OPTIMAL ADDITIVE SCHWARZ PRECONDITIONING FOR THE *hp*-BEM: THE HYPERSINGULAR INTEGRAL OPERATOR IN 3D

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Abstract. We consider the discretization of the hypersingular integral operator by the *hp*-version of the Galerkin boundary element method (*hp*-BEM) in $\mathbb{R}^3$ and propose a preconditioner based on the overlapping additive Schwarz framework. The preconditioner is based on a space decomposition into the space of piecewise linears and spaces of high order polynomials supported by the vertex patches. This decomposition results in uniformly bounded (w.r.t. mesh size h and polynomial degree p) condition number for the preconditioned system. It is possible to further decompose the space of piecewise linears in a multilevel fashion and retain the uniformly bounded condition number. The preconditioner is suitable for locally refined meshes but assumes shape regularity of the mesh. For a mesh with N elements, the preconditioner can be applied in $O(Np^4)$ operations; the setup of the preconditioner takes $O(N + p^6)$ operations.

Keywords: *hp*-BEM, hypersingular integral equation, additive Schwarz preconditioning

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References

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