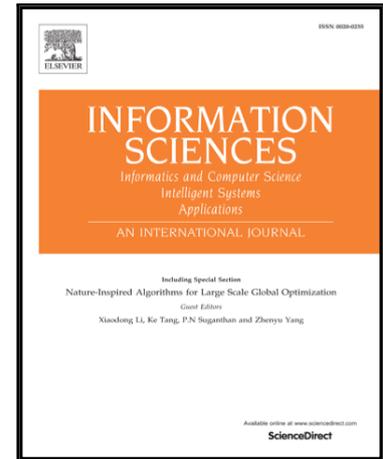


Accepted Manuscript

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PII: S0020-0255(18)30053-7
DOI: [10.1016/j.ins.2018.01.041](https://doi.org/10.1016/j.ins.2018.01.041)
Reference: INS 13395



To appear in: *Information Sciences*

Received date: 3 November 2017
Revised date: 26 December 2017
Accepted date: 21 January 2018

Please cite this article as: Hui Wang, Wenjun Wang, Zhihua Cui, Xinyu Zhou, Jia Zhao, Ya Li, A new dynamic firefly algorithm for demand estimation of water resources, *Information Sciences* (2018), doi: [10.1016/j.ins.2018.01.041](https://doi.org/10.1016/j.ins.2018.01.041)

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A new dynamic firefly algorithm for demand estimation of water resources

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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

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