

HIGH-ORDER INTEGRAL EQUATION METHODS FOR INTERFACE PROBLEMS

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ABSTRACT

Integral equation methods have become increasingly practical and powerful for a wide range of problems with interfaces, including fluid dynamics, wave scattering, and electromagnetics. However, the dense linear systems that arise place a premium on accuracy per degree of freedom, making high-order methods and fast algorithms central components of efficient solvers. Recent developments, including high-order quadrature for near- and weakly-singular integrals, geometry-aware discretizations, fast direct solvers, and fast summation methods, have significantly expanded the range of tractable problems. Such challenges arise in problems with interfaces exhibiting high curvature, periodic structures, or near-contact between distinct components. This minisymposium will bring together researchers across these areas to highlight common challenges and emerging high-order integral equation methods for interface problems.

SPEAKERS

1. Jeremy Hoskins (University of Chicago)
Talk title: *Integral equation methods for elastic waves in floating sheets*
2. Andreas Klöckner (University of Illinois Urbana-Champaign)
Talk title: *Symbolic-numerical-asymptotic algorithms for the asymptotically fast evaluation of layer and volume potentials*
3. Anna-Karin Tornberg (KTH)
Talk title: *Quadrature for Boundary Integral Methods for 3D Viscous Drops*

4. Anna Broms (Imperial)
Talk title: *Brownian hydrodynamics of rigid-body suspensions with the method of fundamental solutions*
5. Manas Rachh (Indian Institute of Technology Bombay)
Talk title: *Quadrature by expansion on open surfaces*
6. Tristan Goodwill (University of Florida)
Talk title: *An integral equation method for fluid flow problems on surfaces.*
7. Zydrunas Gimbutas (National Institute of Standards and Technology)
Talk title: *Fast participation-ratio simulations for superconducting quantum devices*
8. David Hewett (University College London)
Talk title: *High order geometry-conforming methods for the Lippmann-Schwinger equation on fractal domains*
9. Alex Barnett (Flatiron Institute)
Talk title: *Rapid integral-form solution of oxygen perfusion in a network embedded in planar tissue*
10. Nour Al Hassanieh (Courant Institute)
Talk title: *Fast algorithm for 2D wave-equation scattering using windowed Fourier projection*
11. Fredrik Fryklund (KTH)
Talk title: *A Fourier-based solver for coupled systems of PDEs in complicated geometries.*
12. Bryan Quaife (Florida State University)
Talk title: *Boundary Integral Methods for Spectral Fractional Diffusion in Complex Geometries*