过程系统工程

一种新型线性约束系统预测控制算法

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摘要

通过对无约束预测控制算式的修正，应用线性规划求解技术，提出了一种基于脉冲响应模型的线性约束系统的预测控制算法。理论特性分析表明，该方法在一般情况下具有与无约束预测控制算法相同的稳定性和鲁棒性。以蒸馏塔质量控制为例进行了控制仿真，结果表明，这种新的预测控制算法不仅能满足系统存在的线性约束条件，而且有着比无约束预测控制和最优状态反馈控制更好的控制响应；与二次规划等优化算法比较，这种新的预测控制算法计算效率更高，能更好地满足生产过程实时控制需要。

关键词

预测控制　线性规划　模型算法控制　脉冲响应模型　二次规划

分类号

A novel predictive control algorithm of linearly constrained system

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Abstract

Through modification of unconstrained model algorithmic predictive control（PC）algorithm based on the impulse response model of the system，a novel predictive control algorithm of linearly constrained system（LCS-PC）was developed by using linear programming optimization technique.Theoretical analysis showed that LCS-PC possessed the same stability and robustness of PC.Simulation results of an atmospheric distillation column control demonstrated that LCS-PC could not only satisfy the linearly constrained requirements of the column，but also give better control response than PC and linear quadratic optimal state feedback（LQSF）control.Comparison with quadratic programming（QP），LCS-PC had higher computation efficiency，so it could satisfy the real time control requirements of industrial processes much better than QP.

Key words

predictive control　linear programming　model algorithm control　impulse response model　quadratic programming

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