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SELF-REGULATING ONLOOKER BEE STAGE WITH DE-MUTATION OPERATION AND RANKING ASSIGNMENT IN ARTIFICIAL BEE COLONY ALGORITHM FOR SOLVING CONTINUOUS OPTIMIZATION PROBLEMS (SR(O)ABC)

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Abstract:
One of the most recent swarm intelligence-based algorithms is the Artificial Bee Colony (ABC) algorithm that simulates the honey bees' foraging activity in their hive. ABC begins with a colony of artificial bees with the primary purpose of using the solution search equation in the hive and onlooker bee operators used to locate the position of food sources with high nectar amounts. The solution search equation, however, is excellent in discovery and weak in exploitation. The solution quest equation of the onlooker bee is updated in this paper by using the value of the most suitable food sources chosen by a series of selection schemes based on evolutionary algorithms. This is to direct the onlooker bee's quest process towards the population's most suitable food sources in order to empower the capacity to manipulate and converge. This paper proposes Self-Regulating Onlooker Bee Stage with De-Mutation Operation and Ranking Assignment in Artificial Bee Colony Algorithm for Solving Continuous Optimization Problems (SR(O)ABC). The experimental outcome of benchmark features that illustrate the SR(O)ABC algorithm speeds up convergence and improves performance. Eventually, the findings of structural design enhancement issues obtained indicate that the SR(O)ABC algorithm has a clear superiority relative to the other algorithms in determination enhancement in solving problems of optimization engineering design.

Keywords: ABC, Chaotic, Differential Evolution, Ranking, SR(O)ABC , OFSSM.

1. INTRODUCTION

Artificial Bee Colony (ABC) is among the emerging swarm-based intelligence algorithms that simulate the foraging act of bees proposed by Karaboga in [1]. ABC has many advantages that include simple to implement, stable, and highly scalable [2]. In ABC there are only three control parameters which are maximum cycle number, colony size and limit. So, it is easy to customize for the various types of optimization problems. Adding and removing bee is simple without having to reinitialize the algorithm [3, 4]. Because of these benefits, ABC has been successfully adapted to a number of optimization issues.

Classification of Optimization Methods (Two Optimization Methods)

Swarm Intelligence (SI) - Swarm Intelligence (SI) is an important type of methods for optimization process. SI is the property of a framework where agents' collective actions that interact locally with their environment cause the evolution of globally integrated functional patterns. Unlike evolutionary algorithms (EAs), SI algorithms are influenced by simple behaviors and self-organizing interactions among agents, such as foraging ant colonies, flocking of birds, honey bees, herding of animals, fish schooling, bacterial development, etc. Beni [5] first used the term SI in the cellular robotic system where basic agents organize themselves through neighborhood interactions, and later established in [6, 7, 8].

Some popular SI algorithms are Ant Colony Optimization (ACO) [9] and Particle Swarms Optimization (PSO) [10]. Some less popular SI algorithms include Artificial Bees Colony (ABC) [11], Bacterial Foraging Optimization (BFO) [12], Firefly Algorithm (FA) [13], Artificial Fish Swarm Optimization (AFSO) [14] and so on.

Memetic Approach (MA) - Moscato first suggested a population-based model with a local development approach for seeking a solution in [15] known as the "Memetic Algorithm" (MA). MAs are hybrid search methods based on the population-based search framework [16, 17] and the Local Search schema (LS) for neighborhoods [18].