用于确定性计算仿真的响应面法及其试验设计研究

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Response Surface Method and Its Experimental Design for Deterministic Computer Simulation

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摘要 确定性计算仿真在科学研究和工程技术中的应用非常广泛。为精确有效地计算系统多个响应特征对不同自变量的响应,基于试验设计的响应面法就是一个行之有效的方法。该方法能够求解较大规模的优化设计、结构可靠性分析、模型修正和模型确认等问题,并可以全面掌握系统响应特征的变化。本文围绕如何获得高阶高精度的响应面问题进行了研究,把几种现代试验设计方法做了改进和发展,成功应用于确定性计算仿真,使用多个典型算例与全因子试验设计进行了比较,得到了满意的结果,算例的设计变量达16个,响应面模型的阶次达15阶。

关键词: 确定性计算仿真　响应面法　试验设计　D-最优设计　中心点复合设计

Abstract: Deterministic computer simulation is widely used in science and technology. In order to illustrate the relationship between parameters and response features, Design of Experiment (DOE) based Response Surface(RS) method can be employed. This method can deal with large scale models used in design optimization, model updating and model validation. In this article, some modern DOE are introduced and developed to construct high order RS models. The proposed method is verified by studying several typical nonlinear test problems and FEA examples. The number of factors can be more than 16, and the order of the RS model can be more than 15.

Keywords: deterministic computer simulation　response surface　design of experiment　D-optimal design　central composite design

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