11th World Congress on Computational Mechanics (WCCM XI)
5th European Conference on Computational Mechanics (ECCM V)
6th European Conference on Computational Fluid Dynamics (ECFD VI)
July 20–25, 2014, Barcelona, Spain

AN ADAPTIVE INTERPOLATORY MODEL REDUCTION METHOD FOR VIBROACOUSTIC PROBLEMS

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Key words: *Acoustics, Fluid Structure Interaction, Frequency Sweep, Interpolatory Model Reduction, Vibroacoustics*

Frequency sweep problems arise in many structural dynamic, acoustic, and structural acoustic (or vibroacoustic) applications. In each case, they incur the evaluation of a frequency response function for a typically large number of frequencies. Because each function evaluation requires the solution of an often large-scale system of equations, frequency sweep problems are computationally intensive. Interpolatory model order reduction is a powerful tool for reducing their cost. However, the performance of this tool depends on the location and number of the interpolation frequency points. It also depends on the number of consecutive frequency derivatives of the response function that are matched at each frequency point. This lecture will discuss an automatic, adaptive, interpolatory model order reduction method for the solution of the aforementioned problems where adaptivity is based on monitoring the Euclidean norm of the relative residual associated with the function to be evaluated over the frequency band of interest. More specifically, the number of interpolation points and the number of matched frequency derivatives are adaptively increased until the global Euclidean norm of the relative residual is reduced below a user-specified tolerance. The robustness, accuracy, and computational efficiency of this adaptive interpolatory model order reduction method are highlighted with the solution of several frequency sweep problems associated with large-scale structural dynamic, acoustic, and vibroacoustic finite element models.