

SPECIAL PHYSICAL MATHEMATICS SEMINAR

TOPIC: SECOND KIND INTEGRAL EQUATIONS FOR
SCATTERING BY OPEN SURFACES

SPEAKER: SHIDONG JIANG
Department of Computer Science
Yale University

ABSTRACT:

Integral equations have been one of principal tools for the numerical solution of scattering problems for more than 30 years, both in the Helmholtz and Maxwell environments. Historically, most of the equations used have been of the first kind, since numerical instabilities associated with such equations have not been critically important for the relatively small-scale problems that could be handled at the time.

The combination of improved hardware with the recent progress in the design of "fast" algorithms has changed the situation dramatically. Condition numbers of systems of linear algebraic equations resulting from the discretization of integral equations of potential theory have become critical, and the simplest way to limit such condition numbers is by starting with second kind integral equations. Hence, increasing interest in reducing scattering problems to systems of second kind integral equations on the boundaries of the scatterers.

During the last several years, satisfactory integral equation formulations have been constructed in both acoustic (Helmholtz equation) and electromagnetic (Maxwell's equations) environments, whenever all of the scattering surfaces are "closed" (i.e. scatterers have well-defined interiors, and have no infinitely thin parts).

In this talk, I will describe a stable second kind integral equation formulation for the Dirichlet problem for the Laplace and Helmholtz equations in two dimensions, with the boundary conditions specified on a collection of "open" curves; the numerical performance of the scheme will be illustrated with several numerical examples.

This is joint work with Prof. Vladimir Rokhlin at Yale University.

DATE: FRIDAY, MARCH 12, 2004

TIME: 2:30 PM

LOCATION: Building 2, Room 338

Refreshments at 3:30 PM in Room 2-349.

Massachusetts Institute of Technology, Department of Mathematics
Cambridge, MA 02139