

A Trust-Region Method for p -Harmonic Shape Optimization

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Recent developments in shape optimization showed improved results by using descent directions in Banach spaces, in particular by a p -harmonic approach. Here, for each outer iteration a corresponding vector-valued p -Laplace problem with boundary forcing has to be solved for possibly high-order p . Therefore, we work with an algorithm based on an interior-point method that does not require an iteration over increasing p . Extending this, we aim to also reduce the number of outer iterations and thus calls of the algorithm by proposing a trust-region method. Due to the structure of the algorithm, we are able to introduce a constraint on the gradient naturally. This results in a deformation field which fulfills a trust-region-radius in terms of the seminorm. Consequently, no further scaling during the mesh deformation process is required and potential backtracking is avoided. Moreover, in contrast to methods based on sensitivity scaling, the resulting scaling of the deformation field does not depend on the order p and also holds when considering the limit setting.