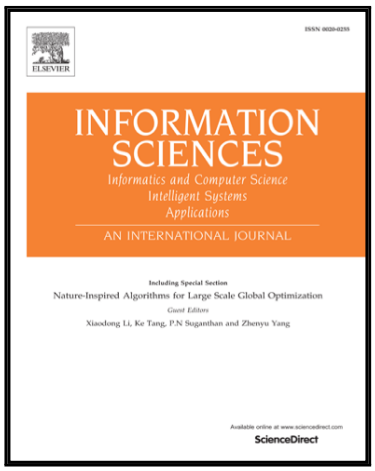

Image encryption using 2D Logistic-adjusted-Sine map

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Image encryption using 2D Logistic-adjusted-Sine map

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Abstract

With complex properties of ergodicity, unpredictability and sensitivity to initial states, chaotic systems are widely used in cryptography. This paper proposes a two-dimensional Logistic-adjusted-Sine map (2D-LASM). Performance evaluations show that it has better ergodicity and unpredictability, and a wider chaotic range than many existing chaotic maps. Using the proposed map, this paper further designs a 2D-LASM-based image encryption scheme (LAS-IES). The principle of diffusion and confusion are strictly fulfilled, and a mechanism of adding random values to plain-image is designed to enhance the security level of cipher-image. Simulation results and security analysis show that LAS-IES can efficiently encrypt different kinds of images into random-like ones that have strong ability of resisting various security attacks.

Keywords: Chaotic map, chaotic encryption, diffusion and confusion, image encryption

1. Introduction

With the fast development of digital technologies and communication networks, more and more digital data carrying all kinds of information are generated and transmitted over the networks. Among these data, digital images are a typical type of two-dimensional (2D) data, which contain a large amount of information. Two examples are as follows: a warship photo may tell not only its size and weapon configurations, but also its rough location and military mission; a personal photo may not only display what he/she looks like, but also his/her rough age and health condition. Because a digital image may contain much inferable information, image security attracts more and more attention. Among all kinds of image security technologies, image encryption is a visualized way by transforming a meaningful original image into an unrecognizable and noise-like cipher-image [29, 47, 48].

The most direct strategy of image encryption is to treat a digital image as a binary stream, and encrypt it with the developed data encryption schemes, such as the Data Encryption Standard and Advanced Encryption Standard [9, 10].

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