

On the problem of crack detection from electrical measurements

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Abstract: We investigate solution methods for the problem of crack detection in bounded planar domains from electrical measurements on the boundary.

Based on the multiple level-set approach introduced in [1] and on the regularization strategy devised in [2], we propose a Tikhonov type method for stabilizing the inverse problem. Convergence and stability results for this Tikhonov method are proven.

An iterative method of (multiple) level-set type is derived from the optimality conditions for the Tikhonov functional, and a relation between this method and the iterated Tikhonov method is established.

Numerical experiments demonstrate the ability of our method to identify cracks in different scenarios with high accuracy even in the presence of noise.

References

- [1] D.Álvarez, O.Dorn, N.Irishina, and M.Moscoso, Crack reconstruction using a level-set strategy, *J. Comput. Phys.* 228 (2009), no. 16, 5710–5721
- [2] A.DeCezaro, A.Leitao, and X.-C.Tai, On multiple level-set regularization methods for inverse problems, *Inverse Problems* 25 (2009), 035004