AbstractID: 3840 Title: Efficient automatic pre-selection of mass lesion candidates in DBT breast volumes

Purpose
We are developing a computerized mass detection algorithm for the DBT breast volume. Extending existing concepts from projection mammography to 3D is computationally expensive.
We are presenting an efficient algorithm for the pre-selection of lesion candidates from the DBT volume for further processing.

Method and Materials
We applied a 3D radial gradient filter to the DBT breast volume. The convolution integral was limited to a shell. To account for variablity of mass sizes, volumes were filtered with multiple shell sizes. To increase computational efficiency, convolution was done in the Fourier domain. A maximum-intensity projection of each filtered volume was processed with a 2D tophat filter, using a structuring element of the same scale as the shell. Projections at multiple scales were combined by chosing the largest filter response, of the 3 scales, at a given pixel location.
Algorithm performance was evaluated on a database of 21 breast volumes with 13 malignant and 8 benign lesions. Patient images were acquired at Massachusetts General Hospital.

Results
The algorithm had a sensitivity of 100% at 22 false positives and 90% at 13 false positives per breast volume. For this pre-selection stage, the goal is to achieve high sensitivity. The false positive rate can be reduced subsequently through feature analysis.

Conclusions
We have developed an efficien pre-selection stage for a 3D mass detection algorithm. The radial filtering stage uses a 3D filter which is less sensitive to reconstruction artifacts and responds more accurately to 3D spherical structures.
Future work will include feature analysis to further reduce false positive detections.

Conflict of Interest
RMN and MLG are shareholders in R2 Technology, Inc. (Sunnyvale, CA). DBK is patent holder for the technique of DBT and has received research funding from GE.