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MODEL ORDER REDUCTION FOR VIBROACOUSTIC PROBLEMS

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ABSTRACT

Vibroacoustic simulations are used to assess the vibration behaviour and sound radiation of structures. To capture the characteristic wave phenomena and the coupling between structure and acoustic fluid properly, a fine discretization of the numerical models has to be chosen, resulting in very large systems of equations. The model order reduction (MOR) provides powerful tools to reduce the size of the numerical models while the system response of the reduced system does not significantly change.

Interpolatory MOR methods reduce the original model by finding a matrix projecting the full system on a much smaller subspace containing the desired solution. Finding a suitable projection basis and its efficient computation is the key to a properly reduced model. The standard MOR methods have been extended to generate reduced models which can be evaluated for different sets of parameters (parametric MOR). In the case of vibroacoustic problems, it is desirable to preserve the second order structure of the original differential equation, so that the reduced model can be used in the same way as the full order model.

Reduced models for vibroacoustic problems can be used in many application fields like the design of acoustic metamaterials, sound propagation through structures such as airplanes and trains, or room and building acoustics, among others. Parametrically reduced models can be used for the efficient optimization of sound radiating structures.

This interdisciplinary minisymposium brings international scientists with mathematical background working on the formulation of model order reduction methods together with researchers and engineers working on vibroacoustic problems applying the MOR methods. It

aims at presenting the most innovative studies and ideas on parametric MOR, efficient basis generation, and applications of the MOR methods on the design of complex structures and at laying the groundwork for new cross-disciplinary collaborations.

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