TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

Wednesday, 23 February 2011, 4:00 p.m.

Solution of structured algebraic linear systems in PDE-constrained optimization problems

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Abstract.

Block structure symmetric linear systems of "saddle-point" type arise in a wide variety of application models which can be stated as constrained optimization problems. In many cases, these systems represent the core step of a nonlinear procedure.

The unfavorable spectral properties and the large size make their solution a great challenge. To enhance the convergence of iterative Conjugate-Gradient type solvers, preconditioning is thus mandatory. Successful preconditioning strategies strongly rely on a careful exploitation of the underlying application problem.

In this talk we will first review some effective preconditioning strategies that take into account the matrix coefficient block structure. Special attention will be paid to the spectral properties of the blocks, such as indefiniteness and singularity. Then we will discuss the use of these preconditioners for efficiently solving certain PDE-constrained optimization problems, that is, optimization problems in which the constraint is represented by a discretized partial differential equation.