A Data Mining Approach for the Prediction of Transport Time Scales in the Dez Reservoir

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Abstract

Hydraulic time scales are of the key parameters in determining the water quality and sediment transport in an aquatic system. In recent years, soft computing tools as modern methods to generate intelligent systems have been used in different field of engineering and science. In this paper, by using multilayer artificial neural network and the results obtained from the simulation of the hydrodynamic processes in Dez reservoir, networks for prediction of mean residence times of river water and flushing time in the Dez reservoir in different days of simulation have been developed. Finally, the predicted results have been compared to the results obtained from the numerical modeling in other days of simulation and error has been cited. The compared data were in a good agreement with each other.

Keywords: Hydraulic time scales, artificial neural networks, residence time, flushing time, numerical modeling.

1. INTRODUCTION

Biochemical behaviors of an ecosystem are highly dependant to physical transport and mixing process. These processes determine location of dissolved and suspended materials at any time as well as conditions that control happening of these biochemical processes. Residence time and flushing time scales are of the most important transport time scales, which are valuable tools that can be used for understanding hydrodynamic processes; their estimation and prediction have been given a considerable amount of attention by researchers in many recent decades By estimating these retention times, the fate of the substances transported within water can be determined. In spite of the biological and chemical implications of residence or flushing time scales there exists widely spread misconceptions and confusion among aquatic scientists on suitable methods for their determination (Monsen et al., 2002). In this study, it is tried to use the artificial neural networks for prediction of the mean residence time of the river water and mean flushing time in the Dez reservoir.

2. BACKGROUND
2.1. Artificial neural network

Neural network are considered as new generation of data mining techniques that have been extended a lot during two recent decades. This technique can be used for discovery and extraction of data from a database, as well as making predictor models. The idea of neural network uses mathematical models and the power of computer in order to represent some simple aspects of the human brain.

The idea of artificial neural network can be described as:
- A group of neurons
- Each neuron has an output and input
- Each neuron does a simple calculation using particular function
- There are rhythmical junctions between neurons
- Junctions are determined according to the network architecture
- The result of a network is a very complicated function of rhythmical relationships

2.2. Network Adjustment by back propagation

Network training consists of a process determining the best weights for inputs of each unit in the neural network. The purpose is to use training samples in order to determine the weights, so that the network output