Computational Methods for Distributed Parameter Estimation with Application to Inversion of 3D Electromagnetic Data

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Abstract: Inverse problems involving recovery of distributed parameter functions arise in many applications. Many practical instances require data inversion where the forward problem can be written as a system of elliptic partial differential equations. Realistic instances of such problems in 3D can be very computationally intensive and require care in the selection and development of appropriate algorithms.

In this talk I will describe work we have been doing in the context of inverting electromagnetic data in frequency and time domains for geophysical mining applications with the objective of making such computations practically feasible. Our techniques are applicable in a wider context, though.

The necessary conditions for the inverse optimization problem yield a large, nonlinear, tightly coupled set of PDEs. We devise multi grid methods as well as preconditioned Krylov solvers for the rapid solution of such systems.

This is joint work with E. Haber.

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