MODELING OF RIVER WATER QUALITY PARAMETERS USING ARTIFICIAL NEURAL NETWORK – A CASE STUDY

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Abstract- In river water quality management, it is very important to use an effective approach to characterize complex water quality processes. This work is referred to the employment of Neural Network models to predict the water quality parameters in the Shatt Al Arab River. In the analysis of the models, the most ordinarily used feed forward error back propagation neural network technique has been utilized. Monthly data sets on turbidity, total hardness, total dissolved solids, and electrical conductivity have been employed for the analysis. The monthly data of four parameters, for the time period 2007-2012 were assigned for this analysis. The results present the ability of the suitable ANN models to predict the water quality parameters. This supplies a very useful tool for estimating the water quality of the Shatt Al Arab River.

Key words- Water quality, ANN, Prediction, Shatt Al Arab River.

I. INTRODUCTION

The problem of water quality management plays an significant role in river basin planning and water pollution control. On the last decades, there has been an altering necessitate for water quality monitoring of many rivers by uniform measurements of different water quality variables. The probability of a pollutant being discharged to rivers as industrial and municipal waste disposal is a constant attention to those amusing and using water from rivers. For prediction of total dissolved solids in a river under assumptions of interest, different deterministic models have been tried in the past. In biological organisms, a computational method animated by the studies of the brain and nervous system, is called an Artificial Neural Network (ANN). It performs highly idealized mathematical models for our present understanding for such complex systems. One of best characteristics of the neural networks is their ability to learn. The process of learning for ANN called trainingthe neural network. The training of ANN regulates itself to develop an internal set of features that it utilizes to classify information or data. In contrast with the ordinary methods, ANNs afford incomplete data, sacrificial results, and have less vulnerability to outliers.

On the last about two decades, ANN have sustain an volatile growth in application in most all the areas of research [1-5]. The ANN method has various advantages over semi-empirical or traditional phenomenological models, because they involve known the set of input data without any assumptions [6]. The ANN acquires a mapping for the input and output variables, which can afterward be used to predict required output as a function of desirable inputs [7]. Any smooth, measurable function between input and output vectors can be approximate with a multi-layer neural network by choosing a suitable set of connecting weights and transfer functions [6]. ANN models have been exceedingly employed for water quality problems [8-10]. The major aim of the

present work is to build an artificial neural network (ANN) model for Shatt Al Arab river water quality and explain its application in the complexity data of water quality as how the model have the ability of the improvement for the interpretation of the results.

II. STUDY AREA AND DATA COLLECTION

Shatt Al Arab River composes the primary source of freshwater to the Arabian Gulf. It plays a significant role for the marine habitats in the Gulf's north-eastern coastal areas. This river is located in southwest Asia of about 200 km in length. It is formed by the meeting of the Euphrates and the Tigris in Basrah Governorate of the southern Iraq. Shatt al Arab River remains a source of conflict in the area of limited access to water resources and the insistence of open sea borders. Shatt Al Arab has several tributaries along its course, the most important joining tributaries are Karun and the Karkheh Rivers, which are supplied the fresh water to Shatt Al-Arab river. During the last years, Karun and Karkheh tributaries was diversion inside the Iranian borders, and this action increases the salinity in the Shatt Al-Arab River. This not only impend s the marine ecosystems in the Gulf, as well as imperils agrarian action along the Shatt Al Arab.

The data of water quality for the years 2007 to 2012 used in this study were collected from station on Shatt Al Arab River as shown in Fig.1. Monthly data sets on turbidity, total hardness, total dissolved solids, and electrical conductivity were available and used for the analysis water quality of Shatt Al Arab River.

III. ARTIFICIAL NEURAL NETWORKS (ANNS)

Artificial Neural Networks (ANNs) are a form of artificial intelligence whose paradigm architecture is inspired by the way biological nervous systems such as the brain. The key element of this paradigm is