Bounds on the stably recoverable information for the Helmholtz equation in R2

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Published in:
Applied Inverse Problems 2017

Publication date:
2017

Document Version
Publisher’s PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):
CT-2: Contributed talk, Session 2

Scheduled: TBA

Organizers: Valter Pohjola, University of Jyväskylä

Talks

1. Borg-Levinson theorems for unbounded potentials
   Valter Pohjola, University of Jyväskylä

   ABSTRACT. The Borg-Levinson problem consists of showing that Dirichlet eigenvalues
   and Neumann boundary data of the corresponding eigenfunctions of the operator $-\Delta + q$
   determine the potential $q$. We will discuss this result in the case where $q \in \mathcal{L}^{n/2}(\Omega, \mathbb{R})$
   and $n \geq 3$. We also discuss the case of incomplete spectral data, in the sense that the
   above spectral data is unknown for some finite number of eigenvalues. In this case we will
   consider potentials $q, q' \in \mathcal{L}^{p}(\Omega, \mathbb{R})$ with $p = n/2$, for $n \geq 4$ and $p > n/2$, for $n = 3$.

2. Edge detection in electrical impedance tomography
   Matteo Santacesaria, Politecnico di Milano

   ABSTRACT. In this talk we will present a new imaging method able to reconstruct discon-
   tinuities (e.g. edges of inclusions) of an electrical conductivity from boundary voltage and
   current measurements. The method combines the high contrast sensitivity of Electrical
   Impedance Tomography with improved spatial resolution obtained through introduction
   of a nonphysical (virtual) variable. This talk presents the theoretical background of the
   method as well as numerical reconstructions. This is a joint work with A. Greenleaf, M.
   Lassas, S. Siltanen and G. Uhlmann.

3. Bounds on the stably recoverable information for the Helmholtz equation in $\mathbb{R}^2$
   Mirza Karamehmedović, Technical University of Denmark

   ABSTRACT. Linearisation casts inverse boundary problems in terms of inverse source
   problems (ISP). For the ISP with the two-dimensional Helmholtz equation, the singular
   value decomposition of the forward operator reveals a sharp cutoff in the stably recoverable
   information. We prove and numerically validate lower and upper bounds on this cutoff.
   Our result explicitly links the amount of stably recoverable information with the size
   parameter of the problem and with the zeros of the Bessel functions $J_m$ and $Y_m$.

4. Semiclassical analysis of elastic surface waves
   Jian Zhai, Rice University

   ABSTRACT. We will give a semiclassical description of surface waves in a three-
   dimensional elastic medium, which is stratified near the boundary at some scale com-
   parable to the wave length. The analysis is based on the work of Colin de Verdiere on
   acoustic surface waves. The description is geometric on the surface and locally spectral
   “beneath”. Eigenvalues of some 1D differential operator are effective Hamiltonians for
   surface waves in semiclassical sense. We will give a study of those differential operators.
   Related inverse spectral problems will be discussed.