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Efficient Optimization of Transient Dynamic Problems for a Micro Accelerometer Using Model Order Reduction

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One of the main obstacles to including transient dynamic effects into the performance functions of a structural optimization is the high computational cost of each time-dependent simulation. The focus of this paper is on the application of model order reduction techniques to reduce the transient analysis time for the attainable optimization process. The software mor4ansys developed at IMTEK performs model reduction via the Arnoldi algorithm directly to ANSYS finite element models. We adopt a micro accelerometer as an example to demonstrate the advantages of this approach. The harmonic and transient results of a reduced model of the accelerometer yield very good agreement with those from the original high dimensional ANSYS model. The use of model reduction within the optimization iterations produces almost the same results as without order reduction and speeds up the total computation by about an order of magnitude.

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