Multilevel Linear Sampling Method for Inverse Obstacle Scattering

Hongyu Liu
Department of Mathematics
The Chinese University of Hong Kong
Shatin, N.T., Hong Kong

Abstract

In this talk, we will be mainly concerned with a novel multilevel linear sampling method (MLSM) for reconstructing the obstacle from its corresponding scattering amplitude. The new method is shown to possess asymptotically optimal computational complexity. For an $n \times n$ sampling mesh in $\mathbb{R}^2$ or an $n \times n \times n$ sampling mesh in $\mathbb{R}^3$, the proposed algorithm requires to solve only $\mathcal{O}(n^{N-1})$ far-field equations for a $\mathbb{R}^N$ problem (N=2,3), and this is in sharp contrast to the original version of the method which needs to solve n^N far-field equations. Numerical experiments are presented to illustrate the promising feature of the algorithm in significantly reducing the computational cost of the linear sampling method. We also introduce some novel technique on avoiding the interior eigenvalue problem and selection of cut-off values in the method.