论文与报告

基于奇异值分解的内模控制方法及在非方系统中的应用

靳其兵, 刘斯文, 权玲, 曹丽婷

1. 北京化工大学自动化研究所 北京 100029

2. 北京化工大学信息科学与技术学院 北京 100029

摘要

针对复杂工业生产过程中常常出现的输入与输出变量数目不相等的非方系统, 首次提出一种基于奇异值分解(Singular value decomposition, SVD)的内模控制(Internal model control, IMC)新方法. 该方法通过添加补偿项实现对非方系统的解耦并消除不可实现因素, 并应用SVD矩阵理论设计一种非对角型滤波器, 使控制系统不仅具备良好的高维解耦能力和响应速度快的优点, 而且因设置新型滤波结构而具备极强的鲁棒性. 仿真结果表明了这种方法的有效性和可靠性.

关键词　非方系统　内模控制　解耦　奇异值分解

分类号

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- 曹丽婷

Internal Model Control Based on Singular Value Decomposition and Its Application to Non-square Processes

JIN Qi-Bing, LIU Si-Wen, QUAN Ling, CAO Li-Ting

1. Institute of Automation, Beijing University of Chemical Technology, Beijing 100029

2. College of Information Science and Technology, Beijing University of Chemical Technology, Beijing 100029

Abstract

A novel internal model control (IMC) method based on singular value decomposition (SVD) is proposed for the non-square processes of which the input numbers do not equal the output numbers in complicated industrial manufacturing processes. The method can realize decoupling of non-square processes and eradicating unrealizable factors by inserting compensated terms. Meanwhile, a non diagonal filter is designed on the basis of SVD matrix theory, which makes control system not only bear the capacity of high-dimensional decoupling and fast response, but also have strong robustness due to the novel filtering structure. Simulation results have proved the effectiveness and reliability of the proposed method.

Key words　Non-square processes　internal model control (IMC)　decoupling　singular value decomposition (SVD)

通讯作者　刘斯文 lsw627@sina.com

作者个人主页　靳其兵; 刘斯文; 权玲; 曹丽婷