

论文与报告

约束Hammerstein系统非线性预测控制及在聚丙烯牌号切换中的仿真研究

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收稿日期 2008-8-29 修回日期 2009-1-12 网络版发布日期 接受日期

摘要

对状态和输入受约束的Hammerstein系统, 提出一种新的可保证闭环指数稳定的非线性模型预测控制策略. 基于线性子系统镇定的最优控制律, 滚动预测非线性代数方程的解算误差, 继而在线优化计算满足约束的预测控制量. 进一步, 得到闭环系统指数稳定的解算误差上界. 从而闭环系统不仅满足约束而且对解算误差具有鲁棒性. 最后以工业聚丙烯牌号切换控制为例, 仿真验证本文算法的有效性.

关键词 [Hammerstein系统](#) [约束预测控制](#) [指数稳定性](#) [聚丙烯](#) [牌号切换](#)

分类号 [TP273.15](#)

Nonlinear Predictive Control of Constrained Hammerstein Systems and Its Research on Simulation of Polypropylene Grade Transition

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Abstract

A new nonlinear model predictive control (NMPC) scheme to guarantee closed-loop exponential stability is presented for Hammerstein systems subject to constraints on the state and input. Solving errors of the nonlinear algebra equation are predicted recedingly based on stabilized and optimal control laws of the linear subsystem. And then predictive control actions are computed to satisfy the constraint via online optimization. Moreover, the bound of solving errors is obtained to ensure the exponential stability of the closed-loop system. Hence, the closed-loop system not only satisfies the constraint but also has robustness property with respect to the solving error. Finally, a simulation example of industrial polypropylene grade transition control is used to illustrate the effectiveness of the algorithm proposed here.

Key words [Hammerstein systems](#) [constrained predictive control](#) [exponential stability](#) [polypropylene](#) [grade transition](#)

DOI: 10.3724/SP.J.1004.2009.01558

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