工程力学
ENGINEERING MECHANICS
ISSN 1000-4750
CN 11-2595/O3
CODEN GOLIEB
Ei 收录期刊

» 2012, Vol. 29 » Issue (4): 90-95 DOI:

基于Kriging代理模型的多点加点序列优化方法

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A SEQUENTIAL OPTIMIZATION METHOD WITH MULTI-POINT SAMPLING CRITERION BASED ON KRIGING SURROGATE MODEL

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全文: PDF (702 KB) HTML (1 KB) 输出: BibTeX | EndNote (RIS) 背景资料

摘要 基于Kriging 代理模型提出了一种同时考虑预测响应值及其不确定性的多点加点准则,并基于该准则发展了一套序列近似优化方法。多点加点准则基于初始样本信息和所预测的对象函数特征增加新样本集,以在寻优迭代过程中自适应地提高代理模型的精度。该文方法依据多点加点准则在一次迭代中增加多个空间无关的新样本点,适用于多机同时计算或并行计算,从而提高计算效率。以两个经典的数学函数为例,将该优化方法与期望提高准则方法进行了比较,结果表明该文提出的优化方法能够有效地提高最优解的全局性。将方法用于一盒式注塑件的成型工艺优化设计,优化结果也表明了该方法的有效性。

关键词: Kriging 代理模型 序列优化 加点准则 注塑成型

Abstract: A multi-point sampling criterion considering the predictor and its uncertainty simultaneously is proposed based on Kriging surrogate model, and a kind of sequential approximation optimization method is developed. Multi-point sampling criterion is used to add the new samples by considering the distribution of the initial samples and the characteristics of the predicted objective function. The proposed method selects more than one new sample point for each optimization iteration, thus it can be performed by parallel computation or multi-computer runs which improves the computational efficiency distinctly. Take tow typical mathematical functions as examples, the proposed method is compared with expected improvement criterion and the results show the proposed method can effectively search the global optimum. The proposed optimization method is used to optimize injection molding process for a box-shape part, and the optimization result shows the method is effective for the reduction of warpage.

Key words: Kriging surrogate model sequential optimization sampling criterion injection molding

收稿日期: 2010-10-28;

PACS:

通讯作者: 高月华

引用本文:

高月华,王希诚. 基于Kriging代理模型的多点加点序列优化方法[J]. , 2012, 29(4): 90-95.

GAO Yue-hua,WANG Xi-cheng. A SEQUENTIAL OPTIMIZATION METHOD WITH MULTI-POINT SAMPLING CRITERION BASED ON KRIGING SURROGATE MODEL[J]. Engineering Mechanics, 2012, 29(4): 90-95.

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