Doing Topology Optimization Explicitly and Geometrically—A New Moving Morphable Components Based Framework

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Abstract

In the present work, we intend to demonstrate how to do topology optimization in an explicit and geometrical way. To this end, a new computational framework for structural topology optimization based on the concept of moving morphable components is proposed. Unlike in the traditional solution frameworks, where topology optimization is achieved by eliminating unnecessary materials from the design domain or evolving the structural boundaries, optimal structural topology is obtained by optimizing the layout of morphable structural components in the proposed approach. One of the advantages of the proposed approach, which may have great potential in engineering applications, is that it can integrate the size, shape, and topology optimization in CAD modeling systems seamlessly. The approach can combine both the advantages of explicit and implicit geometry descriptions for topology optimization. It also has the great potential to reduce the computational burden associated with topology optimization substantially. Some representative examples are presented to illustrate the effectiveness of the proposed approach.

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