FSM1S_12717

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Frequency- and Directionality- Continuation Schemes for Scatterer Shape Detection in Acoustics

Seong-Won Na, **Loukas F. Kallivokas**

Department of Civil Engineering, The University of Texas at Austin, Austin, USA

In this paper we discuss continuation schemes for detecting the location and shape of rigid scatterers embedded in a host acoustic medium when considering scant measurements of the scattered acoustic pressure in the region exterior to the scatterer (near- or far-field). Underlying the inversion process are frequency- and directionality-continuation iterative schemes that allow robust determination of the unknown shape using a small number of frequencies and directions of the probing insonifying waves. The methodology is based on boundary integral equation for the solution of the forward problem. The scattered pressure is measured only in the backscatter region and at receiver locations that do not circumscribe the sought scatterer. Several numerical results are presented, both for parametrically defined shapes (e.g. circle, ellipse, etc), as well as for penny-shaped scatterers and completely arbitrary geometries. For the latter cases, conditions for non-self-intersecting shapes complement the numerical implementation to allow for the recovery of the nodal coordinates of the meshed scatterer boundary.

View the extended summary