

TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Wednesday, 29 January 2014, 4:00 p.m.
Room 617 Wachman Hall

(refreshments and social at 3:45 p.m)

On the use of classical iterative methods for two contemporary problems

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Abstract. While modern Krylov subspace methods are often the technique of choice for large linear systems arising in practical applications, there are cases where classical iterative methods should be preferred. The purpose of this talk is to describe two such cases. First, we will discuss low-rank approximation techniques for the generalized Lyapunov equation, a linear matrix equation that occurs in bilinear model order reduction. We combine stationary iterations with augmented Krylov projections, resulting in an efficient numerical method. The second case concerns preconditioning linear systems arising in acoustic control. We consider the Helmholtz equation and shifted Laplacian preconditioners, and discuss a connection with the spectrum of the preconditioned system and Moebius transformations. We discuss the consequences on the choice of solver for the forward problem and the overall consequences on solving the optimal control problem. In both cases we provide computational as well as theoretical evidence to explain why a classical method should be chosen over a modern one.