

Accepted Manuscript

Robust adaptive neural network-based trajectory tracking control approach for nonholonomic electrically driven mobile robots

Mohamed Boukens, Abdelkrim Boukabou, Mohammed Chadli

PII: S0921-8890(16)30186-5

DOI: <http://dx.doi.org/10.1016/j.robot.2017.03.001>

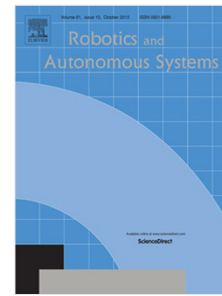
Reference: ROBOT 2800

To appear in: *Robotics and Autonomous Systems*

Received date: 18 April 2016

Please cite this article as: M. Boukens, et al., Robust adaptive neural network-based trajectory tracking control approach for nonholonomic electrically driven mobile robots, *Robotics and Autonomous Systems* (2017), <http://dx.doi.org/10.1016/j.robot.2017.03.001>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Robust adaptive neural network-based trajectory tracking control approach for nonholonomic electrically driven mobile robots

Mohamed Boukens^a, Abdelkrim Boukabou^{1a}, Mohammed Chadli^b

^a*Department of Electronics, Jijel University, Ouled Aïssa, Jijel 18000, Algeria*

^b*Laboratoire de Modélisation, Information et Systèmes, MIS(E.A 4290), University of Picardie Jules Verne, 33 rue Saint-Leu, 80039, Amiens, France*

Abstract

This paper presents a robust intelligent controller to be applied to a class of nonholonomic electrically driven mobile robots. This class of robotic systems has an inherent sensitivity to high degree time-varying parametric uncertainties, unmodeled dynamics, and external disturbances. Furthermore, the effects of coupling terms between the mechanical subsystem and the electrical subsystem may cause severe degradations due to the time-varying variations of DC motors and mechanical structure components around their nominal values. To overcome the effects of all these quantities, the robust adaptive neural network tracking controller developed here introduces adaptive laws to estimate a local upper bound of each subsystem of the nonholonomic mobile robot, then, these laws are used on-line as controller gain parameters in order to robustly improve the transient response of the closed-loop system and reduce conservative, in the sense that the local upper bounds to characterize the corresponding uncertainties dynamics for each subsystem, initially computed based on the worse-case scenario, are not updated during the effective control of the mobile robot. In fact, even if more data become available, then they are avoided when estimating local upper bounds, and hence, the level of uncertainty is considerably decreased. According to the universal approximation theorem and the Lyapunov stability theory, the proposed intelligent controller guarantees global stability in the sense that all the states and signals of the closed-loop system, and the trajectory tracking errors are

¹Corresponding author. E-mail address: aboukabou@univ-jijel.dz (A. Boukabou).

Download English Version:

<https://daneshyari.com/en/article/4948714>

Download Persian Version:

<https://daneshyari.com/article/4948714>

[Daneshyari.com](https://daneshyari.com)