SPECTRAL GALERKIN METHOD FOR SOLVING ELASTIC WAVE SCATTERING PROBLEMS WITH MULTIPLE OPEN ARCS

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Abstract. We study the elastic time-harmonic wave scattering problems on unbounded domains with boundaries composed of finite collections of disjoint finite open arcs (or cracks) in two dimensions [1]. Specifically, we present a fast spectral Galerkin method for solving the associated weakly- and hypersingular boundary integral equations (BIEs) arising from Dirichlet and Neumann boundary conditions, respectively. Discretization bases of the resulting BIEs employ weighted Chebyshev polynomials that capture the solutions' edge behavior [2]. We show that these bases guarantee exponential convergence in the polynomial degree when assuming analyticity of sources and arcs geometries. Numerical examples demonstrate the accuracy and robustness of the proposed method with respect to number of arcs and wavenumber.

Keywords: Boundary Integral Equations, Elastic Waves, Wave Scattering, Open arcs, Spectral Methods, Cracks

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