Department of Mathematics

University of Houston

Scientific Computing Seminar

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Optimal Control of Variable Density Navier-Stokes Equations

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3:00 PM- 4:00 PM
Room 646 PGH

Abstract: Optimal control problems for partial differential equations arise in various applications,such as in engineering,tomography and finance. Here we are concerned with the Navier-Stokes equation as state equation and a source control function to obtain a desired solution,also referred to as a velocity tracking problem. Using Tikhonov regularization and a Lagrange multiplier,a saddle point operator system arises where we can use equal order discretization for the state variable,the control function and the Lagrange multiplier. This enables elimination of the control function. The reduced system takes a particular two-by-two block matrix form for which we can construct a special preconditioner, the inverse of which involves just the inverses of two matrices that are linear combinations of the block matrices in each row of the given matrix.In the N-S problem,they are a mass matrix and an advection perturbed diffusion matrix. There is no need to solve any Schur complement system.The resulting eigenvalues are real and positive with a small condition number, which holds uniformly with respect to both discretization and method parameters.