A Boundary Perturbation Method for Recovering Interface Shapes in Layered Media

"High–Order Numerical Methods for the Simulation of Linear and Non–Linear Waves: High Frequency Radiation and Dynamic Stability"

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Abstract

The scattering of linear acoustic radiation by a periodic layered structure is a fundamental model in the geosciences as it closely approximates the propagation of pressure waves in the earth's crust. In this talk the speaker will describe new algorithms for (1.) the forward problem of prescribing incident radiation and, given known structure, determining the scattered field, and (2.) the inverse problem of approximating the form of the structure given prescribed incident radiation and measured scattered data. Each of these algorithms is based upon a novel statement of the problem in terms of boundary integral operators (Dirichlet–Neumann operators), and a Boundary Perturbation algorithm (the Method of Operator Expansions) for their evaluation. Detailed formulas and numerical simulations will be presented to demonstrate the utility of these new approaches.

This is joint work with A. Malcolm (M.I.T.).