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Performance Evaluation of Chaos-enhanced Stochastic Fractal Search algorithm using Constrained Engineering Design Problems

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Abstract. In the two past decades, many evolutionary algorithms (EAs) have been proposed to solve optimization problems either constrained or unconstrained. This paper presents the performance evaluation of Chaos-enhanced Stochastic Fractal Search (CFS) algorithms for solving three different constrained engineering design optimization problems which extensively were used in the literature as a benchmarking task. Then, a comparative study between the original Stochastic Fractal Search (SFS) algorithm and its chaotic variants is carried out using nonparametric statistical analysis in order to assess performance improvement in terms of convergence rate and solutions accuracy. The results show that the CFS algorithms with appropriate chaotic maps can significantly outperform standard SFS and other established EAs in solving constrained engineering design optimization problems.

Keywords: benchmark, chaos, constrained engineering optimization, metaheuristic algorithm, stochastic fractal search