Hybrid Frequency-Time Analysis and Numerical Methods for Time-Dependent Wave Propagation

11:30 Friday Dec 4

https://njit.webex.com/njit/j.php?MTID=md162dc9a0337e201edb09e6e6d75d729

Abstract

We outline a hybrid frequency-time method that promises efficient (O(1) sampling cost) and high-order dispersionless long-time transient solutions to the time-dependent obstacle scattering problem of the 2D/3D acoustic wave equation (and which readily generalizes to other wave contexts), and demonstrate its effectiveness in comparison to other popular time-stepping methods (hybrid convolution quadrature and pure time-stepping). It becomes useful to study temporal decay of wave solutions (including in ``trapping'' scenarios), a classical question treated by the well-known Lax-Phillips scattering theory. We develop (computationally-amenable) ``domain-of-dependence'' bounds on solutions to wave scattering problems and establish rapid decay estimates using only (existing) Helmholtz resolvent estimates on the real frequency axis, for geometries that have previously posed as barriers to proving rapid decay.

Speaker

Thomas Anderson

Postdoctoral Assistant Prof
Michigan

Department of Mathematical Sciences

NJIT