Adaptive CMAC neural control of Chaotic systems with a PI-type learning algorithm

許駿飛,鍾招名,林志民,徐嘉佑
Electrical Engineering
Engineering
fei@chu.edu.tw

Abstract

The cerebellar model articulation controller (CMAC) has the advantages such as fast learning property, good generalization capability and information storing ability. Based on these advantages, this paper proposes an adaptive CMAC neural control (ACNC) system with a PI-type learning algorithm and applies it to control the chaotic systems. The ACNC system is composed of an adaptive CMAC and a compensation controller. Adaptive CMAC is used to mimic an ideal controller and the compensation controller is designed to dispel the approximation error between adaptive CMAC and ideal controller. Based on the Lyapunov stability theorems, the designed ACNC feedback control system is guaranteed to be uniformly ultimately bounded. Finally, the ACNC system is applied to control two chaotic systems, a Genesio chaotic system and a Duffing-Holmes chaotic system. Simulation results verify that the proposed ACNC system with a PI-type learning algorithm can achieve better control performance than other control methods.

Keyword：Adaptive control; CMAC; Uniformly ultimately bounded; Chaotic system