Symmetric boundary element methods for Helmholtz transmission problems

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Resumen

The study of Helmholtz transmission problems in two or three dimensions arises in many applications related to scattering of acoustic, thermal or electromagnetic waves. The problem consists of Helmholtz equations with different wave numbers in a bounded domain and its exterior coupled with some transmission conditions.

Many different formulations and boundary element discretizations have been derived to deal in an efficient way with these problems [2]. Here we propose a new formulation, based on a paper by Martin Costabel and Ersnt Stephan in 1985 [1], that uses the Calderón projector for the interior and exterior problems to develop closed expressions for the interior and exterior Neumann–to–Dirichlet operator. These operators are then matched to obtain an integral system that is equivalent to the Helmholtz transmission problem and uses Cauchy data on the transmission boundary as unknowns. By employing an additional mortar unknown with respect to the ones used in the original paper, we show that we can simplify the aspect and analysis of the method, writing it in an appropriate way to devise Krylov type iterations based on the separate Neumann–to–Dirichlet operators.

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Referencias

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