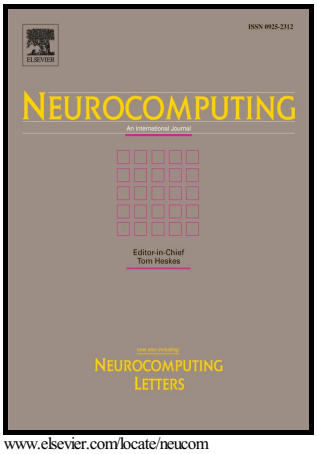

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Minh-Duc Tran, Hee-Jun Kang

PII: S0925-2312(16)31275-9
DOI: http://dx.doi.org/10.1016/j.neucom.2016.09.089
Reference: NEUCOM17672

To appear in: *Neurocomputing*

Received date: 20 December 2015
Revised date: 6 September 2016
Accepted date: 18 September 2016

Cite this article as: Minh-Duc Tran and Hee-Jun Kang, Adaptive Termina Sliding Mode Control of Uncertain Robotic Manipulators Based on Loca Approximation of a Dynamic System, *Neurocomputing* http://dx.doi.org/10.1016/j.neucom.2016.09.089

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

Minh-Duc Tran[a], Hee-Jun Kang[b2*]

[a]Graduate School of Electrical Engineering, University of Ulsan, 680-749, Ulsan, South Korea
[b]School of Electrical Engineering, University of Ulsan, 680-749, Ulsan, South Korea

ductm.ctme@gmail.com
hjkang@ulsan.ac.kr

[*]Corresponding author: Tel.: +82-10-3568-1289; fax: +82-52-259-1686

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.

[2] Preliminary version of this manuscript has been selected in International Conference on Intelligent Computing (ICIC), 2015 (Paper ID: 470, Title: A Local Neural Networks Approximation Control of Uncertain Robot Manipulators) and its extended version is sub-selected for the Neurocomputing journal.