Cosine-transform-based chaotic system for image encryption

Highly Cited Paper

By Hua, ZY (Hua, Zhongyun) [1] ; Zhou, YC (Zhou, Yicong) [2] ; Huang, HJ (Huang, Hejiao) [1]

View Web of Science ResearcherID and ORCID (provided by Clarivate)

Source INFORMATION SCIENCES

Volume: 480 Page: 403-419

DOI: 10.1016/j.ins.2018.12.048

Published APR 2019

Indexed 2019-03-07

Document Type Article

Abstract Chaos is known as a natural candidate for cryptography applications owing to its properties such as unpredictability and initial state sensitivity. However, certain chaos-based cryptosystems have been proven to exhibit various security defects because their used chaotic maps do not have complex

dynamical behaviors. To address this problem, this paper introduces a cosine-transform-based chaotic system (CTBCS). Using two chaotic maps as seed maps, the CTBCS can produce chaotic maps with complex dynamical behaviors. For illustration, we produce three chaotic maps using the CTBCS and analyze their chaos complexity. Using one of the generated chaotic maps, we further propose an image encryption scheme. The encryption scheme uses high-efficiency scrambling to separate adjacent pixels and employs random order substitution to spread a small change in the plain-image to all pixels of the cipher-image. The performance evaluation demonstrates that the chaotic maps generated by the CTBCS exhibit substantially more complicated chaotic behaviors than the existing ones. The simulation results indicate the reliability of the proposed image encryption scheme. Moreover, the security analysis demonstrates that the proposed image encryption scheme provides a higher level of security than several advanced image encryption schemes. (C) 2018 The Authors. Published by Elsevier Inc.

Keywords

Author Keywords: Chaotic system; Chaos-based encryption; Cryptography; Image privacy; Image encryption; Security analysis

Keywords Plus: ALGORITHM; COMPRESSION; DESIGN; SECURE; MAP

Author Information

Corresponding Address: Hua, Zhongyun (corresponding author)

Harbin Inst Technol, Sch Comp Sci & Technol, Shenzhen 518055, Peoples R China

E-mail Addresses :
huazyum@gmail.com

Addresses :

[1] Harbin Inst Technol, Sch Comp Sci & Technol, Shenzhen 518055, Peoples R China:

[2] Univ Macau, Dept Comp & Informat Sci, Macau 999078, Peoples R China:

E-mail Addresses :
huazyum@gmail.com; yicongzhou@um.edu.mo; huanghejiao@hit.edu.cn

Categories/ Classification

Research Areas: Computer Science

Citation Topics: 4 Electrical Engineering, Electronics & Computer Science › 4.101 Security, Encryption & Encoding › 4.101.1713 Image Encryption 11

Web of Science Categories	Computer Science, Information Systems

Funding

View funding text

Funding agency	Grant number	Show All Details
National Key Research & Development Program of China	2018YFB1003800	Show details
	2018YFB1003805	Show details
	2016YFB0800804	Show details
Shenzhen Science and	JCYJ20170307150704051	

+ See more data fields

Journal information

INFORMATION SCIENCES

2.09
Journal Citation Indicator ™ (2023)

ISSN	0020-0255
eISSN	1872-6291
Current Publisher	ELSEVIER SCIENCE INC, STE 800, 230 PARK AVE, NEW YORK, NY 10169
Research Areas	Computer Science
Web of Science Categories	Computer Science, Information Systems

Citation Network

In Web of Science Core Collection

495
Citations

Create citation alert

506
Times Cited in All Databases

+ See more times cited

View citing preprints

48
Cited References

→ View Related Records

How does this document's citation performance compare to peers?

← Open comparison metrics panel

New

Use in Web of Science

23
Last 180 Days

409
Since 2013

Learn more →

This record is from:

Web of Science Core Collection

- Science Citation Index Expanded (SCI-EXPANDED)

Suggest a correction
If you would like to improve the quality of the data in this record, please Suggest a correction

11