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ENHANCED ARTIFICIAL BEE COLONY OPTIMIZATION

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Abstract. *An enhanced Artificial Bee Colony (ABC) optimization algorithm, which is called the Interactive Artificial Bee Colony (IABC) optimization, for numerical optimization problems, is proposed in this paper. The onlooker bee is designed to move straightly to the picked coordinate indicated by the employed bee and evaluates the fitness values near it in the original Artificial Bee Colony algorithm in order to reduce the computational complexity. Hence, the exploration capacity of the ABC is constrained in a zone. Based on the framework of the ABC, the IABC introduces the concept of universal gravitation into the consideration of the affection between employed bees and the onlooker bees. By assigning different values of the control parameter, the universal gravitation should be involved for the IABC when there are various quantities of employed bees and the single onlooker bee. Therefore, the exploration ability is redeemed about on average in the IABC. Five benchmark functions are simulated in the experiments in order to compare the accuracy/quality of the IABC, the ABC and the PSO. The experimental results manifest the superiority in accuracy of the proposed IABC to other methods.*
Keywords: Swarm intelligence, Bee colony algorithm, Numerical optimization, Interactive Artificial Bee Colony, Particle Swarm Optimization

1. **Introduction.** In recent years, swarm intelligence becomes more and more attractive for researchers who work in the related research field. It can be classified as one of the branches in evolutionary computing. Swarm intelligence can be defined as the measure introducing the collective behavior of social insect colonies or other animal societies to design algorithms or distributed problem-solving devices [1]. Generally, the algorithms in swarm intelligence are applied to solve optimization problems. The classical algorithm in evolutionary computing and is used to solve problems of optimization is the Genetic Algorithm (GA) [11,12,17,19,21]. Later then, many swarm intelligence algorithms for solving problems of optimization are proposed such as the Cat Swarm Optimization (CSO) [5,6], the Parallel Cat Swarm Optimization (PCSO) [23], the Artificial Bee Colony (ABC) [15,16], the Particle Swarm Optimization (PSO) [2,4,14,22], the Fast Particle Swarm Optimization (FPSO) [3], and the Ant Colony Optimization (ACO) [7,9]. Moreover, several applications of optimization algorithms based on computational intelligence or swarm intelligence are also presented one after another [10,18,20].

Karaboga proposed the Artificial Bee Colony (ABC) algorithm based on a particular intelligent behavior of the honeybee swarms [16] in 2005. In addition, the accuracy and