Building a Certified Reduced Basis for Transient Coupled Problems

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ABSTRACT

In this contribution, an implicit-explicit a-posteriori error estimator for a transient coupled thermo-hydro-mechanical (THM) system is developed. The goal-oriented error estimation scheme evaluates the error committed in specific quantities of interest or functional outputs of the global solution. The error representation is constructed based on the weak residual of a primal problem (explicit) and the adjoint solution of a dual problem (implicit) associated with the quantities of interest evolving backward in time.

This error estimator is employed to support a greedy adaptive procedure that optimally generates a reduced basis by smartly selecting snapshot points over a given parametric space. The selected snapshot corresponding to the solution of a system with distinct input parameter is assembled to form a compressed subspace. The generated reduced basis is then used in Galerkin projection procedure that results in a model with state-space dimension reduced by several orders of magnitude. An application of this technique is demonstrated through a parametrization problem involving THM coupled processes in a fluid-saturated porous media.

REFERENCES

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