中国化学工程学报 2004 12 (2): 227-233 ISSN: 1004-616x CN: 44-1063/R

SYSTEM ENGINEERING

PVC生产过程故障传感器的检测与重构

李元[a,b,c], 周东华[c], 谢植[b], S.Joe.Qin[d]

[a] School of Information Science and Engineering, Northeastern University, Shenyang 110004, China

[b] School of Information Engineering, Chenyang Institute of Chemical Technology, Shenyang 110142, China

[c] Department of Automation, Tsinghua University, Beijing 100084, China

[d] Department of Chemical Engineering, University of Texas at Austin, Austin, TX 78712, USA

收稿日期 修回日期 网络版发布日期 接受日期

摘要 Based on principal component analysis, this paper presents an application of faulty sensor
detection and reconstruction in a batch process, polyvinylchloride (PVC) making process. To deal with inconsistency in process data, it is proposed to use the dynamic time warping technique to make the historical data synchronized first,then build a consistent multi-way principal component analysis model. Fault detection is carried out based on squared prediction error statistical control plot. By defining principal component subspace, residual subspace and sensor validity index, faulty sensor can be reconstructed and identified along the fault direction. Finally, application results are illustrated in detail by use of the real data of an industrial PVC making process.

关键词 PVC 聚氯乙烯 生产过程 传感器 过程分析

分类号

DOI:

Faulty Sensor Detection and Reconstruction for a PVC Making Process

LI Yuan[a, b, c], ZHOU Donghua[c], XIE Zhi[b], S.Joe.Qin[d]

[a] School of Information Science and Engineering, Northeastern University, Shenyang 110004, China

[b] School of Information Engineering, Chenyang Institute of Chemical Technology, Shenyang 110142, China

[c] Department of Automation, Tsinghua University, Beijing 100084, China

[d] Department of Chemical Engineering, University of Texas at Austin, Austin, TX 78712, USA

Received Revised Online Accepted

Abstract Based on principal component analysis, this paper presents an application of faulty sensor detection and reconstruction in a batch process, polyvinylchloride (PVC) making process. To deal with inconsistency in process data, it is proposed to use the dynamic time warping technique to make the historical data synchronized first,then build a consistent multi-way principal component analysis model. Fault detection is carried out based on squared prediction error statistical control plot. By defining principal component subspace, residual subspace and sensor validity index, faulty sensor can be reconstructed and identified along the fault direction. Finally, application results are illustrated in detail by use of the real data of an industrial PVC making process.

Key words multi-way principal component analysis; dynamic time warping; faulty sensor detection; faulty sensor reconstruction

通讯作者:
李元 zdh@mail.tsinghua.edu.cn
作者个人主页: 李元[a;b;c]; 周东华[c]; 谢植[b]; S.Joe.Qin[d]