TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

Wednesday, 24 February 2016, 4:00 p.m.
(tea at 3:45)

Numerical Analysis of Quantum Graphs

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Abstract. We consider the numerical solution of eigenvalue and boundary-value problems for differential equations posed on graphs or networks. More specifically, the talk is concerned with quantum graphs, which are metric graphs endowed with a self-adjoint differential operator (Hamiltonian) acting on functions defined on the graph's edges with suitable side conditions. We describe and analyze the use of a linear finite element method for discretizing a class of simple Hamiltonians.

The solution of the discrete equations is achieved by means of a (non-overlapping) domain decomposition approach. For model elliptic problems and a wide class of graphs, we show that a combination of Schur complement reduction and diagonally preconditioned conjugate gradients results in optimal complexity. We also discuss time-dependent problems of parabolic type. Numerical results are presented for both simple and complex graph topologies.

This is joint work with Mario Arioli (University of Wuppertal).