A Discrepancy Principle for Local Regularization of Inverse Problems

Cara D. Brooks, Patricia K. Lamm
Department of Mathematics
Michigan State University

We use local regularization, a generalization of the method due to J.V. Beck for solving the inverse heat conduction problem, to approximate the solution of a linear first kind Volterra convolution equation with finitely smoothing kernel. Until now, no *a posteriori* regularization parameter selection criteria existed to be paired with local regularization and convergence of the resulting method proved. We give conditions on the measure associated with local regularization with only a few additional specifications to the existing theory of convergence given by Lamm in 2005. Thus our newly defined discrepancy principle is a natural complement. The principle provides a means for selecting the regularization parameter r constant valued based on the perturbed data f^δ and the known level of noise δ. This is an initial step in the development of *a posteriori* principles for use with local regularization in solving linear and eventually nonlinear Volterra equations. Convergence of the method is proved and a rate of convergence given. Numerical examples illustrate the method's effectiveness.