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Iterative Methods In Inverse Obstacle Scattering Revisited

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Abstract

The inverse problem we consider is to determine the shape of an obstacle from the knowledge of the far field pattern for scattering of time-harmonic plane waves. For the sake of simplicity, we will concentrate on the case of scattering from a sound-soft obstacle or a perfect conductor. After reviewing some basics, we will interpret Huygens' principle as a system of two integral equations, named data and field equation, for the unknown boundary of the scatterer and the induced surface flux. Reflecting the ill-posedness of the inverse obstacle scattering problem these integral equations are ill-posed. They are linear with respect to the unknown flux and nonlinear with respect to the unknown boundary and offer, in principle, three immediate possibilities for their iterative solution via linearization and regularization.

We will discuss the mathematical foundations of these algorithms and describe the main ideas of their numerical implementation. Further, we will illuminate various relations between them and exhibit connections and differences to the traditional regularized Newton type iterations as applied to the boundary to far field map. Numerical results in 3D are presented.

Date : Monday, June 18, 2012

Time: 11:00

Place: IMBM Seminar Room, Boğaziçi University South Campus