Bio: Dr. Yu Zhong received his B.S. and M.S. degrees in electronic engineering from Zhejiang University, Hangzhou, China, in 2003 and 2006, respectively, and the Ph.D. degree from the National University of Singapore, Singapore, in 2010.

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Talk 1: PDE-based inversion method with no forward solver for inverse medium scattering problems

A new partial differential equation (PDE) based inversion method for inverse medium scattering problems is proposed in this talk, which does not need to solve any forward problem. The proposed method is the subspace-based optimization method (SOM) in the differential-equation frame. The finite difference scheme is used to discretized the Helmholtz equation, and the twofold subspace-based regularization scheme, as in the integral equation based SOM, is applied in this PDE-based inversion method to stabilize the solver. By using such a PDE-based inversion method, the Green's funciton for the domain of interests is no longer needed. Representative numerical tests are presented to verify the efficacy of the proposed method.

Talk 2: New integral equation and new partial differential equation for inverse medium scattering problems with strong scatterers

In this talk, we propose two new equations, an integral equation (IE) and a partial differential equation (PDE), for solving inverse medium scattering problems (IMSP) with strong scatterers. First, we present a new integral equation, which could effectively reduce the globle wave contribution in estimating the contrast (the difference between permittivities of the scatterers and the known background) compared to the original Lippmann-Schwinger equation. Using such a new IE in the IE-based inversion method one is able to solve the highly nonlinear IMSP with strong scatterers. Subsequently, the connection between the PDE-based inversion method (in Talk 1), using the Helmholtz equation, and the conventional IE based inversion method, using the Lippmann-Schwinger equation, is discussed. With such a connection and the new IE, we propose a new PDE, using which the PDE-based inversion method can also solve the highly nonlinear IMSP. At last, we discuss the pros and cons of both PDE- and IE-based inversion methods.