UNIFORM PRECONDITIONERS FOR PROBLEMS OF NEGATIVE ORDER

ROB STEVENSON AND RAYMOND VAN VENETIË

Abstract. We construct a preconditioner for operators of negative order discretized by discontinuous triangular Lagrange elements. These operator typically arise in the *Boundary Element Method*, with the canonical example being the *Single Layer* operator mapping from the Sobolev space $H^{-1/2}$ to $H^{1/2}$. We propose a variation of the well-studied dual mesh preconditioning technique [3, 1, 2]. Our approach extends to operators discretized on locally refined triangulations, and to higher order discontinuous elements. The total cost of this preconditioner is the sum of the cost of the opposite order operator, and an additional cost that is always proportional to N.

References

[1] R. Hiptmair, Operator preconditioning, *Computers & Mathematics with Applications*, 2006, 52(5): 699-706.

[2] A. Buffa and S. Christiansen, A dual finite element complex on the barycentric refinement, *Mathematics of Computation*, 2007, 76(260): 1743-1769.

[3] O. Steinbach and W. L. Wendland, The construction of some efficient preconditioners in the boundary element method, *Advances in Computational Mathematics*, 1998, 9(1-2): 191-216.

Korteweg-de Vries (KdV) Institute for Mathematics, University of Amsterdam, P.O. Box 94248, 1090 GE Amsterdam, The Netherlands.

E-mail address, Raymond van Venetie: R.vanVenetie@uva.nl