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Two-Dimensional Sine Chaotification System With Hardware Implementation

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IEEE TRANSACTIONS ON INDUSTRIAL INFORMATICS

Volume: 16 Issue: 2 Page: 887-897

DOI: 10.1109/TII.2019.2923553

Published: FEB 2020

Indexed: 2020-09-16

Document Type: Article

Abstract

Chaotic systems are widely employed in many practical applications for their significant properties. Existing chaotic systems may suffer from the drawbacks of discontinuous chaotic ranges and frail chaotic behaviors. To solve this issue, this paper proposes a two-dimensional (2D) sine chaotification system (2D-SCS). 2D-SCS can not only significantly enhance the complexity of 2D chaotic maps, but also greatly extend their chaotic ranges. As examples, this paper applies 2D-SCS to two existing 2D chaotic maps to obtain two enhanced chaotic maps. Performance evaluations show that these two enhanced chaotic maps have robust chaotic behaviors in much larger chaotic ranges than existing 2D chaotic maps. A microcontroller-based experiment platform is also designed to implement these enhanced chaotic maps in hardware devices. Furthermore, to investigate the application of 2D-SCS, these two enhanced chaotic maps are applied to design a pseudorandom number generator. Experiment results show that these enhanced chaotic maps can produce better random sequences than the existing 2D and several state-of-the-art one-dimensional (1D) chaotic maps.

Keywords

Author Keywords: [Chaotic system](#); [chaotification](#); [hardware implementation](#); [nonlinear system](#); [random number generator](#)

Keywords Plus: [CHAOTIC SYSTEM](#); [LYAPUNOV EXPONENTS](#); [MODEL](#); [SYNCHRONIZATION](#); [ALGORITHM](#)

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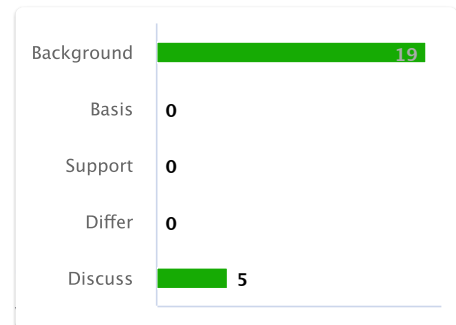
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Funding

Funding agency	Grant number	Show All Details
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ISSN: 1551-3203

eISSN: 1941-0050

Current Publisher: IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC, 445 HOES LANE, PISCATAWAY, NJ 08855-4141

Journal Impact Factor: [Journal Citation Report™](#)

Research Areas: Automation & Control Systems; Computer Science; Engineering

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