Department of Mathematics

University of Houston

Scientific Computing Seminar

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Computational Methods in Systems and Control Theory (CSC)
Max Planck Institute for Dynamics of Complex Technical Systems
Magdeburg, Germany

System-theoretic model reduction methods for nonlinear systems

Thursday, February 27, 2020
1:30 PM- 2:30 PM
Room 646 PGH

Abstract: During the past three decades, Model Order Reduction (MOR) has been established as an important tool to overcome complexity barriers at the intersection of nearly all disciplines in the computational sciences and engineering (CSE). MOR generates surrogate models for numerical simulation that are much faster to evaluate than the original mathematical models of dynamical processes, but retain the necessary numerical accuracy for the quantities-of-interest that are necessary when using the model for control, prediction or verification purposes.

Here, we discuss MOR for nonlinear systems from a system-theoretic perspective, focusing on the approximation of the mapping from inputs (controls, design parameters) to outputs (measurements, quantities-of-interest). Typical methods in this area are either based on system balancing or rational interpolation. These methods are well established for linear systems and part of CSE and control design software packages. Recent years have seen a major effort in generalizing these methods to nonlinear systems, and we will review these approaches. The performance of the new methods is illustrated for several benchmark examples, typically arising from the spatial discretization of time-dependent nonlinear partial differential equations.

This seminar is easily accessible to persons with disabilities. For more information or for assistance, please contact the Mathematics Department at 743-3500.