Title:
Microwave tomographic imaging for breast cancer

Authors:
Leila Gharsalli, Hacheme Ayasso, Bernard Duchêne and Ali Mohammad-Djafari

Abstract:
Microwave imaging has received a great amount of interest in last few decades in view of biomedical applications such as breast tumor detection. The potential advantages of microwave imaging as an alternative to X ray Computed Tomography (CT) are:
i) the non negligible contrast that exists between the dielectric properties of normal and malignant breast tissues,
ii) the non-ionizing nature of microwave and
iii) the low cost of microwave imaging equipments.

Microwave imaging is taken herein as a nonlinear inverse scattering problem. The first step is to build up a forward model that describes interaction between the object (the breast) and a known incident wave. This model is based upon a domain integral representation of the electric field in a 2D-TM configuration. Then, the inversion process consists in retrieving a contrast function representative of the dielectric properties (relative permittivity and conductivity) of the unknown object from measurements of the scattered field that results from the latter interaction.

The non-linear inverse scattering problem is tackled in a Bayesian framework where the proposed Gauss-Markov-Potts prior model translates the fact that the object is composed of a finite set of homogeneous materials distributed in compact regions. In this work, we show some preliminary results obtained using realistic synthetic data obtained from a breast phantom built up from a MRI scan of a real breast. These results show the effectiveness of the method and emphasize the role of prior in the reconstruction improvement