

Coercive second-kind boundary integral equations for the Laplace Dirichlet problem on Lipschitz domains

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The Galerkin method applied to a continuous, linear, invertible operator on a Hilbert space converges for every sequence of asymptotically-dense subspaces if and only if the operator is the sum of a coercive operator and a compact operator.

It was recently proved that there exist 3-d star-shaped Lipschitz domains such that the standard second-kind boundary integral equations for the Laplace Dirichlet and Neumann problems, posed in L^2 , cannot be written as the sum of a coercive operator and a compact operator.

This talk presents new second-kind integral-equation formulations of the Laplace interior and exterior Dirichlet problems. The operators in these formulations are both continuous and coercive (in L^2) on general Lipschitz domains in dimensions greater than or equal to two. These properties imply that (i) the Galerkin method converges when applied to these formulations; and (ii) the Galerkin matrices are well-conditioned as the discretisation is refined, without the need for operator preconditioning.