Einladung zum Oberseminar Wissenschaftliches Rechnen

Julius-Maximilians-Universität Würzburg
Lehrstuhl für Wissenschaftliches Rechnen IX

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A fast subspace optimization technique for nonlinear inverse problems and applications

We introduce a sequential subspace optimization (SESOP) method for the iterative solution of nonlinear inverse problems in Banach spaces, based on the well-known methods for linear problems. The key idea is to use multiple search directions per iteration, whose lengths are determined as minimizers of a suitable functional. This choice admits a geometric interpretation after which the method is originally named: The current iterate is projected sequentially onto (intersections of) stripes, which emerge from affine hyperplanes whose respective normal vectors are given by the search directions and contain the solution set of the unperturbed inverse problem. The local properties of the nonlinear forward operator determine the shape of these stripes. We prove convergence and regularization properties. Furthermore, this method is adapted for complex Hilbert spaces and applied to solve the inverse problem of terahertz tomography, a nonlinear parameter identification problem based on the Helmholtz equation, which consists in the nondestructive testing of dielectric media. The tested object is illuminated by an electromagnetic Gaussian beam and the goal is the reconstruction of the complex refractive index from measurements of the electric field. We conclude with some numerical reconstructions from synthetic data.

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Zu diesem Vortrag laden wir Sie herzlich ein.

gez. Prof. Dr. Alfio Borzì
gez. Prof. Dr. Bernadette Hahn