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Using a 2-D Discrete Chaotic Map to Create a Safe Data in Symmetric Systems

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Abstract: In this work, we focus on the utility of chaotic systems of dimension 2 to generate symmetric keys which will be used to encrypt and decrypt data. Non-linear dynamical 2-D systems with chaotic logistic maps have properties that give us the means to hide data to be shared [10]. The two most important properties that are very useful in this work are: the non-linearity that gives a significant complexity to our keys, and the sensibility to the initial conditions that radically transforms our systems as soon as there is a minimal change [1].

Keywords: *matrices; Zeraoulia-Sprott maps; logistic maps; chaos; cryptography; xor operation.*

Mathematics Subject Classification (2010): 70K55, 70K75, 93-00.

1 Introduction

The use of chaotic maps of dimension 2 can be an interesting approach for the encryption of text. 2-D chaotic maps such as the Henon map or the standard map have 2-dimensional dynamic chaos properties [3]. Zeraoulia and Sprott [6] have proposed a new chaotic map of dimension 2,

$$\forall n \in \mathbb{N}; \quad \begin{pmatrix} x_{n+1} \\ y_{n+1} \end{pmatrix} = \begin{pmatrix} \dfrac{-ax_n}{1+y_n^2} \\ x_n + by_n \end{pmatrix},$$

where $\begin{pmatrix} x_0 \\ y_0 \end{pmatrix}$ are given initial terms, that has the same properties, moreover, these maps can be used to generate complex pseudo-random sequences serving as encryption keys.

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