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## 基于近似技术的协同优化方法在机翼设计优化中的应用

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## Application of Collaborative Optimization Based on Approximate Methods in Wing Design Optimization

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**摘要** 将多学科设计协同优化方法与近似技术相结合,实现某机翼涉及结构和气动两个学科的设计优化。在对某机翼的协同优化设计中,采用基于均匀设计的二次响应面技术得到近似的协同优化模型,利用基于动态松弛近似的协同优化得到合理的结果。研究表明,将协同优化方法与近似技术相结合,能够有效地解决复杂工程的设计优化问题。

**关键词:** 多学科设计优化　协同优化　系统级一致性约束　目标变量　近似技术　动态松弛　均匀设计

Abstract: Collaborative optimization (CO) is an effective and non-hierarchical multidisciplinary design architecture that is well-suited to large-scale multidisciplinary design optimization (MDO). CO and approximate technology are combined to carry out a wing structure/aerodynamics design optimization. According to CO, how to solve the system-level optimization with compatibility equation constraints is the key problem. Before convergence, disagreement among disciplinary optimums is dynamic. Therefore, dynamic slack method is introduced. It regards the optimums' discrepancy (almost 2 norm) among disciplinary as a slack factor, which can translate the system-level compatibility constraints into inequality constraints. By this way, CO is more robust. The CO mathematical model of wing design is established and the model is approximated using quadratic response surface based on uniform design. Then using CO based on dynamic slack method, the reasonable results are acquired. It indicates that CO combined with approximate technology can effectively solve complex engineering design optimization problem.

Keywords: MDO　CO　system-level compatibility constraint　target variables　approximate technology　dynamic slave　uniform design

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