Synchronization of two coupled neurons using CMAC neural networks

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Abstract

Cerebellar model articulation controller (CMAC) neural network has been already validated that it can approximate a nonlinear function over a domain of interest to any desired accuracy. This paper proposes an adaptive PI CMAC neural control (APICNC) system. The proposed APICNC system is composed of a feedback controller, a CMAC neural controller and a compensation controller. The CMAC neural controller is used to mimic system dynamics and the compensation controller is designed to dispel the approximation error. The Lyapunov stability theorem is utilized to derive the parameter learning algorithm, so that the stability of the APICNC system can be guaranteed. Then, the proposed APICNC system is applied to the coupled nonlinear cable model chaotic system. Simulation results verify the proposed APICNC system can achieve a favorable performance and the developed proportional-integral (PI) type learning algorithm can speed up the convergence of the tracking error.

Keyword：CMAC; Adaptive control; Lyapunov stability theorem; Chaotic system; Synchronization