Robust wavelet-based adaptive neural controller design with a fuzzy compensator

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Abstract

In this paper, a robust wavelet-based adaptive neural control (RWANC) with a PI type learning algorithm is proposed. The proposed RWANC system is composed of a wavelet neural controller and a fuzzy compensation controller. The wavelet neural control is utilized to approximate an ideal controller and the fuzzy compensation controller with a fuzzy logic system in it is used to remove the chattering phenomena of conventional sliding-mode control completely. In the RWANC, the learning algorithm is derived based on the Lyapunov function, thus the closed-loop system's stability can be guaranteed. The chaotic system control has become an emerging topic in engineering community since the uncontrolled system displays complex, noisy-like and unpredictable behavior. Therefore, the proposed RWANC approach is applied to a second-order chaotic nonlinear system to investigate the effectiveness. Through the simulation results, the proposed RWANC scheme can achieve favorable tracking performance and the convergence of the tracking error and control parameters can be accelerated by the developed PI adaptation learning algorithm.

Keyword：adaptive control, neural control, chaotic system