Summary: This paper proposes a new metaheuristic algorithm called dwarf mongoose optimization algorithm (DMO) to solve the classical and CEC 2020 benchmark functions and 12 continuous/discrete engineering optimization problems. The DMO mimics the foraging behavior of the dwarf mongoose. The restrictive mode of prey capture (feeding) has dramatically affected the mongooses’ social behavior and ecological adaptations to compensate for efficient family nutrition. The compensatory behavioral adaptations of the mongoose are prey size, space utilization, group size, and food provisioning. Three social groups of the dwarf mongoose are used in the proposed algorithm, the alpha group, babysitters, and the scout group. The family forage as a unit, and the alpha female initiates foraging, determines the foraging path, the distance covered, and the sleeping mounds. A certain number of the mongoose population (usually a mixture of males and females) serve as the babysitters. They remain with the young until the group returns at midday or evening. The babysitters are exchanged for the first to forage with the group (exploitation phase). The dwarf mongooses do not build a nest for their young; they move them from one sleeping mound to another and do not return to the previously foraged site. The dwarf mongoose has adopted a seminomadic way of life in a territory large enough to support the entire group (exploration phase). The nomadic behavior prevents overexploitation of a particular area. It also ensures exploration of the whole territory because no previously visited sleeping mound is returned. The performance of the proposed DMO algorithm is compared with seven other algorithms to show its effectiveness in terms of different performance metrics and statistics. In most cases, the near-optimal solutions achieved by the DMO are better than the best solutions obtained by the current state-of-the-art algorithms. Matlab codes of DMO are available at https://www.mathworks.com/matlabcentral/fileexchange/105125-dwarf-mongoose-optimization-algorithm.

MSC:
92-XX Biology and other natural sciences
90-XX Operations research, mathematical programming

Keywords:
dwarf mongoose optimization algorithm; metaheuristic; nature-inspired algorithms; global optimization; engineering design problems

Full Text: DOI

References:
[12] Liang, J. J.; Qu, B. Y.; Suganthan, P. N., Problem Definitions and Evaluation Criteria for the CEC 2014 Special Session and Competition on Single Objective Real-Parameter Numerical Optimization (2013), Computational Intelligence Laboratory, Zhengzhou University, Zhengzhou China and Technical Report, Nanyang Technological University: Computational Intelligence Laboratory, Zhengzhou University, Zhengzhou China and Technical Report, Nanyang Technological University Singapore, Cina and Singapore


Agushaka, J. O.; Ezugwu, A. E., Advanced Arithmetic Optimization Algorithm for solving mechanical engineering design problems, Plos One, 16, 8, Article e0255703 pp. (2021)


Rasa, O. E., Differences in group member response to intruding conspecifs and potentially dangerous stimuli in dwarf mongooses (Helogule unduluru rufulu), Z. Suggerierkd., 42, 108-112 (1977)


Rasa, O. A.E., Ecological factors and their relationship to group size, mortality and behaviour in the dwarf mongoose, Cimbebasia, 8, 15-21 (1986)


Meier, V.; Rasa, O. E.; Scheich, H., Call-system similarity in a ground-living social bird and a mammal in the bush habitat, Eehav. Ecol. Sociobiol., 12, 5-9 (1983)


Rather, S.; Bala, P., Hybridization of constriction coefficient based particle swarm optimization and gravitational search algorithm for function optimization, (International Conference on Advances in Electronics, Electrical, and Computational Intelligence (ICAEEC- 2019) (2019))


[75] Parkinson, A.; Balling, R.; Hedengren, J. D., Optimization Methods for Engineering Design (2018), Brigham Young University: Brigham Young University Brigham


This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.