SYSTEM ENGINEERING

基于2次核SVM的单步非线性模型预测控制

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摘要 A support vector machine (SVM) with quadratic polynomial kernel function based nonlinear model one-step-ahead predictive controller is presented. The SVM based predictive model is established with black-box identification method. By solving a cubic equation in the feature space, an explicit predictive control law is obtained through the predictive control mechanism. The effect of controller is demonstrated on a recognized benchmark problem and on the control of continuous-stirred tank reactor (CSTR). Simulation results show that SVM with quadratic polynomial kernel function based predictive controller can be well applied to nonlinear systems, with good performance in following reference trajectory as well as in disturbance-rejection.

关键词 SVM 二次方程式 多项式 非线性模型 预测模型 运算法则 控制论
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SVM with Quadratic Polynomial Kernel Function Based Nonlinear Model One-step-ahead Predictive Control

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Abstract A support vector machine (SVM) with quadratic polynomial kernel function based nonlinear model one-step-ahead predictive controller is presented. The SVM based predictive model is established with black-box identification method. By solving a cubic equation in the feature space, an explicit predictive control law is obtained through the predictive control mechanism. The effect of controller is demonstrated on a recognized benchmark problem and on the control of continuous-stirred tank reactor (CSTR). Simulation results show that SVM with quadratic polynomial kernel function based predictive controller can be well applied to nonlinear systems, with good performance in following reference trajectory as well as in disturbance-rejection.

Key words nonlinear model predictive control; support vector machine; nonlinear system identification; kernel function

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