Spectrum of the Neumann-Poincaré Operator for Planar, Thin Doubly Connected Domains

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We present an analysis of the spectrum of the Neumann-Poincaré (NP) operator for a doubly connected domain bounded by two level curves defined by a conformal mapping. The doubly connected domain's inner boundary can have an arbitrary shape. Our approach utilizes an infinite-matrix representation of the NP operator, which involves the Grunsky coefficients of the conformal mapping. By applying the Gershgorin circle theorem, we demonstrate that as the domain thickness tends to zero, the spectrum of the doubly connected domain converges to the interval [-1/2, 1/2] in the Hausdorff distance. This work is in collaboration with Doosung Choi and Stephen P. Shipman.