sharpness and contrast decreased with decreasing numbers of PVs used in the reconstruction. The interplane artifacts increased with decreasing angular range of the PVs.

Conclusion:

The image quality of DTMs depends on the number of PVs and the angular range used in image acquisition. Further investigation is needed to evaluate trade-offs between the angular increment and angular range, as well as the effects of reconstruction parameters on image quality when the number of PVs varies.