



APPLIED MATHEMATICS SEMINAR 291

Optimization of Engineering Systems Modeled by Partial Differential Equations

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ABSTRACT

Optimization of systems governed by partial differential equations (PDEs) plays a crucial role in many science and engineering applications where one needs to identify model parameters or determine inputs to improve the performance of systems. The solution of these optimization problems poses many mathematical and computational challenges, which arise, e.g., from the structure of the underlying PDEs, the large number of optimization variables, or possible uncertainties in PDE model parameters.

In this talk I will discuss several applications of PDE constrained optimization ranging from shape optimization of shell structure acoustics motivated by the design of musical instruments to well-rate optimization arising in subsurface reservoir management. I will describe mathematical formulations of these optimization problems, hint at some of the challenges that arise in their numerical solution, and sketch some of the current solution approaches.

BIO:

Matthias Heinkenschloss is a Noah G. Harding Chair and Professor in the Department of Computational and Applied Mathematics at Rice University. His research is concerned with the design and analysis of mathematical optimization algorithms for nonlinear, large-scale (often infinite dimensional) problems and their applications to science and engineering problems. Current projects include development of parallel-in-time methods for optimal control problems, numerical solution of PDE constrained optimization problems under uncertainty, and development of reduced order models for nonlinear systems. His research is/has been funded by the Air Force Office of Scientific Research, the Department of Energy, the National Science Foundation, and by industry. He has served/is serving on editorial boards of several professional journals including Mathematical Programming, Numerical Linear Algebra with Applications, and SIAM Journal on Control and Optimization. Prior to joining Rice University in 1996, he was an assistant professor at Virginia Tech (1993-96), and at University of Trier, Germany, (1992-93). He received his doctoral degree in 1991 from the University of Trier, Germany.

