Contribution ID: **100** Type: **Minisymposium Contribution**

The temporal domain derivative and shape reconstruction in inverse acoustic scattering

Tuesday, August 13, 2024 11:00 AM (30 minutes)

Domain derivatives have been studied for a variety of time-harmonic scattering problems featuring different partial differential equations, boundary conditions and geometrical configurations.
The aim of this presentation is to establish the temporal domain derivative for the acoustic wave equation when a sound-soft scattering object is present.
In our analysis we proceed through the Laplace domain, in which we derive bounds for the frequency-domain shape derivative expressed in terms of powers of the frequency.
Performing an inverse Laplace transform turns these powers into time regularity requirements guaranteeing the existence of the temporal domain derivative.
In our inverse problem the aim is to reconstruct the scattering object from temporal measurements of the scattered wave at a finite set of observation points that are situated away from the scattering object.
For this purpose we employ a Gauß-Newton scheme, in which we use the Runge-Kutta convolution quadrature method to approximate both the forward map and the temporal domain derivative. This guarantees an efficient time integration scheme.
We provide numerical examples for the two-dimensional wave equation that highlight the efficacy of our approach.

Author: KNÖLLER, Marvin

Co-author: NICK, Jörg

Presenter: KNÖLLER, Marvin

Session Classification: MS 10: Inverse Problems for Partial Differential Equations

Track Classification: Minisymposia: MS 10: Inverse Problems for Partial Differential Equations