A new scan pattern method for color image encryption based on 3D-Lorenzo chaotic map method

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Abstract
Securing the exchange of digital images in the form of huge multimedia data over the internet with limited bandwidth emerges as a significant and sensitive issue. In this paper, a new scan pattern method for protecting color image data based on the 3D-Lorenzo chaotic map method is proposed. The scan pattern method is used for generating three different masks one for each channel of colored image. These masks considered the position of the shuffling pixels which is used as input parameters to the 3D-Lorenzo chaotic map for ciphering the image in a new technique. The experimental results demonstrate that the developed method has the benefit of quick and secure protection of brute force attacks. Hence, the performance analysis of color image encryption reveals a correlation coefficient of almost (CC<0.00036) and entropy greater than (7.9984). It can be seen that this method yields better security performance in comparison to the results obtained from other methods with a fast process.

Keywords Shuffling · Pattern scan · Chaotic map · Color image · Stream cipher

1 Introduction

Nowadays an increasing amount of information is being transmitted over the internet depending on the fast growth in communication technology. Securing information has gained a greater significant issue for protecting information from unauthorized access to communication and storage in recent years. The huge demand for the data that is exchanged via the internet has to include text, image, video, and audio files [8]. Images are considered to have the highest percentages of multimedia data that are being exchanged and stored in great amounts of the internet, and extensively utilized by diverse applications inexpensive cost, and for that reason, the fast process for securing image is needed [15]. Encryption is considered one of the critical aspects of information security that is used to protect them from the intruder. It acknowledges that image encryption is regarded as one of the significant solutions against unauthorized access or hackers [4].

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