Abstracts

Active microwave imaging. I. 2-D forward and inverse scattering methods

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Active microwave imaging (MWI) for the detection of breast tumors is an emerging technique to complement existing X-ray mammography. The potential advantages of MWI arise mainly from the high contrast of electrical properties between tumors and normal breast tissue. However, this high contrast also increases the difficulty of forming an accurate image because of increased multiple scattering. To address this issue, we develop fast forward methods based on the combination of the extended Born approximation, conjugate- and biconjugate-gradient methods, and the fast Fourier transform. We propose two nonlinear MWI algorithms to improve the resolution for the high-contrast media encountered in microwave breast-tumor detection. Numerical results show that our algorithms can accurately model and invert for the high-contrast media in breast tissue. The outcome of the inversion algorithms is a high-resolution digital image containing the physical properties of the tissue and potential tumors.

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