ON THE PERFORMANCE OF QUICK FLOWER POLLINATION ALGORITHM (QFPA) IN SOLVING HIGH-DIMENSIONAL NUMERICAL OPTIMIZATION PROBLEMS

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ABSTRACT

Solving of numerical optimization problems is one of the important usage areas of metaheuristic optimization algorithms. The performance of many meta-heuristic algorithms is evaluated by using these problems. In order to evaluate the success and effectiveness of an optimization algorithm, its performance in solving problems with different dimensions should be examined. In particular, as the dimension of the problem increases, its complexity also increases. This complicates the problem. An effective optimization algorithm is required to solve these problems. The flower pollination algorithm, which models the pollination process in nature, is one of the important meta-heuristic algorithms. It can be seen in the literature that many variants of FPA have been proposed to increase its performance and local search capability. One of them is the quick pollination algorithm (QFPA). The QFPA includes two important updates. Unlike FPA, the switch probability value is calculated adaptively based on the maximum number of generations. It also uses arithmetic crossover to increase local search capability. In this study, QFPA is used for the first time to solve high-dimensional numerical optimization problems. The performance of the QFPA has been evaluated on 10 benchmark test functions. The effect of population size and maximum number of generations on the performance of QFPA is also examined. The solution quality and convergence speed of QFPA have been studied in detail. The performance of QFPA in solving related problems is compared with the standard FPA. Wilcoxon signed rank test is used to analyze the significance of the results. At the same time, a detailed evaluation is made on the tables and figures. The results have showed that the performance of QFPA is more effective than the standard FPA in solving high-dimensional optimization problems.

Keywords: Quick Flower Pollination Algorithm, Flower Pollination Algorithm, Numerical Optimization Problem, Meta-heuristic Algorithm, Optimization