

Adaptive TSK-Type Fuzzy Network Control for Synchronization of a Coupled Nonlinear Chaotic System

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Abstract

This paper proposes an adaptive TSK-type fuzzy network control (ATFNC) system for synchronization of a coupled nonlinear chaotic system. The design of the proposed ATFNC system is comprised of a neural controller and a fuzzy compensator. The neural controller uses a Takagi-Sugeno-Kang (TSK)-type fuzzy neural network (TFNN) to online mimic an ideal controller and the fuzzy compensator is designed to dispel the approximation error between the ideal controller and the neural controller without occurring chattering phenomena. Since the weights of the output layer use a functional-type form in TFNN instead of a singleton-type form in fuzzy neural network (FNN), the TFNN provides more powerful representation than FNN. All the controller parameters of the proposed ATFNC system are tuned in the sense of Lyapunov theorem, thus the stability of the closed-loop system can be guaranteed. Finally, some simulation results verify the proposed ATFNC system can achieve favorable synchronization performance for a coupled nonlinear chaotic system.

Keyword : adaptive control, neural control, coupled nonlinear chaotic system, synchronization