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A STATE OF THE ART REVIEW ON FAST IMAGE ENCRYPTION BASED ON THE COMPRESSING SENSING

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Abstract

A novel visually secure compressive sensing (CS) based image encryption scheme is proposed. Firstly, the plain image is converted into wavelet coefficients and then, using compressive sensing, confused by a zigzag path and encrypted into a compressed cypher image. The cypher image is then inserted into a carrier image, and a visually stable cypher image is gradually acquired. The original image's SHA 256 hash function is generated to calculate the zigzag confusion and one-dimensional skew tent map parameters, and the map is used to create the CS measurement matrix. The proposed algorithm is therefore highly sensitive to the plain image and can withstand known-plaintext and selected-plaintext attacks efficiently. In addition, our algorithm can simultaneously achieve image data protection and image appearance security, and the size of the cypher image and the original image is equal, requiring no additional bandwidth transmission and storage space. Simulation results and performance analyses both show the proposed encryption scheme's excellent encryption performance.

Keywords: *Compressive Sensing (CS), Cypher Image, Digital Images, Image Encryption.*

I. INTRODUCTION

More and more digital images are produced, distributed over networks and stored on different platforms, such as cloud servers, hard drives, and others, with the advancement of digital technology and the Internet [1]. A vast amount of information can be stored in digital data. A military oil depot image, for instance, can not only represent its size and number, but also its location; a picture of a human face cannot only tell its appearance, but also the rough age [2].

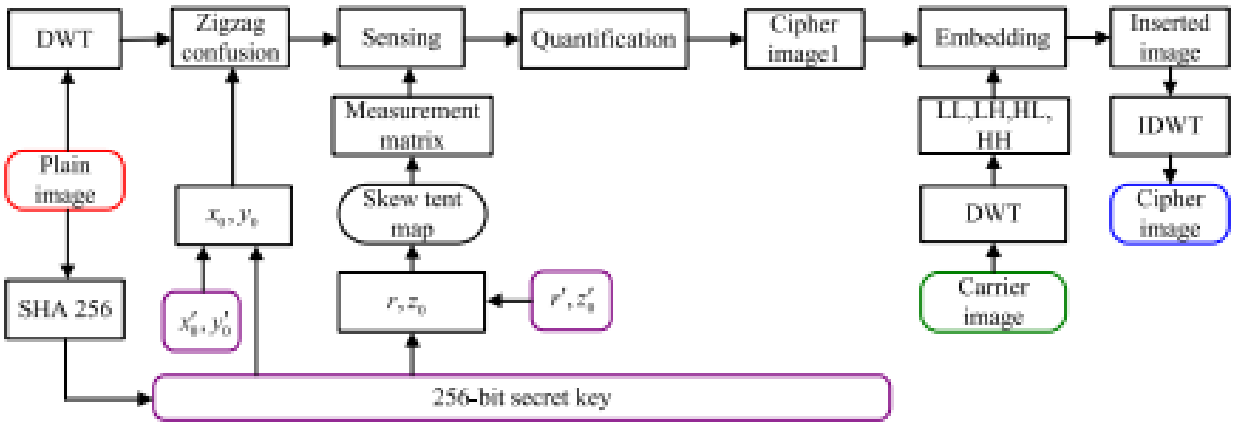

Fig. 1: Illustrates the flow chart of the image encryption algorithm [3]

A new visually protected image encryption technique based on compression sensing is proposed in this section. Two steps are composed of the proposed encryption scheme. In the first step, zigzag uncertainty and compressive sensing compress the plain image and encrypt it. The cypher image is then inserted into the carrier image in the second step, and a visually stable cypher image is obtained. Figure 1: Illustrates the flow chart of the image encryption algorithm. Figure 2: Illustrates the flow chart of the image decryption algorithm [4].

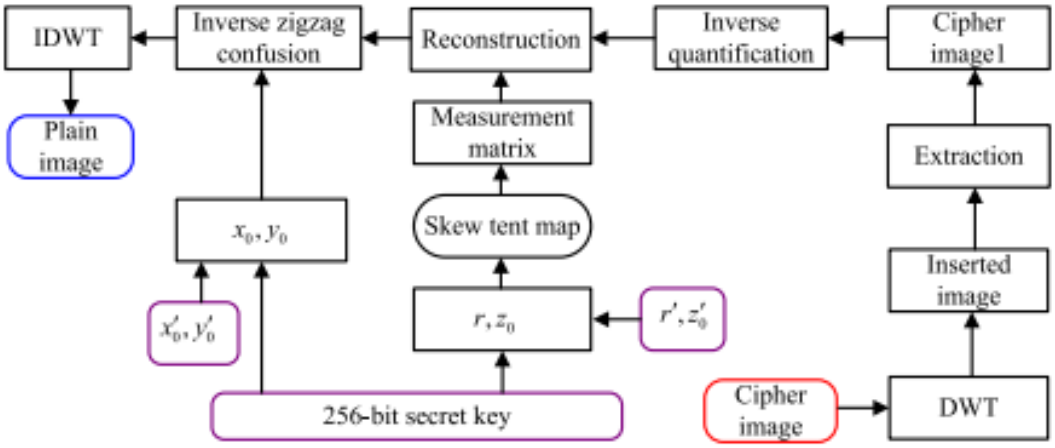

Fig. 2: Illustrates the flow chart of the image decryption algorithm [4]

$$E(x) = \frac{1}{N}\sum_{i=1}^{N} x_i$$

$$D(x) = \frac{1}{N}\sum_{i=1}^{N}(x_i - E(x))^2$$

$$cov\ (x,y) = \frac{1}{N}\sum_{i=1}^{N}(x_i - E(x))\ (y_i - E(y))$$

$$r_{xy} = \frac{cov\ (x,y)}{\sqrt{D(x)}\sqrt{D(y)}}$$

$$\sqrt{D(x)}\ \neq 0, \sqrt{D(y)} \neq 0$$

In order to lose the picture data through the communication channel during the transmission, there are some parameters that ensure the vulnerability of the various color image formats against the different attacks from the strikers[5]. The Amount of Pixel Change Rate (NPCR) and the Strength Shifting Unified Average (UACI). The formulas for the NPCR and UACI calculation for a colored picture are given in below [6].

$$NPCR = \frac{1}{M \times N}\sum_{i=1}^{M}\sum_{j=1}^{N} D(i,j) \times 100\ \%$$

$$UACI = \left[\sum_{i=1}^{M}\sum_{j=1}^{N}\frac{|C1(i,j) - C2(i,j)|}{255}\right] \times \frac{100\%}{M \times N}$$

Another critical constraint is the correlation coefficient to ensure that the encryption algorithm is very accurate. The expression is given below[7].

$$r_{x,y} = \frac{C(x,y)}{\sqrt{D(x)}.\sqrt{D(y)}}$$

Where $C(x,y), D(x)$ and $D(y)$ may be evaluated by utilizing the following equations [8].

$$C(x,y) = \frac{\sum_{i=1}^{K}(x_i - E(x))(y_i - E(y))}{K}$$

$$D(x) = \frac{1}{K}\sum_{i=1}^{K}(x_i - E(x))^2$$

$$D(y) = \frac{1}{K}\sum_{i=1}^{K}(y_i - E(y))^2$$

II. LITERATURE REVIEW

Kaur et al. have conducted a literature review on image encryption techniques. Safety is an important concern for communication and image storage due to the exponential growth of digital communication and multimedia applications. Encryption is one way of ensuring that high security images are used in many areas, such as medical research, military, etc. Modern cryptography offers important methods for information security and multimedia data safety. Encryption technology has been rapidly developed in recent years and several methods of image encryption have been used to secure sensitive image information from unauthorized access. In this paper survey, various image encryption techniques have been explored from which researchers can get an idea of using successful techniques [9].

III. DISCUSSION AND CONCLUSION

A visually secure image encryption method based on compression sensing is implemented in the paper. First, the plain image is transformed using DWT to the coefficient matrix, and then scrambled by a zigzag path connected to the plain image and encrypted by compressive sensing into a compressed cypher image. Secondly, the cypher image is embedded in a carrier image and we finally get a cypher image that is visually stable. The proposed encryption scheme has three benefits compared with the current encryption algorithms. Firstly, it has a high level of security, it can simultaneously achieve image data security and appearance security; secondly, the final cypher image has the same size as the plain image, it can transmit and store quickly over the Internet, and there is no additional bandwidth and memory transmission; and finally, the encryption system is highly sensitive to the plain image, the parameters used in the image.

IV. REFERENCES

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