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NEWTON'S METHOD FOR INVERSE OBSTACLE SCATTERING OF BURIED OBJECTS

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This paper is dedicated to Professor Rainer Kress on the occasion of his 65th birthday.

ABSTRACT. A Newton method to reconstruct the shape of a buried sound soft object through the measured far-field scattering data is given. The scattered field is represented as a single-layer potential which leads to an ill-posed integral equation of the first kind that is solved via Tikhonov regularization. The presented Newton based method combines ideas of both the iterative and decomposition methods and inherits the advantages of each of them, such as getting good reconstructions and not requiring a forward solver at each step. The numerical results show that the method yields good reconstruction.

1. Introduction. Inverse scattering of waves is a fundamental principle of applications such as radar and sonar techniques, nondestructive evaluation, geophysical exploration and medical imaging. In principle, in these applications, the effects of scattering objects on the propagation of the waves are exploited to obtain some information about the unknown object. As opposed to classical techniques of imaging such as computerized tomography, which are based on the fact that X rays travel along straight lines, inverse scattering problems take into account that the propagation of acoustic, electromagnetic and elastic waves has to be modeled by a wave equation. This means that inverse scattering requires a nonlinear model, whereas inverse tomography does linear.

The detection and identification of buried objects using electromagnetic waves are the areas of current importance for applications in remote sensing. The considered problem has practical applications such as detection of underground mines, pipes and cables. Most papers con-

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