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Rainfall-runoff model based on ANN with LM, BR and PSO as learning algorithms (Article) (Open Access)

Romlay, M.R.M.[a], Rashid, M.M.[b], Toha, S.F.[b], Ibrahim, A.M.[a]

[a]International Islamic University Malaysia (IIUM), Malaysia
[b]Department of Mechatronics Engineering, International Islamic University Malaysia (IIUM), Kuala Lumpur, Malaysia

Abstract

Rainfall-runoff model requires comprehensive computation as its relation is a complex natural phenomenon. Various inter-related processes are involved with factors such as rainfall intensity, geomorphology, climatic and landscape are all affecting runoff response. In general there is no single rainfall-runoff model that can cater to all flood prediction system with varying topological area. Hence, there is a vital need to have custom-tailored prediction model with specific range of data, type of perimeter and antecedent hour of prediction to meet the necessity of the locality. In an attempt to model a reliable rainfall-runoff system for a flood-prone area in Malaysia, 3 different approach of Artificial Neural Networks (ANN) are modelled based on the data acquired from Sungai Pahang, Pekan. In this paper, the ANN rainfall-runoff models are trained by the Levenberg Marquardt (LM), Bayesian Regularization (BR) and Particle Swarm Optimization (PSO). The performances of the learning algorithms are compared and evaluated based on a 12-hour prediction model. The results demonstrate that LM produces the best model. It outperforms BR and PSO in terms of convergence rate, lowest mean square error (MSE) and optimum coefficeint of correlation. Furthermore, the LM approach are free from overfitting, which is a crucial concern in conventional ANN learning algorithm. Our case study takes the data of rainfall and runoff from the year 2012 to 2014. This is a case study in Pahang river basin, Pekan, Malaysia. © BEIESP.

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