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De Chang, Zhijun Li, Mengjiao Wang, Yicheng Zeng

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A Novel Digital Programmable Multi-scroll Chaotic System and Its Application in FPGA-based Audio Secure Communication

De Chang ^a Zhijun Li ^{a,*} Mengjiao Wang ^a Yicheng Zeng ^b

a)College of Information Engineering, Xiangtan University, Xiangtan 411105, China

b)School of Physics and Optoelectronics, Xiangtan University, Xiangtan 411105, China

Abstract: In recent years, information security is an increasingly vital problem. In this paper, we introduce an audio encryption scheme based on the novel digital programmable multi-scroll chaotic system. The chaotic system is described by three differential equations with piecewise nonlinear functions. More interesting, the number of scrolls of the proposed chaotic system is programmable and can be changed real-time. The system is discretized by Euler method and the digital implementation is provided. Based on this, a chaos-based audio secure communication system is developed by using feedback drive-response synchronization. The number of scrolls changes randomly by extracting control signals from the encrypted data. A series of security analyses are applied, showing good performance of the method. The system is verified through experiment on an Altera Cyclone IV FPGA platform, which effectively confirms the theoretical analysis.

Keywords: Chaos; Secure communication; Multi-scroll chaos; Field programmable gate array

1.Introduction

Nowadays information security is a vital problem in information communication. Many researchers have attempted a great variety of approaches in order to solve this challenge. One

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