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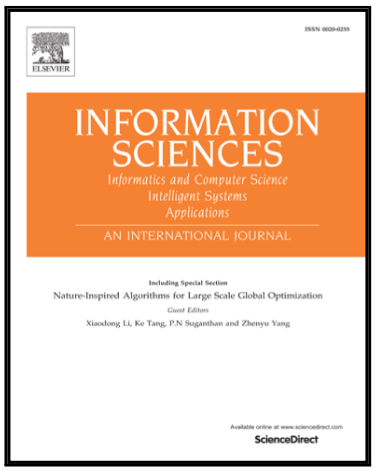

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PII: S0020-0255(16)31355-X
DOI: 10.1016/j.ins.2017.11.007
Reference: INS 13235

To appear in: *Information Sciences*

Received date: 19 October 2016
Revised date: 30 October 2017
Accepted date: 1 November 2017

Please cite this article as: Wan-li Xiang, Xue-lei Meng, Yin-zhen Li, Rui-chun He, Mei-qing An, An improved artificial bee colony algorithm based on the gravity model, *Information Sciences* (2017), doi: 10.1016/j.ins.2017.11.007

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An improved artificial bee colony algorithm based on the gravity model

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Abstract

Artificial bee colony (ABC) algorithm is a relatively new biologically-inspired optimization algorithm. According to its solution search equation, it can be seen that ABC is good at exploration but poor at exploitation. Inspired by the gravity model, an attractive force model is proposed for choosing a better neighbor of a current individual to improve the exploitation ability of ABC. Then we propose a novel solution search equation, in which the chosen neighbor plays an important role in guiding the searching process in the employed bee phase. Next, a random guiding search is introduced in the onlooker bee phase to balance the foregoing exploitation. Subsequently, multiple solution search equations, a scheme of perturbation frequency, and a multiple scouts search strategy in view of opposition-based learning are also incorporated into the proposed algorithm, called ABCG, to further reach a good compromise between the exploitation and the exploration. Finally, ABCG is tested on a great number of benchmark functions. The experimental results show that ABCG is effective for solving the complex benchmark problems and it can be considered as a competitive approach.

Keywords:
Artificial bee colony algorithm, Gravity model, Random guiding mechanism, Opposition-based learning, Numerical Optimization

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