Preconditioners for the p-version of the Galerkin method for a coupled finite element/boundary element system

Abstract

We propose and analyze efficient preconditioners for solving systems of equations arising from the p-version for the finite element/boundary element coupling. The first preconditioner amounts to a block Jacobi method, whereas the second one is partly given by diagonal scaling. We use the generalized minimum residual method for the solution of the linear system. For our first preconditioner, the number of iterations of the GMRES necessary to obtain a given accuracy grows like $\log^2 p$, where p is the polynomial degree of the ansatz functions. The second preconditioner, which is more easily implemented, leads to a number of iterations that behave like $p \log^3 p$. Computational results are presented to support this theory.