An explicit feature control approach in structural topology optimization

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Abstract

The present paper aims to address a long-standing and challenging problem in structural topology optimization: explicit feature control of the optimal topology. The basic idea is to introduce feature control constraints which are closely related to structural skeleton, which is a key concept in mathematical morphology and a powerful tool for describing structural topologies. Benefit from the ability of structural skeleton in geometrical and topological properties of the shape, the feature control constraints can be represented as local and explicit scheme without any post-processing. To illustrate the effectiveness of the proposed approach, the feature control problem is solved under level set and SIMP framework, respectively. Numerical examples show that the proposed approach does have the capability to give a complete control of the feature size of an optimal structure in an explicit and local way.

Keywords: topology optimization; feature control; level-set; SIMP; structural skeleton.