數學系
香港中文大學

Inverse Problems Seminar

Some new forward and inverse solvers for boundary value problems of Helmholtz equation

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Abstract

In this talk, we introduce our recent works on the forward and inverse problems on boundary value problems of Helmholtz equation, which is the partial differential equation that models the electromagnetic radiation, seismology and acoustics.

In the first part, we develop a meshless forward solver in two dimensions based on the conformal mapping theory. In particular, we present the computation scheme for the Laplacian eigenvalue and its shape derivative with a priori error bounds. Our method is based on the theories of boundary integral equations and complex function theory extended to operator-valued functions. This work began as a joint work (under peer review) with Prof. Lim and is being developed with the collaborators in SUNY, namely, Dr. Beceanu and Prof. Kwon.

In the second part, we consider the inverse scattering problem with partial data, which is a highly ill-posed problem. We aim to reconstruct the shape of the sound-soft target using monostatic farfield measurements. We present a new imaging method based on the Markov chain Monte Carlo sampling. We improve the performance by introducing new shape parameters and optimizing the radius of the initial disk for the iterative scheme in advance. This is an ongoing joint work with Prof. Lim and Dr. Kang. Rather than going into details on this work, focus will be given on possible future directions.

Date: August 14, 2023 (Monday)
Time: 2:00pm – 3:00pm (Hong Kong Time)
Venue: LSB 222, CUHK

All are Welcome