

Title:

An improved elephant herding optimization using sine – cosine mechanism and opposition – based learning for global optimization problems.

Journal:

Expert Systems with Applications Volume 172, 2021

Document Type:

Article

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Full text link:**Scopus preview:**

<https://www.scopus.com/inward/record.uri?eid=2-s2.0-85100561014&doi=10.1016%2fj.eswa.2021.114607&partnerID=40&md5=bb44b20475a770b8e8a1a6b3cc4d1203>

Citation:

Muthusamy H., Ravindran S., Yaacob S., Polat K. An improved elephant herding optimization using sine–cosine mechanism and opposition-based learning for global optimization problems (2021) Expert Systems with Applications, 172, art. no. 114607. DOI: 10.1016/j.eswa.2021.114607

Abstract:

An improved elephant herding optimization (EHOI) is proposed for continuous function optimization, financial stress prediction problem and two engineering optimization problems in this work. Elephant Herding Optimization (EHO) is a swarm-based algorithm and was inspired by the social behaviour of elephant clans. In the literature, EHO has received great attention from researchers due to its global optimization capability and ease of implementation. However, it has few limitations like random replacing of worst individual and lack of exploitation, which leads to slow convergence. In this work, EHO was enhanced with the help of the position updating mechanism of sine–cosine algorithm (SCA) and opposition-based learning (OBL). The separating operator in original EHO was replaced by the sine–cosine mechanism and followed by opposition-based learning was introduced to increase the performance of EHO. The proposed EHOI was compared with eight well-known meta-heuristic optimization algorithms (MAs) by using 23 classical benchmark functions, 10 modern CEC2019 benchmark test functions and two engineering optimization problems. From the results, it was observed that the proposed EHOI outperformed most of the selected MAs in terms of solution quality. A kernel extreme learning machine (KELM) model was optimized by improved EHO and applied to handle financial stress prediction.