# Optimization of modified Bouc–Wen model for magnetorheological damper using modified cuckoo search algorithm

*Rosmazi Rosli[1] and Zamri Mohamed[2]*

[1]Advanced Structural Integrity and Vibration Research Group, Faculty of Mechanical and Automotive Engineering Technology, Universiti Malaysia Pahang, Malaysia
[2]Department of Mechanical Engineering, College of Engineering, Universiti Malaysia Pahang, Malaysia
Email: rosmazi@ump.edu.my

**ABSTRACT**

This article presents a new modified cuckoo search algorithm with dynamic discovery probability and step-size factor for optimizing the Bouc–Wen Model in magnetorheological damper application. The newly proposed algorithm was tested using a set of standard benchmark functions with different searching space and global optima placement. An engineering optimization application was chosen to evaluate the performance of the algorithm in complex engineering applications. The optimization task involved hysteresis parameter identification of the root mean square error between the model and an actual magnetorheological damper. The magnetorheological damper response was chosen as the objective function. The final value of the fitness function and the iteration number it took to converge were used as the qualifying indicator to the proposed cuckoo search algorithm efficiency. A comparison was done against particle swarm optimization, genetic algorithm, and sine–cosine algorithm, where the modified cuckoo search algorithm showed the lowest root mean square error and fastest convergence rate among the three algorithms.

**KEYWORDS:** Dynamic cuckoo search algorithm, modified Bouc–Wen model, magnetorheological damper

**DOI:** https://doi.org/10.1177/1077546320951383

**FUNDING**

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was supported by the RDU170382 grant from Universiti Malaysia Pahang (www.ump.edu.my).

**REFERENCES**


Charalampakis AE and Dimou CK (2010) Identification of Bouc-Wen hysteretic systems using particle swarm optimization. Computers and Structures 88(21–22): 1197–1205.

Cheng M-Y and Lien L-C (2012) Hybrid artificial intelligence-based PBA for benchmark functions and facility layout design optimization. Journal of Computing in Civil Engineering 26(5): 612–624.

Cheng MY and Prayogo D (2014) Symbiotic organisms search: a new metaheuristic optimization algorithm. Computers and Structures 139: 98–112.

Fellah Jahromi A, Bhat RB, Xie W-F, et al. (2015) Frequency dependent spencer modeling of magnetorheological damper using hybrid optimization approach. Shock and Vibration 2015: 1–8.

Gandomi AH, Yang X-S, Alavi AH (2013) Cuckoo search algorithm: a metaheuristic approach to solve structural optimization problems. Engineering with Computers 29(1): 17–35.