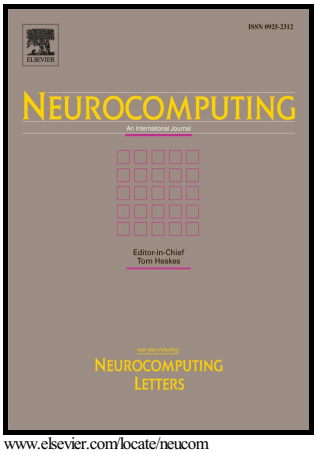

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Xinyong Wang, Hongmin Li, Xudong Zhao

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Adaptive neural tracking control for a class of uncertain switched nonlinear systems with unknown backlash-like hysteresis control input☆

Xinyong Wang[a], Hongmin Li[a], Xudong Zhao[a,b]

[a] *College of Engineering, Bohai University, Jinzhou 121013, Liaoning, China*
[b] *Chongqing SANY High-intelligent Robots Co.,Ltd., Chongqing, 401120, China.*

Abstract

This paper is concerned with the problem of adaptive tracking control for a class of uncertain switched nonlinear systems. Completely unknown backlash-like hysteresis control input that frequently exists in practice is also considered. By combining adaptive backstepping technique with neural networks approximation ability, an adaptive neural control algorithm is presented for the systems under consideration. A common virtual control function is deigned to construct a common Lyapunov function for the system. The explosion of complexity in traditional backstepping design is avoided by using dynamic surface control. It is demonstrated that the practical output tracking performance is achieved by using the proposed state-feedback controllers, and all the signals remain bounded. Finally, simulation results are given to show the effectiveness of the theoretical approaches.

Keywords: Neural networks, adaptive backstepping, dynamic surface control (DSC), backlash-like hysteresis, uncertain switched nonlinear systems.

1. Introduction

Switched system has a wide application background, such as in electric power systems, networked control systems, walking robot control systems, and cart pendulum control systems[1, 2, 3, 4]. In [1], the authors presented an innovative Pulse-Width Modulation switching algorithm for the the Program-mable Logic Controller adaptive frequency-domain control. The authors in [2] transformed the synchronization problem into the stability problem for time-varying

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Email addresses: wangxinyong1993@gmail.com (Xinyong Wang), fslihongmin@gmail.com (Hongmin Li), xdzhaohit@gmail.com (Xudong Zhao)