工程与应用

严格反馈非线性系统的自适应模糊控制

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摘要　　针对一类不确定非线性系统，基于backstepping方法提出了一种新的鲁棒自适应模糊控制器设计方案。该方案通过引入最优逼近误差的自适应补偿项和新的鲁棒项，削减建模误差和参数估计误差的影响，从而在稳定性分析中取消了要求逼近误差平方可积或逼近误差的上确界已知的条件。理论分析证明了闭环系统状态有界，跟踪误差收敛到零的较小邻域内。仿真结果表明了该方法的有效性。

关键词　　非线性系统　后推　模糊控制　最优逼近误差

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Adaptive fuzzy control for a class of strict-feedback nonlinear systems

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Abstract

A new robust adaptive indirect fuzzy controller is designed based on backstepping method for a class of uncertain nonlinear systems.The adaptive compensation term of the optimal approximation error and a new robust term are adopted to minify the influence of modeling error and parameter estimation error.The approach does not require the optimal approximation error to be square-integrable or the supremum of the optimal approximation error to be known.It's proved that the final closed-loop system must be globally stable in the sense that all signals involved must be uniformly bounded and simulation results show that the closed-loop fuzzy control system is proved to be globally stable，with tracking error converging to the arbitrarily small neighborhood of the origin.

Key words　nonlinear systems　backstepping　fuzzy control　the optimal approximation error

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