Wave splitting for multiple obstacle reconstruction

Roland Potthast

,

r.w.e.potthast@reading.ac.uk

Abstract

We study wave splitting procedures for acoustic or electromagnetic scattering problems. The idea of these procedures is to split some scattered field into a sum of fields coming from different spatial regions such that this information can be used either for inversion algorithms or for active noise control.

Splitting algorithms can be based on general boundary layer potential representation or Green's representation formula. We will prove the unique decomposition of scattered wave outside the specified reference domain G and the unique decomposition of far-field pattern with respect to different reference domain G. Further, we employ the splitting technique for field reconstruction for a scatterer with two or more separate components, by combining it with the point source method for wave recovery. Using the decomposition of scattered wave as well as its far-field pattern, the wave splitting procedure proposed in this paper gives an efficient way to the computation of scattered wave near the obstacle, from which the multiple obstacles which cause the far-field pattern can be reconstructed separately. This considerably extends the range of the decomposition methods in the area of inverse scattering. Finally, we will provide numerical examples to prove the feasibility of the splitting method.