RESIDUAL REDUCTION ALGORITHMS FOR NONSYMMETRIC SADDLE POINT PROBLEMS

CONSTANTIN BACUTA, BRENDAN MCCRACKEN, AND LU SHU

Abstract. In this paper, we introduce and analyze Uzawa algorithms for non-symmetric saddle point systems. Convergence for the algorithms is established based on new spectral results about Schur complements. A new Uzawa type algorithm with optimal relaxation parameters at each new iteration is introduced and analyzed in a general framework. Numerical results supporting the efficiency of the algorithms are presented for finite element discretization of steady state Navier-Stokes equations.

University of Delaware, Department of Mathematics, 501 Ewing Hall 19716
E-mail address: bacuta@math.udel.edu

University of Delaware, Department of Mechanical Engineering
E-mail address: brendan@udel.edu

University of Delaware, Department of Mathematics, 501 Ewing Hall 19716
E-mail address: shu@math.udel.edu

2000 *Mathematics Subject Classification.* 74S05, 74B05, 65N22, 65N55.

Key words and phrases. Uzawa algorithms, non-symmetric saddle point system, multilevel methods, residual reduction.

The work of C. Bacuta was partially supported by NSF DMS-0713125. The work of B. McCracken was supported by REU NSF DMS-0713125, and the work of L. Shu was supported by University of Delaware's GEMS Project.