[2010-0369]一类非线性时滞系统的自适应模糊DSC控制

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摘要

针对一类具有未知方向增益函数的严格反馈非线性时滞系统，提出了一种自适应模糊动态面(Dynamic Surface Control)控制算法．通过利用DSC设计技术和Lyapunov-Krasovskii函数，该算法不仅克服了计算膨胀的问题，而且同时补偿了未知的时滞．采用Nussbaum函数解决了虚拟控制增益的符号问题，并且避免了控制器的奇异性．所设计的控制器保证了闭环系统所有的状态和信号是半全局有界的，并且通过选择合适的设计参数可使跟踪误差为任意小．仿真结果表明了所提出控制器的有效性．

关键词　　自适应控制, 时滞, 模糊系统, DSC

分类号

Adaptive Fuzzy Dynamic Surface Control for a Class of Nonlinear Systems with Unknown Time-Delays

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Abstract

In this paper, adaptive fuzzy dynamic surface control (DSC) is presented for a class of strict-feedback nonlinear systems with unknown time-delays and control directions. By incorporating DSC design technique and a novel Lyapunov-Krasovskii functions into adaptive fuzzy control design framework, the proposed control system can overcome not only the problem of "explosion of complexity" inherent in the backstepping design methods but also the unknown time-delays. The control singularity problem and unknown signs of the virtual control coefficients are well solved by use of Nussbaum gain function (NGF). The proposed controller guarantees the semiglobal boundedness of all states and signals in the closed-loop system, with arbitrary small tracking error by appropriately choosing design constants. Simulation results are given to demonstrate the effectiveness of the proposed scheme.

Key words　　Adaptive control　time-delay　fuzzy system　DSC

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