Technische Universität Braunschweig

MUSEN

Adaptive and reduced-order approaches for flows and dynamical systems

Lecture of

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Okerhochhaus, Pockelsstraße 3,
seminar room, ground floor

In the first part of this talk, we are concerned with model predictive control (MPC) where the governing dynamics are given by a linear parabolic problem. We propose a residual-based a-posteriori approach to construct an adaptive time discretization for the prediction and application horizon in each level of the MPC algorithm. The adaptive concept is based on a reformulation of the optimality system as an elliptic space-time problem. The concept is illustrated with a numerical example. This part is joint work with A. Alla and M. Hinze.

In the second part of this talk, we consider an unsteady incompressible flow problem governed by the Navier-Stokes equations which is discretized in space using adaptive finite elements. In order to reduce the computational complexity, we utilize POD model order reduction. We propose two approaches to derive stable reduced-order models. The first approach leads to a velocity reduced-order model and relies on POD basis functions which are weakly divergence-free with respect to a reference pressure space. The second approach is a velocity-pressure reduced-order model and utilizes a supremizer enrichment. The approaches are illustrated for the benchmark example of a lid-driven cavity flow. This part is joint work with S. Ullmann, J. Lang and M. Hinze.