Department of Mathematics

University of Houston

Scientific Computing Lectures

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Automating DEIM for Nonlinear Model Reduction

Friday, March 9, 2012 4:20 PM- 5:00 PM Room 232 PGH

Abstract: Recently, we developed a new method for nonlinear model reduction that is based upon proper orthogonal decomposition (POD) combined with discrete empirical interpolation (DEIM). This POD-DEIM approach has provided spectacular dimension and complexity reduction for challenging systems large scale ordinary differential equations(ODEs). Reductions from 15,000 variables to 40 variables in the reduced model with very little loss of accuracy have been achieved. Several examples will be shown.

The DEIM is surprisingly simple and amounts to replacing orthogonal projection with an interpolatory projection of the nonlinear term that only requires the evaluation of a few selected components of the nonlinear term. This is the crux of the improvement over POD and it has potential for being automated as well. The technology used for automatic differentiation can be adapted to enable the automatic generation of a code for the reduced order function and its Jacobian from the code for the original high dimensional problem.

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