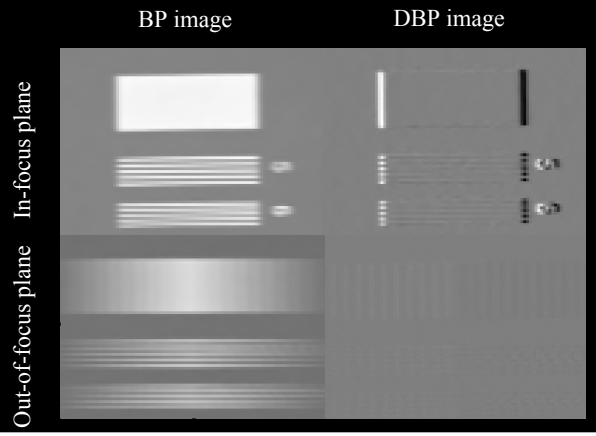
Back-projection filtration image reconstruction approach for reducing high-density object artifacts in digital breast tomosynthesis

Presenting author: Hyeongseok Kim, Date: 07/31/2018, Time: 08:20 AM, Session title: Breast Imaging, Location: Room 202

Innovation

Ripple artifacts reduction



$$\mu_j = \frac{\sum_n \left(I_{differentiated}(i_n, j)\right)}{N}$$

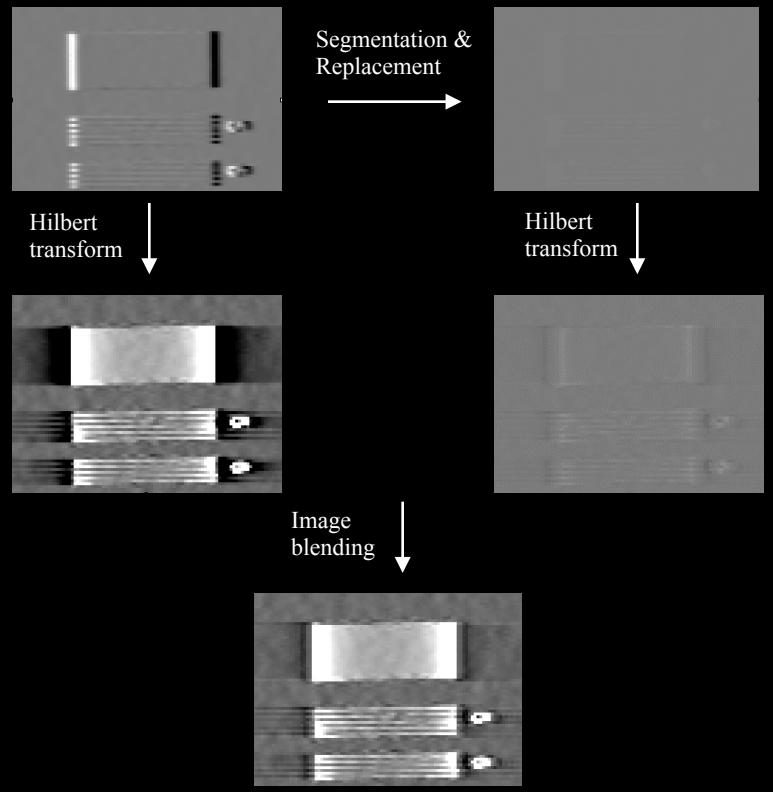
$$\sigma_j^2 = \sum_n \frac{\left(I_{differentiated}(i_n, j) - \mu_j\right)^2}{N}$$

$$w(i_n, j) = \frac{1}{\sigma_j \sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{I_{differentiated}(i_n, j) - \mu_j}{\sigma_j}\right)^2}$$

$$V_w(j) = \frac{\sum_n w(i_n, j) * \left(I_{differentiated}(i_n, j)\right)}{\sum_n w(i_n, j)}$$

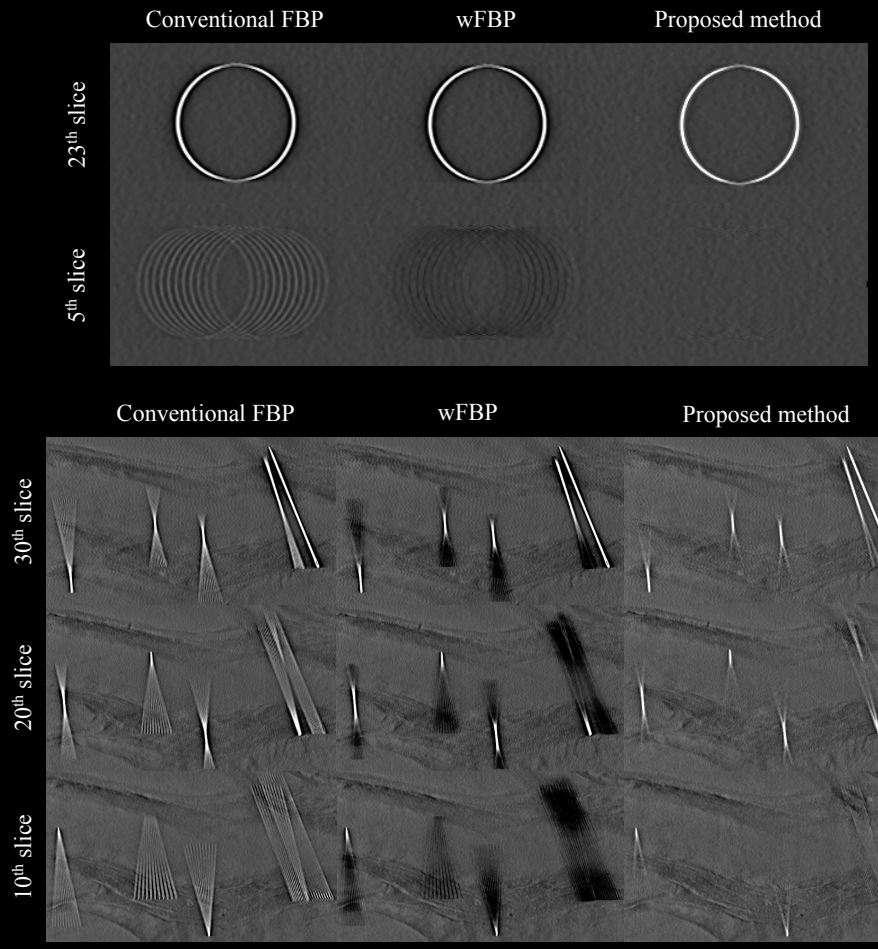
,where $I_{differentiated}(i_n, j)$ is the back-projected value from i-th pixel in n-th differentiated projection to j-th voxel in image, μ_j is mean, σ_j^2 is standard deviation, $w(i_n, j)$ is weights, and $V_w(j)$ is weighted sum of back-projected value of each reconstructed voxel.

Undershoot artifacts reduction



* DBP images before segmentation (left top) and after segmentation and replacement (right top). Hilbert transformed images in the middle row. Final image in the bottom-most. We blended the two images in the middle row. to generate final image. In blending procedure, larger values were taken between the two images.

Key Results



* Conventional FBP is the filtered back-projection algorithm that is modified for DBT reconstruction, and wFBP is the FBP algorithm involving weighted back-projection for ripple artifacts reduction.

KAIST

Medical Imaging & Radiotherapy Lab.