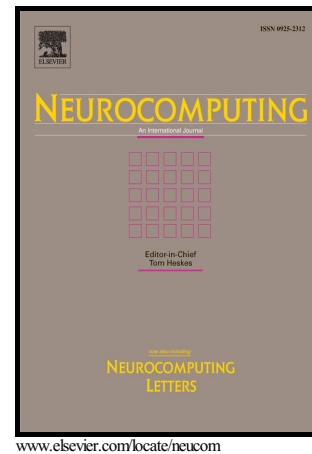


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Adaptive Terminal Sliding Mode Control of Uncertain Robotic Manipulators Based on Local Approximation of a Dynamic System

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Abstract

This paper presents a novel adaptive finite-time control for robotic manipulators using terminal sliding mode control (TSMC) and radial basis function neural networks (RBFNNs). Firstly, the controller is developed based on terminal sliding mode which requires the prior knowledge of the robot dynamic model. Secondly, RBFNNs are adopted to directly approximate all parts of the system parameters through Ge-Lee (GL) matrix and its product operators. Moreover, an error estimator is added to suppress the approximation errors of neural networks (NNs) and external disturbances. And then, an adaptive finite-time control law with a proper update law is designed to guarantee the occurrence of the sliding motion in finite time without relying on a priori knowledge of uncertainties and external disturbances. The stability and finite-time convergence of the closed loop system are established by using the Lyapunov theory. Finally, the simulation results of a two-link robot manipulator are presented to illustrate the effectiveness of the proposed control method.

Keywords: Nonsingular terminal sliding mode control, radial basis function neural network, adaptive control, finite-time convergence, robot manipulator.

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