

Daily discharge simulation: Combining semi-distributed GIS-based and artificial intelligence models

Abstract

Developing highly accurate semi-distributed rainfall runoff models are still a big challenge in streamflow simulation. In this paper, a new technique using ANN to improve the accuracy of TOPMODEL is presented. TOPMODEL contains three sub-models, which are root storage, gravity storage and saturated storage. The proposed scheme is to replace one of the sub-models by artificial neural networks (ANN) model. A medium catchment located in tropical Malaysia known as Rantau Panjang catchment (RPC) is used. Two years, 1998–1999, are used for calibration, and 2000–2001 are used for validation process using daily data sets. Model results are evaluated by Nash-Sutcliffe model (NS), relative volume error (RVE) and correlation coefficient (CoC) which have been improved from 0.63 to 0.86, 0.92 to 0.93 and 40.91 to 14.12 respectively demonstrate the ability of ANN to improve the accuracy of TOPMODEL. It is concluded that the scheme can improve performance in terms of streamflow simulation.

Keywords

ANN; Artificial intelligence; Artificial neural networks; Hybrid; Johor River Basin; Malaysia; MLP; Rainfall runoff models; Rantau Panjang; TOPMODEL-Simulink; Tropical catchment