

Total Variation Regularization of Multi-material Topology Optimization

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Abstract: This work is concerned with the determination of the diffusion coefficient from distributed data of the state. A novel approach is proposed which involves total variation regularization combined with a suitably chosen cost functional that promotes the diffusion coefficient assuming preassigned values. The main difficulty lies in the delicate functional-analytic structure of the resulting non-differentiable optimization problem with pointwise constraints for functions of bounded variation, which makes the derivation of useful pointwise optimality conditions challenging. To cope with this difficulty, a novel reparametrization technique is introduced. Numerical examples using a regularized semismooth Newton method illustrate the structure of the obtained diffusion coefficient.

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