

论文与报告

随机系统的多模型直接自适应解耦控制器

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摘要

针对多变量离散时间随机系统, 提出了一种采用广义最小方差性能指标的多模型直接自适应解耦控制器. 该多模型控制器由多个固定控制器和两个自适应控制器构成. 固定控制器用以覆盖系统参数的可能变化范围, 自适应控制器用以保证系统的稳定性和提高暂态性能. 该多模型控制器利用矩阵的伪交换性和拟 Diophantine 方程性质, 基于广义最小方差性能指标, 将随机系统辨识算法和最优控制器设计相结合, 直接辨识出控制器的参数, 通过广义最小方差性能指标中加权多项式的选取, 不但实现了多变量系统的动态解耦控制, 而且消除了稳态误差、配置了闭环极点. 文末给出了全局收敛性分析. 仿真结果表明该方法明显优于常规自适应控制器.

关键词 [多模型](#) [随机系统](#) [直接自适应控制](#) [动态解耦](#)

分类号

Multiple Models Direct Adaptive Decoupling Controller for Stochastic Systems

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Abstract

For a multivariable discrete-time stochastic system, a multiple models direct adaptive decoupling controller based on generalized minimum variance performance index is presented. It is composed of multiple fixed models and two adaptive models. The fixed models are used to cover the region where the system parameters jump, while the adaptive models are used to guarantee the stability and improve the transient response. For the fixed models, it utilizes the matrix pseudo-commutativity and quasi-Diophantine equation to design the generalized minimum variance controller. For the adaptive models, it adopts the stochastic system identification algorithm with optimal controller design method to identify the controller parameter directly. Then, through the choice of the weighting polynomial matrices, it not only realizes the dynamic decoupling control but also eliminates the steady state error and places the closed-loop poles arbitrarily. Finally, the global convergence is given. The simulation proves the effectiveness of the controller proposed.

Key words [Multiple models](#) [stochastic system](#) [direct adaptive control](#) [dynamic decoupling](#)

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