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Optimal Model Order Reduction Based on Hybridization of Adaptive Safe Experimentation Dynamics-Nonlinear Sine Cosine Algorithm

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Abstract

Convolutated high-order structures as modeled through mathematical principle including telecommunication systems, power plants for urbanized energy supply and aerospace systems are often accompanied by the apparent setbacks in analyzing, experimentation and operational control. The complexity of such structures is proposedly decreased within the current study through introduction of a hybridized meta-heuristics fine-tuning approach between Adaptive Safe Experimentation Dynamics (ASED) and Nonlinear Sine Cosine Algorithm (NSCA). Entrapment within the local optima is hereby overcome through ASED by adaptive random perturbation, with improved exploration and exploitation of the introduced approach being further enabled by NSCA. The method's potency was evaluated through an empirically adopted 6th order numerical function. Experimentation outcomes uncovered profound robustness and consistency from ASED-NSCA against alternative modern optimization-based techniques towards comparatively outstanding model order reduction (MOR). © 2023 IEEE.

Author Keywords

Adaptive Safe Experimentation Dynamics; Meta-heuristics Optimization; Model Order Reduction; Nonlinear Sine Cosine Algorithm

Index Keywords

Numerical methods, Optimization, Random processes; Adaptive safe experimentation dynamic, Dynamic non-linear, High-order structure, Higher-order structure, Hybridisation, Metaheuristic optimization, Model order reduction, Nonlinear sine cosine algorithm, Optimal model, Sine-cosine algorithm; Dynamics

References

- Bai, Z.
Krylov subspace techniques for reduced-order modeling of large-scale dynamical systems
(2002) *Appl. Numer. Math*, 43 (1-2), pp. 9-44.
Oct
- Kumar, D.
(2014) *Model Reduction by Extended Minimal Degree Optimal Hankel Norm Approximation*,
S. N.-A. M. Modelling, and undefined, Elsevier
- Shamash, Y.
Stable reduced-order models using Padé-type approximations
(1974) *Ieee Trans. Automat. Contr*, 19 (5), pp. 615-616.
Oct
- Krishnamurthy, V., Seshadri, V.
Model reduction using the Routh stability criterion
(1978) *Ieee Trans. Automat. Contr*, 23 (4), pp. 729-731.
Aug
- Mukherjee, S.S., Mittal, R.C.
Order reduction of linear discrete systems using a genetic algorithm

(2005) *Appl. Math. Model*, 29 (6), pp. 565-578.

Jun

- Desai, S.R., Prasad, R.
A novel order diminution of LTI systems using big bang big crunch optimization and routh approximation
(2013) *Appl. Math. Model*, 37 (16-17), pp. 8016-8028.
Sep
- Sikander, A.A., Prasad, B.R.
A Novel Order Reduction Method Using Cuckoo Search Algorithm
(2015) *Iete J. Res*, 61 (2), pp. 83-90.
Mar
- Bhatnagar, U., Gupta, A.
Application of grey wolf optimization in order reduction of large scale LTI systems
(2017) *2017 4th IEEE Uttar Pradesh Section International Conference on Electrical, Computer and Electronics (UPCON)*, pp. 686-691.
2018-Janua
- Nair, S.S., Rana, K.P.S., Kumar, V., Chawla, A.
Efficient Modeling of Linear Discrete Filters Using Ant Lion Optimizer
(2017) *Circuits, Syst. Signal Process*, 36 (4), pp. 1535-1568.
Apr
- Singh, V.P.
Sine cosine algorithm based reduction of higher order continuous systems
(2017) *2017 International Conference on Intelligent Sustainable Systems (ICISS)*, pp. 649-653.
- Suid, M.H., Ahmad, M.A.
Optimal tuning of sigmoid PID controller using Nonlinear Sine Cosine Algorithm for the Automatic Voltage Regulator system
(2021) *Isa Trans*,
Dec
- Guha, D., Roy, P.K., Banerjee, S.
Grasshopper optimization algorithm scaled fractional order PI-D controller applied to reduced order model of load frequency control system
(2020) *Int. J. Model. Simul*, 40 (3), pp. 217-242.
May
- Lavania, S., Nagaria, D.
Evolutionary approach for model order reduction
(2016) *Perspect. Sci*, 8, pp. 361-363.
Sep

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