基于最大波动分析的稳健设计

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关键词： 最大波动分析 目标函数稳健性 约束可行性 稳健设计

摘 要： 针对稳健设计中目标函数以及约束的稳健性两个方面，提出了一种基于最大波动分析的稳健设计优化方法。通过分析不确定因素对目标函数以及约束的影响，计算目标函数以及约束的最大波动量，将约束的最大波动值添加到原约束中以保证约束的稳健可行性；同时在原有优化模型上添加新约束保证目标函数的最大波动值不超过设计者规定的范围，从而构造了两级稳健设计优化数学模型。顶级优化用来求解原有常规优化的数学模型；次级优化用来判断目标函数以及约束的稳健性。 最终实例结果证明该方法是可行的。 In view of robustness of objective function and constraints in robust design, a new robust design method based on maximal variation analysis was proposed. Firstly, the principle of variations which have been generated in objective functions and constraints by considering the uncertain factors in design variables and design parameters were analyzed, then the maximal variations of objective function and constrains were estimated by using maximal variation analysis. The maximal variations of constraints were added to original constraints to guarantee feasibility of constraints; a new constraint has been added to original optimization problem to ensure the variation of objective function was less than the value which designer set, and then a bi-level mathematical optimal model was constructed. The top-level optimization was used to solve the original mathematical model; the lower-level optimization was used to judge the robustness of objective function and constraints. Example results showed that the proposed approach is feasible.

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