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基于移动渐近线方法的结构多刚度拓扑优化设计

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Topological Optimization Design for Multiple Stiffness Structures Using Method of Moving Asymptotes

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摘要 基于人工密度指数法,结合序列分层优化方法和折衷规划法,提出并建立了一种求解复杂工况下连续体结构多刚度拓扑优化设计问题的多目标混合优化策略。连续体结构的多刚度拓扑优化设计问题本质上是一种非线性数学规划问题,以数学规划方法中的移动渐近线方法为基础,提出一种具有较佳全局收敛性和单调性特点的序列凸规划近似方法,该法对于目标函数复杂和多约束的拓扑优化问题具有更好的适定性。通过典型的数值算例证明了所研究方法的有效性。

关键词： 结构拓扑优化 多刚度 多目标规划 数学规划 移动渐近线方法

Abstract： A hybrid multi-objective programming scheme for multi-stiffness continuum topology optimization subject to complex loading cases has been proposed and developed in this paper by using artificial power law, in which sequential hierarchical optimization method and compromising programming method are combined. Multi-stiffness topological optimizations are actually nonlinear mathematical programming problems. A mathematical programming method with globally convergent and monotonous characteristics is presented based on convex approximations of the method of moving asymptotes, which is theoretically well-founded for advanced topology optimizations with complicated objectives and multiple constraints. Numerical application is applied to demonstrate the validity of the presented methodologies.

Keywords： structural topology optimization multiple stiffness multi-objective programming mathematical programming method of moving asymptotes

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