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短文

一类纯反馈非线性系统的简化自适应神经网络动态面控制

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摘要:

针对一类完全非仿射纯反馈非线性系统, 提出一种简化的自适应神经网络动态面控制方法. 基于隐函数定理和中值定理将未知非仿射输入函数进行分解, 使其含有显式的控制输入; 利用简化的神经网络逼近未知非线性函数, 对于?? 阶SISO 纯反馈系统, 仅一个参数需要更新; 动态面控制可消除反推设计中由于对虚拟控制反复求导而导
致的复杂性问题. 通过Lyapunov 稳定性定理证明了闭环系统的半全局稳定性, 数值仿真验证了方法的有效性.

关键词: 自适应控制; 动态面控制; 神经网络; 纯反馈系统

Simplified adaptive neural dynamic surface control for a class of nonlinear systems in pure feedback form

Abstract:

A simplified adaptive neural dynamic surface control approach is proposed for a class of completely non-affine
pure-feedback nonlinear systems. By using implicit function theorem and mean value theorem, unknown non-affine input
functions can be transformed to partially affine forms. The simplified neural networks are used to approximate the unknown
nonlinearities in systems, and for a ??-th order strict feedback nonlinear system, only one parameter is needed to be estimated
on-line. The problem of explosion of terms in traditional backstepping design is eliminated by utilizing dynamic surface
control. It is proved that the developed method can guarantee the semi-global stability of the close-loop system. Simulation
results show the effectiveness of the proposed approach.

Keywords: adaptive control; dynamic surface control; neural network; pure-feedback systems

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