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A grey artificial bee colony algorithm

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Abstract

Artificial bee colony (ABC) algorithm is a very popular population-based algorithm. Unfortunately, there exists a shortcoming of slow convergence rate, which partly results from random choices of neighbour individuals regarding its solution search equation. A novel scheme for the choice of neighbors is introduced based on grey relational degrees between a current individual and its neighbors to overcome the insufficiency. Then, the chosen neighbor is used to guide the search process. Additionally, inspired by differential evolution, a solution search equation called ABC/rand/2 is employed to balance the previous exploitation and a new perturbation scheme is also employed. What is more, solution search equations using information of the best individual, an opposition-based learning method and a chaotic initialization technique are also integrated into the proposed algorithm called grey artificial bee colony algorithm (GABC for short). Subsequently, the effectiveness and efficiency of GABC are validated on a test suite composed of fifty-seven benchmark functions. Furthermore, it is also compared with a few state-of-the-art algorithms. The related experimental results show the effectiveness and superiority of GABC.

Keywords:

Artificial bee colony algorithm, Grey relational analysis, Opposition-based learning, Chaotic initialization, Numerical Optimization

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