MICROWAVE IMAGING : CHARACTERIZATION OF UNKNOWN DIELECTRIC OR CONDUCTIVE MATERIALS

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Abstract

Microwave imaging problem consists of reconstructing unknown objects from measurements of the scattered field that results from their interaction with a known interrogating wave. This problem is nonlinear and ill-posed. The most classical methods to solve this inverse problem are based on the linearization of the model (by using Born or Rytov approximation) or work directly on the nonlinear mapping. In both cases the inverse problem is solved by minimizing a cost functional that can be, in a Bayesian estimation framework, interpreted as a Maximum *a posteriori* (MAP) estimate. The classical prior information introduced is a smoothness or contour preserving constraint.
In this paper we propose to introduce the information that the object is composed of a finite (known) number of materials by using hierarchical Markov Random Field modeling approach. We then propose a Bayesian inversion method and compute the Posterior Mean estimate by using appropriate Markov Chain Monte Carlo (MCMC) algorithms.

References:
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