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论文

基于自适应调整蚁群-RBF神经网络模型的中长期径流预测

白继中[1,2], **师彪**[1], **冯民权**[1], **周利坤**[1,3]

1. 西安理工大学 水利水电学院,西安 710048;
2. 山西水利职业技术学院,山西 运城 044004;
3. 武警工程学院,西安 710086

摘要:

径流预测历来是水利部门的一项重要工作,针对水库和河流中长期径流预测精度不高,提出了自适应调节人工蚁群算法(ARACS),对RBF神经网络参数进行优化,建立了自适应调节人工蚁群-RBF神经网络组合算法(ARACS-RBF)预测模型,综合考虑影响径流预变化因素,对安康水库进行中长期径流预测。对预测效果进行检验,结果证实该模型可真实地反映河川径流变化的总体趋势, 并为判断时间序列数据的非线性提供了一种新方法。与RBF神经网络模型、人工蚁群-RBF神经网络模型预测结果进行对比,结果表明,应用ARACS-RBF模型对中长期径流量进行预测,预测精度更高、效果更好。该方法克服了RBF神经网络和人工蚁群算法易陷于局部极值、搜索质量差和精度不高的缺点,改善了RBF神经网络的泛化能力,收敛速度快,输出稳定性好,提高了径流预测的精度,置信度为98%时的预测相对误差小于6.5%。可有效用于水库和河川中长期径流预测。

关键词: 水文学 径流预测 ARACS-RBF神经网络算法 自适应调节人工蚁群算法

Adaptive Regulation Ant Colony System Algorithm-Radial Basis Function Neural Network Model and Application in Mid-long Term Runoff Prediction

BAI Ji-zhong[1,2], SHI Biao[1], FENG Min-quan[1], ZHOU Li-kun[1,3]

1. Institute of Water Resources and Hydro-electric Engineering, Xi'an University of Technology, Xi'an 710048, China;
2. Shanxi Water Conservancy Technical Institute, Yuncheng 044004, China;
3. Engineering College of CAPF, Xi'an 710086, China

Abstract:

Runoff prediction is an important task of water conservancy departments. In order to improve the reservoir long-term runoff forecasting accuracy, adaptive regulation ant colony system algorithm (ARACS) is proposed. The forecast model is set up by using an adaptive regulation ant colony system algorithm and the radial basis function (RBF) neural network combined to form ARACS-RBF hybrid algorithm, and then training the neural network by using the ARACS algorithm. It can automatically determine the parameters of the neural network from the sample data and form the reservoir long-term runoff forecast model based on the hybrid algorithm. Then the reservoir long-term runoff forecast was carried out by using the method and history runoff data. In long-term runoff forecasting such factors impacting long-term runoff as meteorology, weather, rainfall and season are comprehensively considered. The results indicate that the method can reflect the general trend of the stream flow truly, which provides a new method to estimate the no linearity of time series. The result shows the convergence of method is faster and forecast accuracy is more accurate than that of the traditional ant colony system algorithm-RBF neural network and RBF neural network. The method improves forecast accuracy and improves the RBF neural network generalization capacity; it has a high computational precision, and in 98% of confidence level the average percentage error is no more than 6.5%. The hybrid algorithm can be used efficiaciously in long-term runoff forecasting of the reservoir and river.

Keywords: hydrology runoff prediction ARACS-RBF hybrid algorithm adaptive regulation ant colony system algorithm

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通讯作者:

作者简介:

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