Training a Neural Network Using Hierarchical Genetic Algorithm for Modeling and Controlling a Nonlinear System of Water Level Regulation

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Abstract: In this paper, we present a new approach of Hierarchical Genetics Algorithms (HGA), and the improvement brought compared to the backpropagation algorithm for the simultaneous determination of the structure and the learning of a Multilayer Perceptron (MLP). The neural model found by the two methods are employed separately in a non-linear system for water level regulation. A comparison study will therefore be presented.

Keywords: hierarchical genetic algorithms; neural networks; backpropagation algorithm; training; multilayer perceptron; optimization; modeling and controlling; nonlinear systems.

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1 Introduction

The use of artificial neural network is an approach that has its origins in the study of nervous tissue. In fact, the operation of an artificial neuron is by analogy with that of the nerve cell.

Neural network consists of a set of artificial neurons interconnected by weights whose values affect the behaviours of the whole structure. The rules under which the adjustment operation is carried out connections characterize the learning algorithm of network. Due to the massively parallel structure and ability to reproduce arbitrary behaviours from examples, neural networks are an interesting tool for solving various problems [1–4].