Design of a wavelet-neural-based adaptive controller with a fuzzy compensator

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Abstract

In this paper, a wavelet-neural-based adaptive control (WNBAC) with a PI type learning algorithm is proposed. The proposed WNBAC 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 WNBAC, the learning algorithm is derived based on the Lyapunov function, thus the closed-loop system's stability can be guaranteed. Then, the proposed WNBAC approach is applied to a second-order chaotic nonlinear system to investigate the effectiveness. Through the simulation results, the proposed WNBAC 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：Lyapunov function, fuzzy compensation