Computing Resonances of Elastic Waveguide Problems with Hardy Space Infinite Elements

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Waveguide problems bear the difficulties of an unbounded domain. Instead of a boundary condition a radiation condition has to be fullfilled in the infinite direction, ensuring that waves are physically correct. A numerically problematic phenomen arising in elastic waveguides is the possibility of waves with different signs of phase and group velocity, often referred as backward propagating waves. Standard numerical methods like complex scaling (also known as PML) fail in such cases or become nonlinear in the frequency.

We introduce a transparent boundary condition based on a new variant of the pole condition and Hardy space infinite elements for its discretization. This method stays linear in the square of the frequency and thus resonance problems lead to linear eigenvalue problems. Numerical experiments exhibit super-algebraic convergence.

References:

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