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A new dynamic firefly algorithm for demand estimation of water resources

Hui Wang^{a,b}, Wenjun Wang^c, Zhihua Cui^d, Xinyu Zhou^e, Jia Zhao^{a,b}, Ya Li^{f,*}

^aJiangxi Province Key Laboratory of Water Information Cooperative Sensing and Intelligent Processing, Nanchang Institute of Technology, Nanchang 330099, China

^bSchool of Information Engineering, Nanchang Institute of Technology, Nanchang 330099, China

^cSchool of Business Administration, Nanchang Institute of Technology, Nanchang 330099, China

^dSchool of Computer Science and Technology, Taiyuan University of Science and Technology, Taiyuan 030024, China

^eCollege of Computer and Information Engineering, Jiangxi Normal University, Nanchang 330022, China

^fSchool of Computer Science and Educational Software, Guangzhou University, Guangzhou 510006, China

Abstract

Firefly algorithm (FA) is an effective optimization technique based on swarm intelligence, which has been successfully applied to various practical engineering problems. In this paper, a new dynamic FA (called NDFA) is proposed for demand estimation of water resources in Nanchang city of China. First, a dynamic parameter strategy is used to avoid manually adjusting the step factor. Second, three estimation models in different forms (linear, exponential and hybrid) are developed in terms of the historical water use and local economic structure. Third, normalization method is utilized to eliminate the influences of different units of data. In the experiments, water use in Nanchang city from 2003 to 2015 is considered as a case study. The data from 2003 to 2012 are used for finding the optimal weights of the models, and the rest of data (2013–2015) are applied to test the models. Computational results show that all five FA variants can achieve promising solutions. The proposed NDFA obtains better performance than four other FA variants, and its prediction accuracy is up to 97.91%. Finally, the water demand in Nanchang city from 2017 to 2020 is predicted.

Keywords: Firefly algorithm (FA), Swarm Intelligence, Dynamic parameter, Water

*Corresponding author

Email addresses: huiwang@whu.edu.cn (Hui Wang), wangwenjun881@126.com (Wenjun Wang), zhihuacui@gmail.com (Zhihua Cui), xyzhou@jxnu.edu.cn (Xinyu Zhou), zhaojia925@163.com (Jia Zhao), liya@gzhu.edu.cn (Ya Li)

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