UNIVERSITI TEKNOLOGI MARA

AN ARTIFICIAL NEURAL NETWORK MODEL FOR FLOOD FORECASTING IN KEMAMAN, TERENGGANU

TUAN ASMAA BINTI TUAN RESDI

Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science

Faculty of Civil Engineering

February 2016

CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 25th May 2015 to conduct the final examination of Tuan Asmaa binti Tuan Resdi on her Master of Science thesis titled "An Artificial Neural Network Model for Flood Forecasting in Kemaman, Terengganu" in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners recommends that the student be awarded the relevant degree. The Panel of Examiners was as follows:

Afidah binti Abu Bakar, PhD
Associate Professor
Faculty of Civil Engineering
Universiti Teknologi MARA
(Chairman)

May Raksmey, PhD
Faculty of Civil Engineering
Universiti Teknologi MARA
(Internal Examiner)

Othman A. Karim, PhD
Professor
Faculty of Engineering and Built Environment
Universiti Kebangsaan Malaysia
(External Examiner)

SITI HALIJJAH SHARIFF, PhD
Associate Professor
Dean
Institute of Graduate Studies
Universiti Teknologi MARA
Date: 18th February, 2016

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Tuan Asmaa binti Tuan Resdi
Student I.D. No	:	2012859848
Programme	:	Master of Science- Civil Engineering (EC780)
Faculty	:	Faculty of Civil Engineering
Thesis Title	:	An Artificial Neural Network Model for Flood Forecasting in Kemaman, Terengganu
Signature of Student	:	.....
Date	:	February 2016

ABSTRACT

Flood is the most common natural hazard in Malaysia. Flood hazard brings damage to life and property in Malaysia. This hazard happens almost every year in the eastcoast and the southwest of Peninsular Malaysia. Kemaman district, Terengganu is one of the flood prone area, and was considered in the present study. Using historical hourly data of rainfalls, evaporation, temperature, mean relative humidity, tidal and river stage for the year 2009, the performance of Feed Forward Back-Propagation (FFBP), General Regression Neural Network (GRNN), and Radial Basis Function Neural Network (RBFNN) model were evaluated. Results of network training show that RBFNN model performs best. Hydrological variables including temperature, humidity and evaporation are shown to be important in the determination of river stage in the sensitivity study. However, this network model is incapable of reproducing the river stage accurately in the validation stage. In subsequent investigation, it is shown that the Nonlinear Autoregressive Network with Exogenous (NARX) model performs satisfactory in both the training and validation stages. Using representative set of hourly data, with optimal time delay for both the input and output, it is shown that the model with 13 hydrological inputs variables performs slightly better compared to a model which takes into consideration the tidal data. For one-step ahead prediction, the model performs satisfactorily for simultaneous hydrological simulations at multiple gauging stations.

ACKNOWLEDGEMENT

Firstly, I wish to thank Allah swt for giving me the opportunity to embark on my Master degree and for completing this long and challenging journey successfully. My gratitude and thanks go to my supervisor Dr. Lee Wei Koon. Thank you for the support, patience and ideas in assisting me with this project. I would like to express my gratitude to the Department of Irrigation and Drainage Malaysia (DID), Department Of Survey and National Mapping (JUPEM), Malaysian Meteorological Department (MMD) for providing all data station.

Finally, this thesis is dedicated to my loving father, mother, siblings and my friends for the vision, support and determination to educate me. This piece of victory is dedicated to both of you. Alhamdulillah.