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系统工程

基于非信息超先验的Bayesian Kriging元建模算法

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摘要：

计算机试验引入近似建模的思想，使其广泛地用于复杂物理系统。针对计算机试验中的近似建模问题,基于Jeffreys非信息超先验为Kriging 模型的相关参数赋予了多层先验约束，提出了一种有效的Bayesian元建模方法，并且利用期望最大化算法对相关参数进行数值求解。新方法在本质上属于惩罚似然方法，但是它不含有任何需要调整或者估计的参数。将之与国际上已有的几种方法进行了比较，实验结果显示新方法不仅能够取得较高的元建模精度，而且能够大大降低计算复杂度。

关键词： 计算机实验 近似建模 Jeffreys 先验 Kriging 模型

Bayesian meta modeling for Kriging utilizing noninformative hyper prior

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Abstract:

Computer experiments introduce the fundamental idea of building a metamodel of its simulation model, which has widely used for complex physical systems. The paper proposes a novel Bayesian meta modeling approach for computer experiments. It imposes a hierarchical prior on the correlation parameters in Kriging based on Jeffreys' noninformative hyper prior, and is solved by the expectation maximization (EM) algorithm. Though the new approach is essentially a penalized likelihood method, it does not involve any parameters to be adjusted or estimated. Compared with several other methods in literature, experimental results show that the new approach not only yields state of the art performance, but also has much low computational cost.

Keywords: computer experiment meta modeling Jeffreys' prior Kriging model

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