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Obstacle Identification using the TRAC Algorithm

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We consider obstacle identification using wave propagation. In such problems one wants to find the location and shape of an unknown obstacle from given measurements. We propose an algorithm for the identification task based on a time-reversed absorbing condition (TRAC) technique [1]. Here we apply the TRAC method to time-dependent linear acoustics, although our methodology can be applied to other wave-related problems as well, such as elastodynamics. There are two main contributions of our identification algorithm. The first contribution is a robust and effective method for the localization of the obstacle. While the original application of the TRAC for obstacle identification used a trial and error procedure, we present an algorithm for an automatic localization of the obstacle. The second contribution is the utilization of an improved absorbing boundary condition for the identification process. We use the second-order Engquist-Magda absorbing boundary condition, and we implement it with a finite element scheme. Numerical experiments for the algorithms are presented, employing finite elements in space and an explicit marching scheme in time.

REFERENCES

[1] F. Assous, M. Kray, F. Nataf and E. Turkel, Time-reversed absorbing condition: application to inverse problems. *Inverse Problems* **27**, p. 065003, 2011.