On an optimal control problem of three-dimensional Navier-Stokes-Voigt equations

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Abstract

We consider a distributed optimal control problem of the three-dimensional Navier-Stokes-Voigt equations in bounded domains with a quadratic objective functional and box control constraints. We first show the existence of optimal solutions, and derive the necessary optimality conditions and the sufficient optimality conditions. The second-order optimality conditions obtained here seem to be optimal in the sense that the gap between the necessary condition and the sufficient one is minimal.

We then analyze a fully discrete scheme based on the discontinuous (in time) Galerkin approach, which is combined with conforming finite element subspaces in space. The space-time error estimates of order $O(\sqrt{\tau} + h)$, where τ and h are respectively the time and space discretization parameters, are proved for the difference between the locally optimal controls and their discrete approximations.

This is joint work with Tran Minh Nguyet.