Local recovery of a piecewise constant anisotropic conductivity in EIT on domains with exposed corners

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Abstract

We study the local recovery of an unknown piecewise constant anisotropic conductivity in EIT (electric impedance tomography) on certain bounded Lipschitz domains Ω in $\mathbb{R}^2$ with corners. The measurement is conducted on a connected open subset of the boundary $\partial\Omega$ of Ω containing corners and is given as a localized Neumann-to-Dirichlet map. The above unknown conductivity is defined via a decomposition of Ω into polygonal cells. Specifically, we consider a parallelogram-based decomposition and a trapezoid-based decomposition. We assume that the decomposition is known, but the conductivity on each cell is unknown. We prove that the local recovery is almost surely true near a known piecewise constant anisotropic conductivity γ_0. We do so by proving that the injectivity of the Fréchet derivative $F'(\gamma_0)$ of the forward map F, say, at γ_0 is almost surely true. The proof presented, here, involves defining different classes of decompositions for γ_0 and a perturbation or contrast H in a proper way so that we can find in the interior of a cell for γ_0 exposed single or double corners of a cell of supp$H$ for the former decomposition and latter decomposition, respectively. Then, by adapting the usual proof near such corners, we establish the aforementioned injectivity.

This is based on joint work [1] with Maarten V. de Hoop, Ching-Lung Lin, Gen Nakamura, and Manmohan Vashisth.

References

[1] M. V. de Hoop, T. Furuya, C. L. Lin, G. Nakamura, M. Vashisth, "Local recovery of a piecewise constant anisotropic conductivity in EIT on domains with exposed corners", arXiv:2202.06739, (2022).