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THE FACTORIZATION METHOD FOR A CONDUCTIVE BOUNDARY CONDITION

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ABSTRACT. In this article, the inverse scattering problem for obstacles with conductive boundary conditions is considered. The problem at hand is solved with the factorization method; that is, the operator and its factorization is derived. To obtain generic far field data for several obstacles, the boundary element method is employed to solve the integral equation numerically. The far field data are highly accurate due to superconvergence. Finally, we show that we are able to reconstruct several obstacles and thus confirm the validity of the new operator factorization.

1. Introduction. In this section, we first describe the problem at hand; that is, scattering from obstacles on which we impose conductive boundary conditions. We describe the boundary integral equation to obtain the far field pattern for a given obstacle and a given incident wave. In the next section, the boundary element collocation method is reviewed to evaluate the far field numerically. Now, the purpose is to reconstruct the obstacles from the knowledge of these generic far field data. This goal is achieved with the factorization method. Therefore, we derive the factorization of our operator in Section 3. Several reconstructions are presented in Section 4 to show that the numerical results are in agreement with the theory. Some interesting facts are observed.

To start with, let $D \subset \mathbf{R}^3$ be a finite union of bounded domains such that the exterior is connected. Furthermore, let $\kappa > 0$ be the wave number, $\lambda \in C(\partial D)$ (or only $\lambda \in L^\infty(\partial D)$) such that $\lambda \geq 0$ on ∂D and $\widehat{\theta} \in S^2$ (the unit sphere in $\mathbf{R}^3$). The time harmonic scalar scattering problem for a conductive boundary value problem has the following form. Given the incident field

$$u^{inc}(x) = \mathrm{e}^{\mathrm{i}\kappa\,\hat{\theta}\cdot x}, \quad x \in \mathbf{R}^3,$$

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