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Modified Function Projective Feedback Control for Time-Delay Chaotic Liu System Synchronization and its Application to Secure Image Transmission

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Abstract

This paper is devoted to synchronize time-delay Liu chaotic system in order to develop a secure image transmission system. An adaptive modified function projective synchronization (MFPS) method is proposed to control the behavior of the uncertain Liu chaotic system in the presence of time-delay state variables and uncertainty in system parameters. The stability and convergence of the present method are analyzed by means of Lyapunov stability theorem. Numerical simulations were used to validate the effectiveness of the proposed MFPS method. Furthermore, a novel image cryptosystem is generated for secure image transmission. Image data is embedded within the response signals and is transmitted to the receiver. The image data can be extracted at the receiver by using of the drive signals. The proposed image cryptosystem was applied to a plain image, and also, performance of the image cryptosystem was evaluated by some mathematical tools and the results were satisfactory, in both cases.

Keywords: Liu system, Time-delay, Modified function projective synchronization (MFPS), Image transmission, Cryptosystem

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