1138-49-5 **S. S. Ravindran*** (`ravinds@uah.edu`), 301 Sparkman drive, Department of Mathematical Sciences, UAH, Huntsville, AL 35899. *Finite element approximation of Dirichlet control using boundary penalty method for unsteady Navier–Stokes equations.*

This paper is concerned with the analysis of the finite element approximations of Dirichlet control problem using boundary penalty method for unsteady Navier–Stokes equations. Boundary penalty method has been used as a computationally convenient approach alternative to Dirichlet boundary control problems governed by Navier–Stokes equations due to its variational properties. Analysis of the mixed Galerkin finite element method applied to the spatial semi-discretization of the optimality system, from which optimal control can be computed, is presented. An optimal L∞(L2) error estimate of the numerical approximations of the optimality system is derived. Feasibility and applicability of the approach are illustrated by numerically solving a canonical flow control problem (Received September 26, 2017)