Inf-Sup-Constant-Free State Error Estimator for Model Order Reduction of Parametric Systems in Electromagnetics

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In this talk, we discuss efficient, sharp *a posteriori* state error estimation for reduced-order models of general linear parametric systems. Standard *a posteriori* state error estimation for model order reduction relies on the inf-sup constant. The *a posteriori* error estimation for systems with very small or vanishing inf-sup constant poses a challenge, since it is inversely proportional to the inf-sup constant, resulting in overly pessimistic error estimators. Such systems appear in electromagnetics since the inf-sup constant values are zero or close to zero, at or near resonant frequencies. We propose a novel *a posteriori* state error estimator which avoids the calculation of the inf-sup constant. The proposed state error estimator is compared with the standard error estimator and a recently proposed one in the literature. It is shown that our proposed error estimator outperforms both existing estimators. Furthermore, our new estimator is integrated within an adaptive greedy algorithm that iteratively builds the reduced-order model. Numerical experiments are performed on real-life microwave devices such as narrowband and wideband antennas, as well as a dual-mode waveguide filter. These examples show the capabilities and efficiency of the proposed methodology.

Reference:

[1] S. Chellappa, L. Feng, V. de la Rubia, and P. Benner, "Inf-Sup-Constant-Free State Error Estimator for Model Order Reduction of Parametric Systems in Electromagnetics," arXiv preprint, 2021. https://arxiv.org/abs/2104.12802