UNIVERSITI TEKNOLOGI MARA

MODELING OF FLOOD WATER LEVEL PREDICTION USING NNARX

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of the requirements for the degree of
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CONFIRMATION BY PANEL OF EXAMINERS

I certify that a panel of examiners has met on 17 March 2015 to conduct the final examination of Fazlina bt Ahmat Ruslan on her Doctor of Philosophy thesis entitled "Modeling of Flood Water Level Prediction Using NNARX" 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:

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AUTHORS'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.

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ABSTRACT

There were a total of 58 events of natural disaster in Malaysia for the period between years 1980 to 2010 that claiming a total of 1,239 lives of the 640,000 people affected. These data were based on statistics provided by United Nation Officer for Disaster Risk Reduction (UNISDR). From all different categories of natural disasters considered, flood accounted for over half the registered events. Floods contribute to 8 out of 10 disaster events with the highest human exposure and affect over 85 % of all the disaster-stricken people. Floods are thus the primary hazard which affecting Malaysia, in particular the west coast of Peninsular. Therefore, an accurate and reliable flood prediction model is very much needed to provide early warning for residents nearby flood locations for evacuation purposes. However, current trends in flood prediction only involve flood modeling because no prediction time was mentioned and discussed. Furthermore, in Malaysia there is none of flood model or flood prediction model developed yet. An existing system in the Department of Irrigation and Drainage Malaysia is only the alarming system which alarms the users only when the water level exceeds the danger limit. Based on these scenarios, the research objective is to obtain a flood water level prediction model for Kuala Lumpur flood prone area using a new develops modeling technique that based on Neural Network Autoregressive Model with Exogenous Input (NNARX). The samples used for model training, model validation and model testing were carefully selected. In order to obtain good flood water level prediction model, all samples must be the data when flood events happened. All samples were real-time data that were obtained from the Department of Irrigation and Drainage Malaysia upon special request. From carefully selected samples, several optimal flood prediction times were suggested for flood location in Kuala Lumpur. Model validation and model testing were conducted to observe the prediction performances. The optimal prediction time was selected based on the results of prediction performances. A new modeling technique was develop and implemented to improve the prediction performance of NNARX model. The prediction performance of the new develop method was compared with Elman Neural Network (ENN), Radial Basis Function Neural Network (RBFNN) and Multilayer Perceptron Neural Network (MLPNN). In order to justify that the new develop method is applicable to other locations, selected flood prone locations in Kedah and Terengganu were considered. Results from the new develop method show significant improvement to prediction performance as compared to NNARX model.

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