Design of a growing-and-pruning adaptive RBF neural control system

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Abstract

This study proposes a growing-and-pruning adaptive RBF neural control (GP-ARBFNC) system for a class of uncertain nonlinear systems. The proposed GP-ARBFNC system is composed of a neural controller and a saturation compensator. The neural controller uses a growing-and-pruning RBF (GP-RBF) network to online mimic an ideal controller, and the saturation compensator is designed to dispel the approximation error between ideal controller and neural controller. The proposed GP-RBF network not only can create the new hidden neurons online if the approximation performance is inappropriate, but can also prune the insignificant hidden neurons online if the hidden neuron is inappropriate. Finally, the proposed GP-ARBFNC system is applied to a chaotic system. Some simulation results show GP-ARBFNC can achieve favorable tracking performance without any chattering phenomenon after the GP-RBF network is sufficiently trained.

Keyword：RBF network; adaptive control; neural control; structuring learning; parameter learning