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SELF-REGULATING EMPLOYED BEE SEARCH WITH LEVY FLIGHT PATTERN MECHANISM AND SCOUT STAGE WITH SELF-ADAPTIVE-LIMIT MECHANISM IN ARTIFICIAL BEE COLONY ALGORITHM FOR SOLVING CONTINUOUS OPTIMIZATION PROBLEMS (SRABC)

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Abstract: With the event of science and technology, the accuracy necessities for determination engineering issues have gotten stricter than before. Most structural design optimization issues in civil and applied science have evidenced to be the non-deterministic polynomial exhausting issues. The artificial bee colony (ABC) algorithmic has been evidenced to be an efficient methodology of design optimization issues. This paper proposes Self-Regulating Employed Bee Search with Levy Flight Pattern Mechanism and Scout Stage with Self-Adaptive-Limit Mechanism [SRABC] combined with Levy flight and Self-Adaptive-Limit Mechanism. The experimental result of benchmark functions that shows the SRABC algorithmic accelerates the convergence and improves the performance. Eventually, the obtained results of improvement structural design issues prove that the SRABC algorithmic encompasses a sturdy superiority compared with the other algorithms in determination improvement in solving optimization engineering design issues.

Keywords: ABC, Chaotic, Leavy Flight, SRABC, Self Adaptive.

1. INTRODUCTION

Problems with optimization are usually found in various branches and areas of sciences and engineering. The focus of optimization problems is to find the optimal solution or Near-optimal solutions to certain goals. Handling optimization issues are not trifling handle for the optimization strategies due to its complexity and a huge number of solutions within the lookup (search) space. These sorts of problems can be classified into: continuous or discrete due to their variable esteem range, obliged or unconstrained due to the limitation requirements, single or multiobjective due to their assessment criteria, and so on [1]. One of the special kinds of optimization problems is Global optimization problems, which are continuous in nature and the value range of each decision variable is boundless [2]. It is a one branch of solving applied mathematics optimization problem based on some criteria [3].

The global optimization can be regarded as a paradigm for other kinds of optimization problems in medicine, mathematics, engineering and so on. The conventional approaches such as linear programming or branch and bound algorithms have some drawbacks in providing optimal GOP solutions given their immense sizes.

The common characteristics of these algorithms are their search methods, which are based on processes of exploration (diversification) and exploitation (intensification) [4]. Where feasible, exploration can be defined as the process of visiting a new search space region, while exploitation is the process of using accrual search. Any successful metaheuristic methods should be able to strike a right balance between these two processes to utilize their maximum search capability.

Artificial Bee Colony (ABC) is among the emerging swarm-based intelligence algorithms that simulate the foraging act of bees proposed by Karaboga in [5]. ABC has many advantages that include simple to implement, stable, and highly scalable [6]. 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 [7, 8]. Because of these benefits, ABC has been successfully adapted to a number of optimization issues.

1.1 WORK CONTRIBUTIONS

The major contribution of proposed Algorithm SRABC is described as follows:

- The chaotic mechanism is applied to the initial stage to avoid repeated search and to control the diversity of the population into the boundary.
- The two different searching mechanisms are adopted in the search process.