TEMPLE UNIVERSITY MATHEMATICS COLLOQUIUM

Peter Monk
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will speak on

Forward and Inverse Electromagnetic Scattering

ABSTRACT: When electromagnetic waves impinge on an object, they are scattered by reflection, refraction and other mechanisms depending on the shape and properties of the scatterer. One the one hand, in a forward scattering problem, we are interested to compute the scattered field resulting from the interaction of a known object (the scatterer) and a known incident field. Such problems are usually well-posed and there is a great deal of theory and experience to guide numerical analysis in this area. On the other hand, electromagnetic waves are often used to try to determine properties of an inaccessible scatterer. This problem, in which the incident and resulting scattered field are known, but the scatterer, or it's electromagnetic properties, are unknown is termed an inverse scattering problem. Such problems are ill-posed and non-linear. In contrast to the forward problem, numerical methods and theory are much less well developed in this case

In this talk I shall start by presenting a discontinuous Galerkin method for approximating the forward problem in the frequency domain and discuss some of the issues that influence the choice of an algorithm. In particular I shall discuss the use of plane wave solutions of the Maxwell system as basis functions.

Switching to the inverse problem, I shall present a simple algorithm for approximating the shape of a scatterer from multi-static scattering data involving only the solution of linear ill-posed problems and show some computational results using synthetic forward data. I shall also briefly indicate how the same data can be used to reconstruct surface properties such as the impedance of a coated scatterer.

MONDAY, DECEMBER 5, 2005
LECTURE AT 4:00 PM (♯)
COFFEE, TEA, AND REFRESHMENTS FROM 3-5 PM.
ROOM 617, WACHMAN BUILDING
DEPARTMENT OF MATHEMATICS