Image encryption based on trigonometric chaotic maps for secure communications

María Teresa Rodríguez Sahagún[1], José Benjamín Mercado Sánchez[2], Didier López Mancilla[3], Rider Jaimes Reátegui[4], & Juan Hugo García López[5]

[1] Centro Universitario de Ciencias Exactas e Ingenierías, Universidad de Guadalajara (CUCEI-UdeG) C.P. 44420, Guadalajara, Jal., México
[2] Centro Universitario de Ciencias Exactas e Ingenierías, Universidad de Guadalajara (CUCEI-UdeG) C.P. 44420, Guadalajara, Jal., México
[3] Centro Universitario de los Lagos, Universidad de Guadalajara (CULagos-UdeG) C.P 47460, Lagos de Moreno, Jalisco, México
[4] Centro Universitario de los Lagos, Universidad de Guadalajara (CULagos-UdeG) C.P 47460, Lagos de Moreno, Jalisco, México
[5] Centro Universitario de los Lagos, Universidad de Guadalajara (CULagos-UdeG) C.P 47460, Lagos de Moreno, Jalisco, México

pay1955@yahoo.com

Abstract: In this work, we present a modification for encryption scheme based on the trigonometric chaotic map of Jafarizadeh (2001) and Sohrab (2008). These maps are defined as polynomial quotients of N degrees. They have properties, such as: variable chaotic region, bifurcation from a stable state to a chaotic one (and viceversa) without presenting the usual scenario of double period or n period in route to chaos, and the possibility of building composition maps. With the objective of achieving image encryption, a Composition of Trigonometric Chaotic Maps (CTCM) is applied to permutate the image pixels. Another CTCM is used in the diffusion process. In this work, we propose a color image encryption of variable sizes applying CTCM in the permutation, and a new algorithm in the diffusion process using a second map. The encryption and decryption algorithm presented can fulfill high-level security requirements, big key space, and an acceptable encryption speed for a color image. Numerical simulations and graphic representations are executed for image encryption and decryption using MatLab software.

Keywords: Trigonometric Chaotic Maps, image encryption, secure communications.