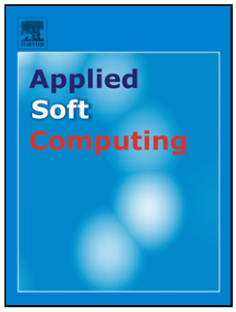

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Discrete time control based in neural networks for pendulums

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Abstract

In this investigation, a model free discrete time neural network control is designed for the trajectory tracking of a kind of nonlinear processes. The introduced control has three main characteristics: 1) the tracking error is used instead of the estimation error in the weights learning equations, avoiding the requirement of a good behavior estimation of the unknown elements in the nonlinear model, 2) the projection method is suggested to avoid the overfitting in the control law, and 3) the Lyapunov technique is utilized to assure the uniform stability of the tracking and weights errors. The suggested technique is applied in two nonlinear processes: the inverted-car and Furuta pendulums.

Keywords: Robust control, neural network, pendulums, stability, discrete time.

1 Introduction

The learning from online data streams for the model free discrete time trajectory tracking control is a research area of growing interest, because large volumes of data are continuously generated from pendulums, often with a high incoming rate. This fact requires the usage of the online learning for the behavior estimation of some unknown elements.

There are some investigations about the online learning for the estimation of nonlinear processes. In [5], [6], and [7], fuzzy processes for the prediction are studied. Online classifi-