中国化学工程学报 2006 14 (6): 754-758 ISSN: 1004-616x CN: 44-1063/R

SYSTEM ENGINEERING

# 基于支持向量机MPLS的间歇过程故障诊断方法

李运锋[a], ,汪志锋[b], 袁景淇[a,c]

[a] Department of Automation, Shanghai Jiao Tong University, Shanghai 200030, China
[b] Department of Automation, Shanghai Second Polytechnic University, Shanghai 201209, China
[c] State Key Laboratory of Bioreactor Engineering, East China University of Science and Technology, Shanghai 200237, China

收稿日期 修回日期 网络版发布日期 接受日期

摘要 In this article, a nonlinear dynamic multiway partial least squares (MPLS) based on support vector machines (SVM) is developed for on-line fault detection in batch processes. The approach, referred to as SVM-based DMPLS, integrates the SVM with the MPLS model. Process data from normal historical batches are used to develop the MPLS model, and a series of single-input-single-output SVM networks are adopted to approximate nonlinear inner relationship between input and output variables. In addition, the application of a time-lagged window technique not only makes the complementarities of unmeasured data of the monitored batch unnecessary, but also significantly reduces the computation and storage requirements in comparison with the traditional MPLS. The proposed approach is validated by a simulation study of on-line fault detection for a fed-batch penicillin production.

关键词 fault detection multiway partial least squares support vector machines time-lagged window
分类号
**DOI:**

## On-line fault detection using SVM-based dynamic MPLS for batch processes

LI , Yunfeng[a], , WANG , Zhifeng[b], YUAN , Jingqi[a,c]

[a] Department of Automation, Shanghai Jiao Tong University, Shanghai 200030, China
[b] Department of Automation, Shanghai Second Polytechnic University, Shanghai 201209, China
[c] State Key Laboratory of Bioreactor Engineering, East China University of Science and Technology, Shanghai 200237, China

Received Revised Online Accepted

**Abstract** In this article, a nonlinear dynamic multiway partial least squares (MPLS) based on support vector machines (SVM) is developed for on-line fault detection in batch processes. The approach, referred to as SVM-based DMPLS, integrates the SVM with the MPLS model. Process data from normal historical batches are used to develop the MPLS model, and a series of single-input-single-output SVM networks are adopted to approximate nonlinear inner relationship between input and output variables. In addition, the application of a time-lagged window technique not only makes the complementarities of unmeasured data of the monitored batch unnecessary, but also significantly reduces the computation and storage requirements in comparison with the traditional MPLS. The proposed approach is validated by a simulation study of on-line fault detection for a fed-batch penicillin production.

**Key words** fault detection; multiway partial least squares; support vector machines; time-lagged window

通讯作者:
李运锋 jqyuan@sjtu.edu.cn
作者个人主页: 李运锋[a]; 汪志锋[b]; 袁景淇[a,c]