



Annual runoff prediction with a sensitive artificial neural networks model

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Abstract: The hydrological time series modelling is a challenge to hydrologists for its great complexity. It is not easy to accurately make the mid-and-long term runoff forecasting such as annual runoff prediction. The technique of artificial neural network provides a promising alternative to hydrological time series modelling. However, there are still many unsolved fundamental problems related to mid-and-long term runoff forecasting, such as structure identification, parameter estimation, generalization performance improvement, etc. This paper presents a new model named sensitive artificial neural networks model (SANNs) for annual runoff prediction. Different from the tradition ANN model, The SANN model introduces the so-called forgetting factor and expectation factor to change the weights of the raw data at different time stages. The forgetting factor is used to reduce the influence level of the raw data at the earlier time and the expectation factor used to enhance the prediction accuracy of the nearest future time. Furthermore, the self-adaptive error back-propagation algorithm was applied to quicken the model's learning convergence rate when adjusting the connection strengths. The validations against the hydrological data at Yichang station in the Yangtse River and San Huangmiao station in the Tuo River show the proposed model can effectively enhance the forecasting precision and depress the oscillation level occurring in the learning process.

Keywords: Artificial neural networks; Annual runoff prediction; Forgetting factor; Expecting factor; Self-adaptive