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THE PREDICTION OF SIGNIFICANT WAVE HEIGHT BY USING NEURAL NETWORKS IN PERSIAN GULF COASTS

Yaser Dehghan , Msc student , university of Isfahan , yaser_dehghan87@yahoo.com

♁Smaeyl Hassanzadeh , Associated Prof , university of Isfahan , shz@phys.ui.ac.ir

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Introduction

As the sea wave is a key factor in the design of marine structures an accurate estimation of the wave characteristics is of particular importance. For this reason analytical and numerical models are applied to describe the wave parameters. Since the analytical methods is containing complicated mathematical equations and non linear terms in some cases the accurate solution of this equation is difficult. So some simplifying is performed to solve the equations. Sometimes the numerical model is employed that requires high computational grid number and memory volume which would be time consuming. In order to overcome to this problem the statistical and empirical method is used which is based upon the past observing data[1]. In recent decades the technique of artificial neural network (ANN) had been developed and proved that have high capability in the estimation of sea wave parameters.

This study employs the technique of (ANN) to predict significant wave height (Hs) for different warning time based upon the past meteorological and oceanographic data.

Data collection

The data provided by port and maritime organization from "OCEANOR" buoy is used. The buoy records the wave parameters such as Hs and period as well as meteorological data such as air pressure and wind speed and direction. A typical time series plot of Hs is shown in figure (1).

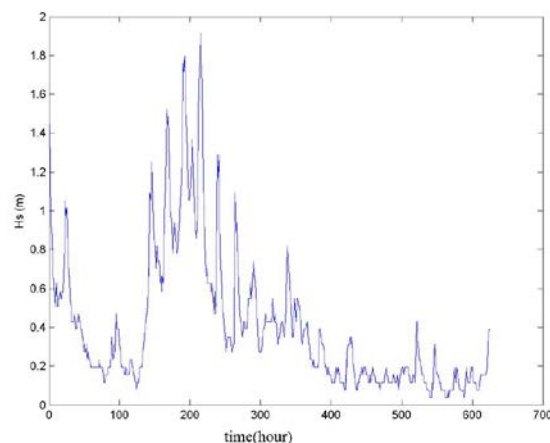


Fig.1) Time series of Hs (From 7/8/2007 to 8/2/2007)

STRUCTURE OF ANN

in this work back-propagation neural network(BPN) is used which is consisted of three layers[2]. The first one is the input layer and the last one is the output layer and the layers between the input and output is called the hidden layer[3]. Figure (2) shows a typical ANN that is used in this study.

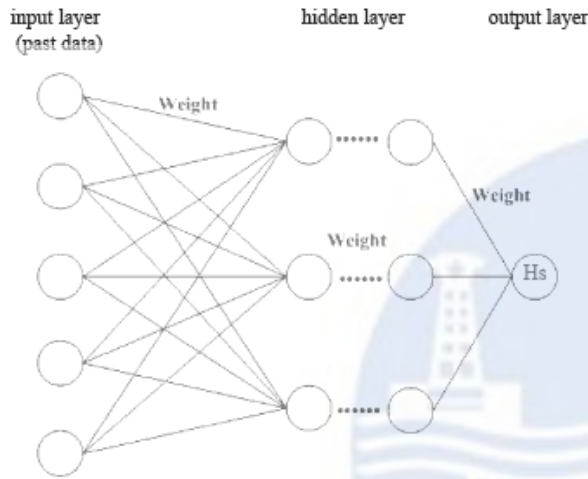


Fig. 2) A typical ANN used

We have used past recorded data as inputs and Hs will be predicted in the output layer.

ANN PERFORMANCE

In this study the data collection is divided into two parts. the first part for training task and the second one for validation of ANN performance[4]. When the ANN is trained based on former data it will be capable in forecasting future data. One simple result of prediction of Hs by ANN is shown in figure (3). As shown as in this figure the forecasted Hs closely agree with the measured value.

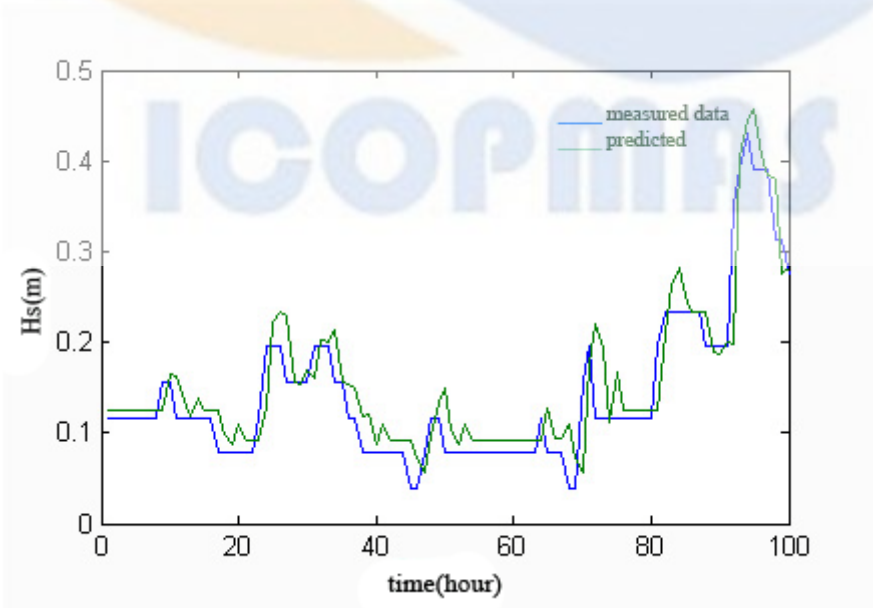


Fig.3) Comparison between measured value and predicted value by ANN

CONCLUSIONS

In this study we apply the ANN model to prediction of the significant wave height. The result clearly demonstrates that the technique of ANN has high performance while does not require exact mathematical equations.

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