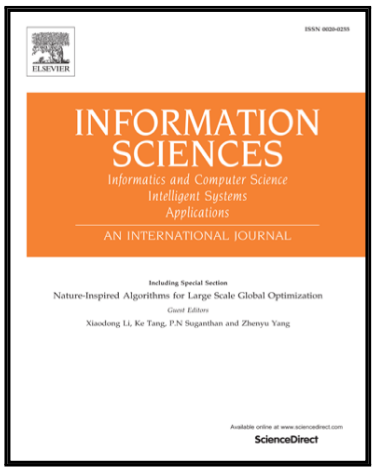

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A novel artificial bee colony algorithm with an adaptive population size for numerical function optimization

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Abstract: The artificial bee colony (ABC) algorithm is a new branch of evolutionary algorithms (EAs) that is inspired by the collective foraging behavior of real honey bee colonies. Due to its foraging model and its solution search equation, ABC generally performs well in exploration but badly in exploitation. To address this concerning issue and obtain a good balance between exploration and exploitation, in this paper, we mainly introduce into the ABC an adaptive method for the population size (**AMPS**). **AMPS** is inspired by the natural principle that the size of a population is affected by the availability of food resources. When food resources are abundant, a population tends to expand; otherwise, a decrease in the availability of food resources leads to a shrinkage in the population size. Specifically, when the algorithm performs well in exploration, **AMPS** will shrink the population to enhance exploitation by periodically removing some inferior solutions that have low success rates. In contrast, **AMPS** will enlarge the population to improve exploration by introducing some reserved solutions. Furthermore, to make **AMPS** perform better, we design a new solution search equation for employed bees and onlooker bees. Moreover, we also improve the probability model of the onlooker bees. By embedding our three proposed algorithmic components into ABC, we propose a novel ABC variant, called APABC. To demonstrate the performance of APABC, we compare APABC with some state-of-the-art ABC variants and some other non-ABC methods on 22 scalable benchmark functions and 30 CEC2014 test functions. The simulation results show that APABC is better than or at least competitive with the competitors in terms of its solution quality, robustness and convergence speed.

Key words: Artificial bee colony algorithm, exploration and exploitation, adaptive method for the population size, solution search equation, probability model

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