

STABILITY OF SOLUTIONS TO A BOUNDARY IDENTIFICATION PROBLEM FOR THE LAPLACE EQUATION

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The paper addresses an inverse geometric problem for the Laplace equation which we could interpret as concerning steady-state heat conduction or electrical potential fields. Given the function and its outward normal derivative along a part of the domain boundary, the unknown part of the domain boundary has to be determined from a given boundary condition on it. The present approach proposes a boundary reconstruction algorithm in which the solution to the Laplace equation is obtained with the Trefftz method. Unlike in the reference papers [1–3], where stability analysis is limited to assessing the impact of noisy measurements on the boundary reconstruction, we make use of analyticity of Trefftz-type solutions to perform a more detailed discussion of numerical stability. The approach sheds new light on tests of boundary identification algorithms through numerical simulations based on a known exact solution to the governing equation. Additionally, the present approach allows for estimating accuracy of the boundary reconstruction.

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