Choice of Optimal Regularisation Parameters for Multi-Parameter Regularization Methods

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Abstract

We consider the ill-posed operator equation

$$Fx = y$$

In order to solve such a problem we need to regularize. As a particular example we look at the determination of the shape of a perfectly conducting crack within a conducting homogeneous host medium from overdetermined Cauchy data on the accessible exterior boundary.

A major and difficult part is choosing a good set of regularization parameters as there are more than one of it and so the standard procedures like Morozov's discrepancy principle do not work.

We provide an algorithm (balancing principle) for choosing the regularization parameter which can be proven to provide an optimal rate and does not require the smoothness of the solution. The necessary knowledge of the error will be estimated out of several initial data sets with uncorrelated noise. This means in particular that we do not need any apriori known parameters.