SYSTEM ENGINEERING

基于多核支持向量机的非线性模型预测控制

包哲静, 皮道映, 孙优贤

State Key Laboratory of Industrial Control Technology, Institute of Industrial Process Control, Zhejiang University, Hangzhou 310027, China

摘要　Multi-kernel-based support vector machine (SVM) model structure of nonlinear systems and its specific identification method is proposed, which is composed of a SVM with linear kernel function followed in series by a SVM with spline kernel function. With the help of this model, nonlinear model predictive control can be trans-formed to linear model predictive control, and consequently a unified analytical solution of optimal input of multi-step-ahead predictive control is possible to derive. This algorithm does not require online iterative optimiza-tion in order to be suitable for real-time control with less calculation. The simulation results of pH neutralization process and CSTR reactor show the effectiveness and advantages of the presented algorithm.

关键词　nonlinear model predictive control　support vector machine with multi-kernel　nonlinear system identification　kernel function

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Nonlinear model predictive control based on support vector machine with multi-kernel

BAO Zhejing, PI Daoying, SUN Youxian

State Key Laboratory of Industrial Control Technology, Institute of Industrial Process Control, Zhejiang University, Hangzhou 310027, China

Abstract Multi-kernel-based support vector machine (SVM) model structure of nonlinear systems and its specific identification method is proposed, which is composed of a SVM with linear kernel function followed in series by a SVM with spline kernel function. With the help of this model, nonlinear model predictive control can be trans-formed to linear model predictive control, and consequently a unified analytical solution of optimal input of multi-step-ahead predictive control is possible to derive. This algorithm does not require online iterative optimiza-tion in order to be suitable for real-time control with less calculation. The simulation results of pH neutralization process and CSTR reactor show the effectiveness and advantages of the presented algorithm.

通讯作者:
包哲静 zjbao@iipc.zju.edu.cn
作者个人主页: 包哲静; 皮道映; 孙优贤