TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

Wednesday, 2 October 2013, 4:00 p.m.
(tea and social at 3:45)

An Overview of Interpolatory Model Reduction

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Abstract. Dynamical systems form the basic modeling framework for an enormous variety of physical phenomena of interest in science and engineering. Direct numerical simulation of the richly complex dynamical systems that result is often one of few means available for accurate analysis and prediction. The ever increasing need for improved accuracy requires inclusion of ever more detail in the modeling stage, leading inevitably to ever larger-scale, ever more complex dynamical systems that must be simulated. As a consequence, simulations in such large-scale settings can make unmanageably large demands on computational resources. This is the main motivation for model reduction, which has as its goal production of much simpler dynamical systems retaining the same essential features of the original systems (high fidelity emulation of input/output response and conserved quantities, preservation of passivity, etc.).

I will give a brief overview of the objectives and methodology of model reduction, focussing eventually on interpolatory projection methods that are both simple and capable of providing nearly optimal reduced order models in many circumstances. Interpolatory methods provide a framework for model reduction that allows retention of special structure such as parametric dependence and port-Hamiltonian structure, as well as internal connectivity of delays and other infinite-order subsystems. I will describe the context for some of these features and how they influence model reduction methodology.