An Overlapping Domain Decomposition Preconditioner for High Order BEM with Anisotropic Elements

Abstract

We study a preconditioner for the boundary element method with high order piecewise polynomials for hypersingular integral equations in three dimensions. The meshes may consist of anisotropic quadrilateral and triangular elements. Our preconditioner is based on an overlapping domain decomposition which is assumed to be locally quasi-uniform. Denoting the subdomain sizes by H_j and the overlaps by δ_j, we prove that the condition number of the preconditioned system is bounded essentially by $\max_j O(1+\log H_j/\delta_j)^2$. The appearing constant depends linearly on the maximum ratio H_i/H_j for neighboring subdomains, but is independent of the elements' aspect ratios. Numerical results supporting our theory are reported.