Title: Design and Development of Intelligent Optimization Algorithm

Abstract

Nowadays, optimization is used in almost every field of research and industrial applications. In the literature, there are mainly two categories of optimization tools, viz., traditional and non-traditional algorithms, available. Traditional optimization tools work mostly in a deterministic manner and these are not suitable to tackle complex, non-linear, and discontinuous objective functions. Moreover, the trapping of solutions in local optimum basins is a big concern for these algorithms. In contrast, non-traditional tools, which are motivated by some natural phenomena, can overcome those issues. These algorithms are mathematically simple, easy to apply, robust, and powerful to solve a variety of problems. Among several algorithms, the Genetic Algorithm (GA) is one of the most popular and commonly-used optimization techniques. Besides several advantages of a GA, there are some limitations, like slow convergence rate, weak local search capability, and low probabilistic guarantee to find the globally optimum solution, etc. To elude these demerits, several efforts were made by various researchers. However, those were not sufficient to make GA intelligent enough. In this study, various efficient operators, like selection, crossover, mutation, restart-strategy, and search space reduction technique are developed. Moreover, a new intelligent optimization tool, namely Bonobo Optimizer (BO) is proposed in both single- and multi-objective realms. Furthermore, a Self-adaptive Bonobo Optimizer is also constructed to make BO more efficient. The performances of all these algorithms are checked through several experiments including test functions and real-world optimization problems. Moreover, the obtained results are analyzed and found competitive compared to that of state-of-the-art algorithms.

Keywords: Intelligent Genetic Algorithm; Bonobo Optimizer; Multi-objective Bonobo Optimizer; Self-adaptive Bonobo Optimizer; Repulsion-based Learning.