

过程系统工程

高斯过程及其在软测量建模中的应用

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摘要

结合工业萘初馏塔关键质量指标估计问题,提出了采用高斯过程(GP)建立复杂工业过程软测量方法。将自动相关确定(ARD)原理与GP模型结合进行软测量模型辅助变量选择,通过建立GP软测量模型,同时得到关键质量指标估计值和相应的预测不确定度,有效解决了现有软测量建模方法不能给出估计值的测量不确定度的问题。研究表明,GP软测量模型不仅能自动选择辅助变量,而且还具有较高的估计精度和较小的测量不确定度,能够更好地满足工业现场对测量可靠性的要求。

关键词 [高斯过程](#) [测量不确定度](#) [软测量](#) [建模](#)

分类号

Gaussian process and its application to soft-sensor modeling

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Abstract

With the estimation of key quality index in an industrial naphthalene distillation column, a novel soft-sensor modeling method based on Gaussian process (GP) was proposed for complex industrial processes. The principle of automatic relevance determination, implemented with GP model, was proposed to determine the secondary variables for the soft-sensor. To overcome the shortcomings existing in present methods, which can not determine the measurement uncertainty of soft-sensors, the GP based soft-sensor was developed to get both the prediction of key quality index and its measurement uncertainty simultaneously. Application studies showed that the GP soft sensor model not only determined the secondary variable automatically, but also possessed both high accuracy and small measurement uncertainty, which met the demands for reliable measurements in industrial application.

Key words

[Gaussian process](#) [measurement uncertainty](#) [soft-sensor](#) [modeling](#)

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