A Certified Reduced Basis Method for Variational Inequalities and Optimal Control Problems

E. Bader[1], M. Grepl[1], M. Kaercher[1], K. Veroy-Grepl[1], and Z. Zhang[1]

[1]RWTH Aachen University, Aachen, Germany

In this talk, we present a method for computing reduced order models and associated a posteriori error estimates for two problem classes: variational inequalities and optimal control.

In the first part of the talk, we present a minimum residual, slack–variable reduced basis approach for variational inequalities of the first kind. The strict feasibility of the resulting approximations leads to two significant improvements upon existing methods. First, it provides a posteriori error bounds which are significantly sharper than existing bounds. Second, it enables a full offline–online computational decomposition in which the online cost to compute the error bound is completely independent of the dimension of the original (high–dimensional) problem.

In the second part of the talk, we discuss the use of reduced order models as surrogate models for PDE–constrained optimal control problems. In this context, we develop rigorous and efficiently computable a posteriori error bounds for both the optimal control and the associated optimal cost functional.

Numerical results compare the performance of the proposed and existing approaches.