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ABSTRACT

Topology Optimization with Stress Constraints using the Augmented Lagrangian Method: A Comparative Analysis of Optimization Strategies

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Incorporating stress constraints in topology optimization is a challenging task, especially due to the large number of stress constraints involved in the formulation. Despite this, there are some strategies that can be employed to solve the problem efficiently. One of these strategies is the augmented Lagrangian method, which transforms the original constrained optimization problem into a sequence of optimization subproblems with only bound constraints. A key question when using the augmented Lagrangian method is how to solve its optimization subproblems efficiently. This work addresses this issue by performing a comparative study of different optimization methods for solving the augmented Lagrangian subproblems. In total, six optimization methods are compared in terms of efficiency, performance, and mesh dependence. The numerical results show that the choice of method to solve the optimization subproblems has a significant impact on the efficiency of the augmented Lagrangian method, and on both performance and mesh dependence of the optimized results. Furthermore, we identified the most effective methods in terms of performance and efficiency, and which are the most promising in solving large-scale problems with stress constraints.