TEMPLE UNIVERSITY
Department of Mathematics

Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

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An Efficient Boundary Integral Method for Stiff 3D Interfacial Flow Problems

by Michael Siegel
New Jersey Institute of Technology

Abstract.

A nonstiff boundary integral method for 3D interfacial flow with surface tension or elastic membrane stress is presented, with applications to porous media flow, water waves, and hydroelastic waves. The velocity of the interface is given in terms of the Birkhoff-Rott integral, and we present a new method to compute this efficiently in doubly-periodic problems. The stiffness is removed by developing a small-scale decomposition in the spirit of prior work for 2D flow by Hou, Lowengrub and Shelley. In order to develop this small scale decomposition, we formulate the problem using a generalized isothermal parameterization of the free surface. We will also present preliminary work on a new version of the method which uses overlapping coordinate patches to describe the interface. This provides a framework for significant spatial adaptivity of the method.