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ON THE CONDITIONAL STABILITY OF THE RECONSTRUCTION OF CHARACTERISTIC SOURCES IN HELMHOLTZ EQUATIONS

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ABSTRACT

This work focuses on the conditional stability in the reconstruction of characteristic sources in Helmholtz equations from boundary data, assuming the existence and uniqueness of this reconstruction. The direct problem for this equation, with Dirichlet boundary conditions, is solved using the Method of Fundamental Solutions. The obtained solution generates the corresponding Neumann data, and from this data, the Levenberg-Marquardt method is applied to estimate the parameters in the Fourier expansion of the boundary that best approximates the original boundary. In this context, the stability of the inverse problem consists of verifying whether, even when starting from initial data with measurement errors, it is possible to approximate the support of the original characteristic source by comparing the measured data with the one obtained through the Levenberg-Marquardt method. When an additional condition is assumed in this stability problem, we refer to it as a conditional stability problem. Therefore, we prove a new conditional stability result in L^1 between the Neumann data and the boundary parametrization, assuming a separation condition on the boundary of two characteristic sources. Numerical experiments are presented.

Keywords: Conditional Stability. Inverse Problem. Helmholtz equation.

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