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Shape optimization with imperfect interfaces

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Abstract

Motivated by the optimization of supports for structures built by additive manufacturing techniques [1], we study shape optimization problems for two different materials separated by an imperfect interface. For example, in the context of a diffusion equation, the interface, separating two phases, is imperfect in the sense that the solution is discontinuous while the normal flux is continuous and proportional to the jump of the solution. For a two-phase optimal design problem the shape derivative of an objective function with respect to the interface position is computed by the adjoint method [2]. Numerical experiments are performed with the level set method and an exact remeshing algorithm so that the interface is captured by the mesh at each optimization iteration. Comparisons with a perfect interface are discussed in the setting of optimal design or inverse problems. Some applications to support optimization for additive manufacturing will be shown.

Joint work with:
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References

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