Identification-based chaos control via backstepping design using self-organizing fuzzy neural networks

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Abstract

This paper proposes an identification-based adaptive backstepping control (IABC) for the chaotic systems. The IABC system is comprised of a neural backstepping controller and a robust compensation controller. The neural backstepping controller containing a self-organizing fuzzy neural network (SOFNN) identifier is the principal controller, and the robust compensation controller is designed to dispel the effect of minimum approximation error introduced by the SOFNN identifier. The SOFNN identifier is used to online estimate the chaotic dynamic function with structure and parameter learning phases of fuzzy neural network. The structure learning phase consists of the growing and pruning of fuzzy rules; thus the SOFNN identifier can avoid the time-consuming trial-and-error tuning procedure for determining the neural structure of fuzzy neural network. The parameter learning phase adjusts the interconnection weights of neural network to achieve favorable approximation performance. Finally, simulation results verify that the proposed IABC can achieve favorable tracking performance.

Keyword：adaptive control, neural control