Interpolatory Model Reduction Methods for a Class of Frequency Response Problems

U. Hetmaniuk
Department of Applied Mathematics
University of Washington
Box 352420
Seattle, WA 98195-2420 (U.S.A.)
hetmaniu@uw.edu

Frequency sweeps in structural dynamics, acoustics, and vibro-acoustics require evaluating frequency response functions for a large number of frequencies. The brute force approach for performing these sweeps leads to the solution of a large number of large-scale systems of equations. Several methods have been developed for alleviating this computational burden by approximating the frequency response functions. Among these, interpolatory model order reduction methods are perhaps the most successful.

This talk reviews this family of approximation methods with particular attention to their applicability to specific classes of frequency response. It also includes novel aspects pertaining to the iterative solution of large-scale systems of equations in the context of model order reduction and frequency sweeps. The quality of the reduced-order model strongly depends on the selection of interpolation points. So far, this selection has been mostly heuristic, which remains the main disadvantage of interpolatory model reduction. The talk will also describe a simple strategy based on monitoring the residual error and adaptively adding interpolation points over the frequency range of interest.

All reviewed computational methods are illustrated with realistic, large-scale structural dynamic, acoustic, and vibro-acoustic analyses in wide frequency bands.

U. Hetmaniuk
Department of Applied Mathematics
University of Washington
Box 352420
Seattle, WA 98195-2420 (U.S.A.)
hetmaniu@uw.edu

Séminaire de Mathématiques Appliquées et de Calcul Scientifique du CERMICS
Ecole des Ponts ParisTech, 6-8 avenue Blaise-Pascal, 77455 Champs-sur-Marne, France
http://cermics.enpc.fr/seminaires/cs/index.html