

## **Shape optimization by pursuing diffeomorphisms**

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We develop an algorithm that allows to tackle PDE constrained shape optimization problems in the framework of finite element discretization of the underlying boundary value problem. The key idea is to identify shapes with diffeomorphisms and reformulate shape optimization problems so that all computations can be performed on an initial mesh. Then, we discretize deformation diffeomorphisms with B-splines and present an optimization algorithm based on superconvergent domain integral expressions of shape gradients. We discuss theoretical aspects of this approach and provide numerical evidence of its performance on well-posed test cases. Finally, we show how the method has been used to improve the design of microlenses.