The nonlinear function approximation based on the neural network application

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Abstract

In this paper, genetic algorithm (GA) is the technique to search for the optimal structures (i.e., the kind of neural network, the number of hidden neuron,..) of the neural networks which are used approximating a given nonlinear function. In this paper, we used multi layer feed-forward neural network. The decision method of synapse weights of each neuron in each generation used back-propagation method. In this study, we simulated nonlinear function approximation in the temperature control system.

1. Introduction

Neural network (NN) have been successfully implemented in various application fields in the last decade because of their parallel computation and complex nonlinear function mapping characteristics compared with conventional schemes. Neural networks also possess a learning ability which is the most important feature in its real applications.

The neural networks implemented in above applications may have different structures, may use the classical back-propagation training algorithm or other improved training algorithms to obtain the synapses weights of the neural networks, they all have the common features, i.e., the neural networks have the fixed structures. It means that we do not exactly know what kind of neural networks, the related training algorithms and how many inputs and hidden neurons will be mostly suitable to the special object.

To design the optimal architectures of neural network, e.g. attempt is implementing the evolutionally algorithms, e.g. genetic algorithm.

In this paper, GA based algorithm is proposed to search for the optimal architecture of neural network which are used to approximate a given nonlinear function in the temperature control system.

2. Neural network structure and training algorithm

We consider the general multiplayer feed-forward neural network in this