Inverse Problems

A simple method for solving inverse scattering problems in the resonance region

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Abstract

This paper is concerned with the development of an inversion scheme for two-dimensional inverse scattering problems in the resonance region which does not use nonlinear optimization methods and is relatively independent of the geometry and physical properties of the scatterer. It is assumed that the far field pattern $u_\infty(\varphi;\theta)$ *corresponding to observation angle* φ *and plane waves incident at angle* θ *is known for all* $\varphi,\theta\in[-\pi,\pi]$. *From this information, the support of the scattering obstacle is obtained by solving the integral equation*

$$\int_{-\pi}^{\pi} u_\infty(\varphi;\theta)g(\theta)\,d\theta = e^{-ikp\cos(\varphi-\alpha)} \qquad \varphi\in[-\pi,\pi]$$

where k is the wavenumber and $y_0=(p\cos\alpha,\,p\sin\alpha)$ *is on a rectangular grid containing the scatterer. The support is found by noting that* $\|g\|_{L^2(-\pi,\pi)}$ *is unbounded as* y_0 *approaches the boundary of the scattering object from inside the scatterer. Numerical examples are given showing the practicality of this method.*

Introduction to inverse problems in imaging, a dream, in contrast to the classical case, multifaceted begins black ale.

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