Boundary control problem for unstable parabolic problems: Application to reactive flow

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Abstract

We consider the stabilization problem by means of Dirichlet feedback control for systems modeled by scalar or vector parabolic equations. The main emphasize is put on the treatment of nonlinear reaction-advection-diffusion type equations which are unstable if uncontrolled. In that context a new numerical method which relies on DG-FEM (Discontinuous-Galerkin) for the time discretization as well as continuous finite elements for the space discretization is presented. A modified BFGS scheme combined with a new checkpointing strategy for the computation of the adjoint problem lead to an efficient scheme. Applications to three dimensional reactive flow problems are presented.