Rainfall-Runoff Modelling Using Artificial Neural Network and Adaptive Neuro-Fuzzy Inference System

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Abstract: Rainfall is one of the most complicated hydrological process in runoff prediction. Development of rainfall-runoff relations in hydrological modeling is a very important issue. Since it directly affects the design and operation of many water resources structures. The present study was undertaken to predict runoff for Usri river basin. The Usri river basin is located in Giridih district of Jharkhand with an area of about 731.02 km^2. In this study, two techniques were considered namely artificial neural networks (ANNs) and adaptive neuro-fuzzy inference system (ANFIS) to predict runoff. Data of monsoon period (15th June to 30th September) of years 1998-2005 were used for calibration of the models and data of years 2006-2008 were used for validation of models. The data of rainfall and runoff with three days lag as inputs and current day runoff as output were used for runoff prediction. The performance of the models were evaluated qualitatively by visual observations and quantitatively using performance indicators such as root mean square error (RMSE), correlation coefficient (r) and coefficient of efficiency (CE). It is concluded that the performance of the ANFIS model is better than ANN model for runoff prediction of the study area.

Keywords: Adaptive neuro-fuzzy inference system, Artificial neural networks, Modelling, Rainfall, and Runoff