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The Integration of Explicit and Implicit Models in Topology Optimization

Jian Zhang [1], Xu Guo [1], Weisheng Zhang[1], and Wenliang Zhong [1]

[1] Dalian University of Technology, Dalian, China

Abstract

In the present work, we intend to demonstrate a new topology optimization approach combining both the explicit and implicit geometric models in the solution process. To this end, we resort to the moving morphable component approach proposed in [5], which is fundamentally different from the existing topology optimization approaches. In the proposed method, the geometry of every structural component is described explicitly by a Bezier Spline, which represents the shape of its skeleton and some thickness variables. At the same time, the boundary of each component can be traced implicitly by a level set function. The optimal topology can then be found by optimizing the layout and the shape parameters of the structural components simultaneously. The proposed method has great potential to share the merits of both Lagrangian and Eulerian topology optimization approaches and a natural link with the CAD modeling systems. Numerical examples illustrate the effectiveness of the approach. It is shown that the presented approach is a very attractive method for solving topology optimization problems in a computationally effective and explicit way.

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