

过程系统工程

## 基于辅助变量KNN分析的软测量建模方法

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摘要

提出一种基于辅助变量最近邻(KNN)分析的软测量建模方法, 该方法将KNN算法应用于辅助变量分类, 根据分类结果, 应用核主成分分析(KPCA)和支持向量回归机(SVR)相结合进行软测量建模。KNN分析独立于后继回归模型, 却又直接影响模型结构, KPCA作为中间层, 在KNN分类结果指导下提取不同类别包含辅助变量高阶信息的特征主元, 然后使用SVR建立特征主元和主导变量之间的回归模型。用该方法建立粗汽油干点软测量模型, 结果表明KNN-KPCA-SVR(KKS)模型的预测精度和泛化能力优于线性PLS、RBF核函数SVR和KPCA-SVM模型。

关键词

[软测量](#) [主元分析](#) [核主元分析](#) [支持向量机](#) [K-最近邻算法](#)

分类号

## Soft sensor modeling method based on secondary variables KNN analysis

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### Abstract

A soft sensor modeling method based on the *K*-nearest neighbors method (KNN) was proposed. This method applied KNN to secondary variables classification and used the classified result, principal component analysis (KPCA) and support vector machine (SVR) to establish a model for soft measurement. KNN analysis was independent of the correlated regression model, but directly affected the model structure. Via KPCA as a middle layer, under the instruction of assorted result of the kernel function, the method was able to capture the high-ordered principal components among the secondary variables, and use SVR to establish a correlated regression model between the featured principal components and the primary variable. The proposed KKS method was used in soft sensor modeling for the end point of crude gasoline. Compared with the models of linear PLS, RBF-SVR and KPCA-SVM, the result obtained by the KNN-KPCA-SVR (KKS) approach showed better estimation accuracy and was more extendable.

### Key words

[soft sensor](#) [principal component analysis](#) [kernel principal component analysis](#) [support vector machine](#) [K-nearest neighbors method](#)

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