Real-Time Image Encryption Using a 3D Discrete Dual Chaotic Cipher

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Abstract : In this paper, an encryption algorithm is proposed for real-time image encryption. The scheme employs a dual chaotic generator based on a three dimensional (3D) discrete Lorenz attractor. Encryption is achieved using non-autonomous modulation where the data is injected into the dynamics of the master chaotic generator. The second generator is used to permute the dynamics of the master generator using the same approach. Since the data stream can be regarded as a random source, the resulting permutations of the generator dynamics greatly increase the security of the transmitted signal. In addition, a technique is proposed to mitigate the error propagation due to the finite precision arithmetic of digital hardware. In particular, truncation and rounding errors are eliminated by employing an integer representation of the data which can easily be implemented. The simple hardware architecture of the algorithm makes it suitable for secure real-time applications.

Keywords : chaotic systems, image encryption, non-autonomous modulation, FPGA
Conference Title : ICEWC 2015 : International Conference on Electronics and Wireless Communication
Conference Location : Miami, United States
Conference Dates : March 09-10, 2015