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Prediction of Discharge of Simple Conical Flume by using Artificial Neural Network (ANN) Tool of Matlab Software

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ABSTRACT

MATLAB is a high-level language enables us to perform computational intensive tasks faster than with traditional programming language. This paper presents some of the positive aspects of MATLAB software. In this paper, MATLAB software is used for the prediction of discharge of simple conical flume by using Artificial Neural Network (ANN) Tool. A simple portable conical flume in the form of cone inserted axially into the channel is referred as simple conical flume. ANN is one of the tool of MATLAB software which is used for development of the ANN model for various purposes. ANN model can provide reasonable accuracy for civil engineering problems, and more effective tool for engineering applications. Predicted discharge by ANN model is compared with the measured discharge. It has been observed that the ANN model results are in close agreement with the measured data except one reading.

Keywords : MATLAB, Flume, ANN

I. INTRODUCTION

Water is precious resource and water demand is very much high. Hence, improvement of water management can encourage the conservation and make best use of our limited water resources. Water management depends upon the ability to preciously measure and manage the flow of water at important points in canal irrigation system. A simple portable conical flume in the form of cone inserted axially into the channel is referred as simple conical flume, can be used for such purpose. MATLAB software is used for the prediction of discharge of simple conical flume by using Artificial Neural Network (ANN) Tool of MATLAB software. ANN is one of the tool of MATLAB software which is used for the prediction of discharge of simple conical flume. ANN model can provide reasonable accuracy for civil engineering problems, and more effective tool for engineering applications.

II. MATLAB

The name MATLAB stands for MATrix LABoratory

MATLAB is a high performance language for technical computing. It integrates computations, visualization and programming environment. It has a sophisticated data structures, contains built in editing and debugging tools and supports object oriented programming. MATLAB, MATrix LABoratory is a programming package specially designed for quick and easy scientific calculations. It has literally hundreds of built-in functions for a wide variety of computations and many tool boxes design for specific research disciplines, including statistics, optimization, solution for partial differential equation, data analysis.

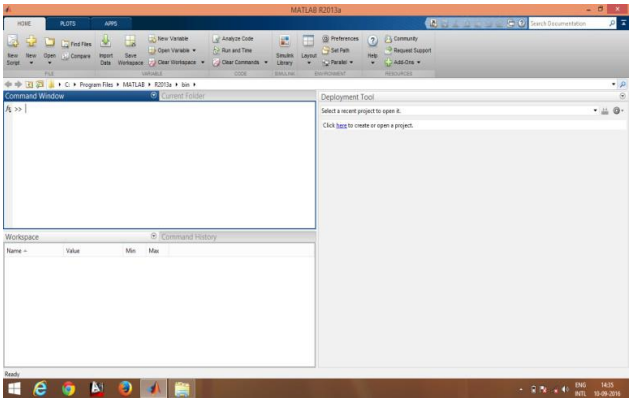

Figure 1 : starting window of MATLAB

III. ARTIFICIAL NEURAL NETWORKS

Artificial neural network emerged from the studies of how brain performs. The human brain consists of many millions of individual processing elements called neuron that are highly interconnected. ANNs are made up of simplified individual models of biological neurons that are connected together to form a network. Information stored in the network in the form of weight or different connecting strengths associated with the synapses in the artificial neuron models.

Many different type of neuron networks are available and multi-layered neural network are the most popular which are extremely successful in pattern reorganization problems. Each neuron input is weighted by wi. Changing the weights of an element will alter the behaviour of the whole network. The output y is obtained summing the weighted inputs and passing the result through a non-linear activation function.

IV. DATA MANAGER

By using this window input, Training & Target file are imported to ANN tool of Matlab.

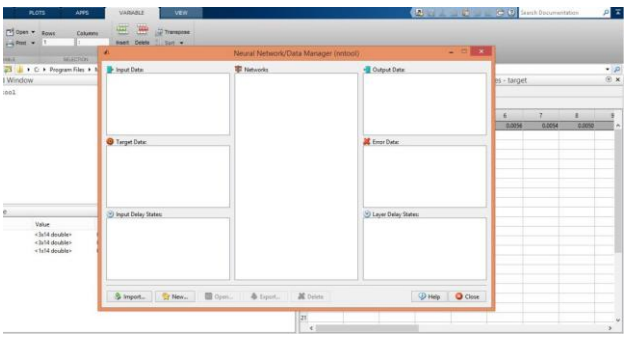

Figure 2 : NN tool data manager

V. NEURAL NETWORK TRAINING

Next, we create a training vector for the neural network in order to match the input accepted by the neural network function. The steps performed in creating and training the neural network has been illustrated below:

The 'nntool' of Matlab opens a dialog box where we required to Import the Inputs and Targets files from the MATLAB workspace. After importing files, the created network appears in the network list. Open the network and select training tab. Here, we can choose the training parameters and data (inputs and targets) and finally click on Train option to train the network. we used feed forward back propagation neural network. There were two hidden layers used with TANSIG (tan-sigmoid) function.

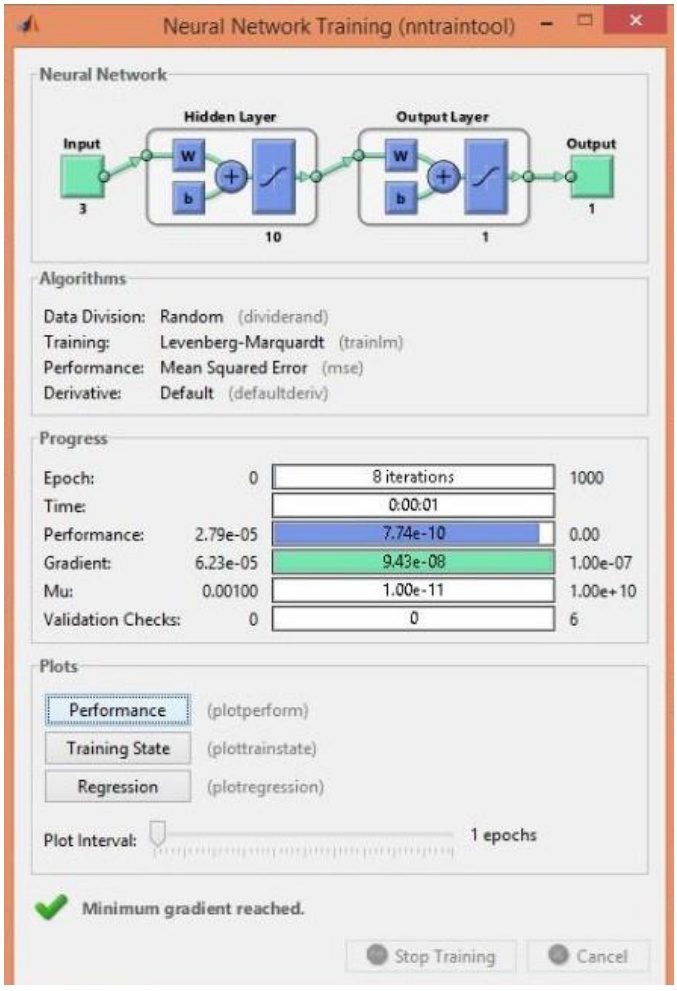

Figure 3 : Network training

Calculation of percentage error between measured and predicted discharge for 151mm diameter cone (NN Tool)

Table 1 shows the measured discharge Qm and discharge predicted by ANN model and percentage error between measured discharge and predicted discharge by 'nntool' of Matlab.

Table 1 : Comparison of Measured & Predicted Discharge

Q_m	Q_p	% Error
0.0146	0.0133	0.1394
0.0129	0.0122	0.0146
0.0116	0.0032	69.041
0.0107	0.0063	32.404
0.0098	0.0071	0.0024
0.009	0.0060	8.0939
0.0081	0.0055	4.3410
0.0069	0.0049	9.8556
0.0062	0.0039	0.0002
0.0047	0.0033	0.0039
0.0037	0.0027	0.1728
0.0031	0.0022	3.7472
0.0024		

VI. CONCLUSION

The predicted flow rates based on the ANN model were compared with the corresponding measured ones. The comparison showed a good agreement. The proposed model predicted measured flow rates with a maximum error of ± 10% except one reading out of thirteen. Based on the results of case study it is evident that ANNs perform well than conventional methods.

VII. REFERENCES

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