
ABAS SABOUNI, University of Manitoba

Hybrid optimization method for microwave breast cancer detection

Breast cancer has long been one of the most common forms of cancer in women. One of the challenges facing the medical community is the early detection and treatment of breast cancer. Microwave-based imaging techniques offer a number of benefits, including improved contrast of malignant lesions and safety. Microwave imaging is the process by which radiofrequency electromagnetic waves are used to generate an image of the body to enable physicians to diagnose disease. In an effort to improve this imaging strategy, a variety of mathematical method has been developed in the literatures. Recently, the microwave tomography method has been developed by solving Maxwell's partial differential equations with Finite-Difference Time-Domain (FDTD) as well as solving nonlinear reconstruction problem using iterative algorithms.

In this talk, we consider an accurate numerical model for breast phantom derived from Magnetic Resonance Imaging (MRI) data that incorporates water content and frequency dependency of dielectric properties for breast tissues. The microwave tomography method based on FDTD and hybrid Genetic Algorithm (GA) was applied to phantoms derived from this data in order to locate, characterize, monitor, and treat the breast cancer.

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