

State estimation approach to nonstationary inverse problems

Hanna Katriina Pikkarainen

Johann Radon Institute for Computational and Applied Mathematics
Austrian Academy of Sciences
Linz, Austria
hanna.pikkarainen@oeaw.ac.at

We examine nonstationary inverse problems in which the time evolution of the unknown quantity is modelled by a stochastic partial differential equation. We consider the problem as a state estimation problem. The time discrete state evolution equation is exact since the solution is given by an analytic semigroup. For the practical reasons the space discretization of the time discrete state estimation system must be performed. However, space discretization causes an error and inverse problems are known to be very intolerant to both measurement errors and errors in models. We analyse the discretization error so that the statistics of the discretization error can be taken into account in the estimation. We are interested in the related filtering problem. A suitable filtering method is presented. We also verify the method using numerical simulation.

The work has been done in collaboration with Janne M.J. Huttunen, Department of Physics, University of Kuopio.