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ELECTRICAL IMPEDANCE TOMOGRAPHY WITH POINT ELECTRODES

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Dedicated to Charles Groetsch for
his contributions to integral equations and inverse problems

ABSTRACT. We consider the two-dimensional inverse electrical impedance problem in the case of piecewise constant conductivities with the currents injected at adjacent point electrodes and the resulting voltages measured between the remaining electrodes. Our approach is based on nonlinear integral equations for the unknown shape of an inclusion with conductivity different from the background conductivity. It extends a method that has been suggested by Kress and Rundell [**7**] for the case of a perfectly conducting inclusion. We describe the method in detail and illustrate its feasibility by numerical examples.

1. Introduction. Electrical impedance tomography creates images of the electrical conductivity of a medium by applying currents at a number of electrodes at the boundary and measuring resulting voltages. If $\Omega \subset \mathbf{R}^2$ is a simply connected bounded domain representing the conducting medium, the electric potential u satisfies the potential equation

$$\operatorname{div} \sigma \operatorname{grad} u = 0 \quad \text{in } \Omega$$

with a strictly positive L^∞ function σ representing the isotropic conductivity in Ω. In the classical model, imposing currents on the boundary $\partial\Omega$ is described via a Neumann boundary condition

$$\sigma \frac{\partial u}{\partial \nu} = f \quad \text{on } \partial\Omega$$

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