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REAL-TIME DECENTRALIZED NEURAL BLOCK CONTROL: APPLICATION TO A TWO DOF ROBOT MANIPULATOR

R. Garcia-Hernandez[1,3,*], E. N. Sanchez[1], E. Bayro-Corrochano[1]
V. Santibañez[2] and Jose A. Ruz-Hernandez[3]

[1]Departamento de Ingenieria Electrica
CINVESTAV Unidad Guadalajara
Avenida Cientifica 1145, Zapopan, Jalisco, Mexico
{ rhernand; sanchez; edb }@gdl.cinvestav.mx

[2]Division de Estudios de Posgrado
Instituto Tecnologico de la Laguna
Apartado Postal 49, Adm. 1, C.P. 27001, Torreon, Coahuila, Mexico
vsantiba@itlalaguna.edu.mx

[3]Facultad de Ingenieria
Universidad Autonoma del Carmen
Avenida 56, No. 4, Cd. del Carmen, Campeche, Mexico
jruz@pampano.unacar.mx
*Corresponding author: rghernandez@pampano.unacar.mx

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Abstract. *This paper presents a discrete-time decentralized control scheme for trajectory tracking of a two degrees of freedom (DOF) robot manipulator. A modified recurrent high order neural network (RHONN) structure is used to identify the plant model and based on this model, a discrete-time control law is derived, which combines block control and sliding mode techniques. The neural network learning is performed on-line by extended Kalman filtering (EKF). The controllers are designed for each joint using only local angular position and velocity measurements, simplifying computation complexity. The proposed scheme is implemented in real-time to control a two DOF robot manipulator.*

Keywords: Decentralized control, Recurrent neural networks, Extended Kalman filter, Block control

1. **Introduction.** Robot manipulators are employed in a wide assortment of applications. Today most of the applications are in manufacturing to move materials, parts and tools of various types. Future applications will include nonmanufacturing tasks, such as construction work, exploration of space and medical care.

In this context, different control schemes have been proposed to guarantee efficient trajectory tracking and stability [1,2]. Fast advance in computational technology offers many ways for implementing control algorithms within the approach of a centralized control design [3]. However, there is a great challenge to obtain an efficient control for this class of systems, due to its highly nonlinear complex dynamics, with strong interconnections, parameters difficult to be measured and dynamics difficult to model. Considering only the most important terms, the mathematical model obtained requires control algorithms with great number of mathematical operations, which affect real-time implementation feasibility. On the other hand, within the area of control systems theory, for more than three decades, an alternative approach has been developed considering a global system as a set