

IMAGE ENCRYPTION SCHEMES FOR SECURE DATA TRANSMISSION: A REVIEW ARTICLE

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Abstract

In multimedia applications to protect and authenticate digital images, image encryption techniques play a significant role. This paper provides a systematic analysis of different strategies for image encryption. The most critical advances in meta-heuristic dependent image encryption techniques are discussed in this paper. It has also researched the numerous attacks and efficiency measures related to image encryption techniques. With regard to differential, mathematical, and key analyses, the current techniques are analyzed. The main purpose of this paper is to provide a broad perspective on the features of techniques for image encryption. In conclusion, the paper addresses important developments in the field of image encryption and outlines potential challenges.

Keywords: *Digital Image, Data Transmission, Image Encryption, Information Security.*

I. INTRODUCTION

Digital images have been used widely in diverse fields due to developments in distributed data networks, storage devices, and imaging technologies. They are susceptible to numerous security threats such as eavesdropping, unauthorized modification, replication, etc., as photos are communicated over public networks [1]. Therefore, in recent years, much attention has been paid to securing the picture in an effective manner. Figure 1 demonstrates the classification of strategies for information security [2].

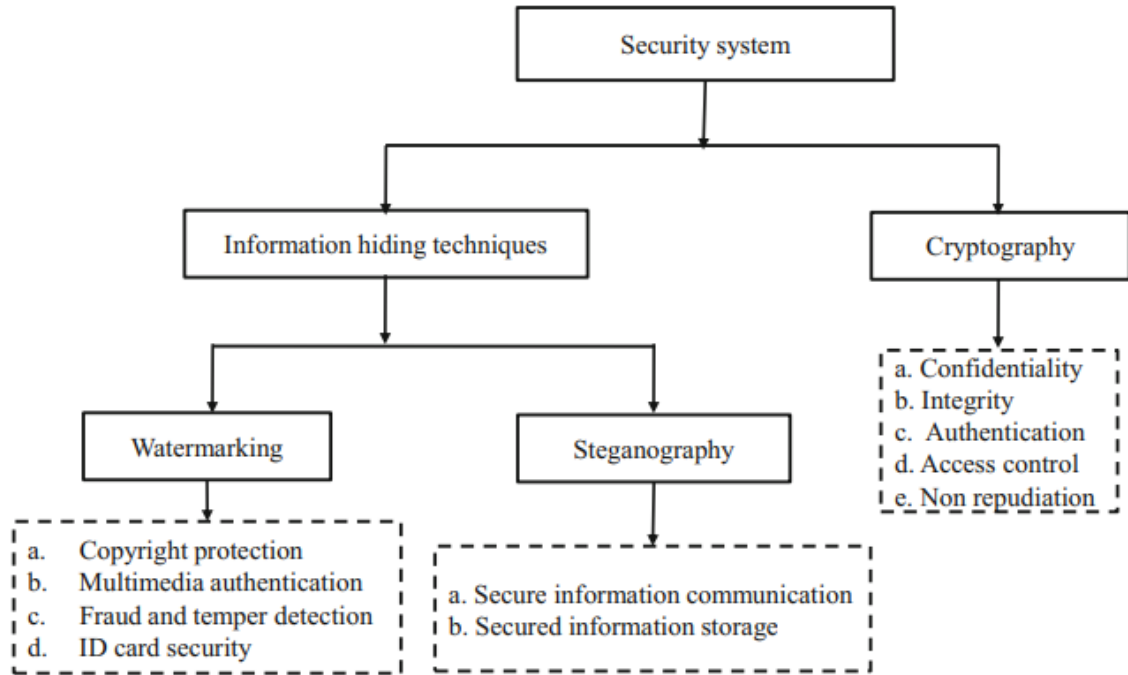


Fig. 1: Illustrates the classification of the information safety methods

In the case of cryptography, before communicating over public networks, the real data is transformed into a meaningless shape. The most effective techniques for preserving images are image encryption algorithms [3]. Steganography injects details such as digital photographs, audio signals or videos into a cover media to conceal its presence. Steganography thus achieves secret information in such a way that no one, except the intended receiver, can recognize the presence of data [4]. The similarity analysis of color pictures is performed using the following formulas. In order to determine the similarity between the two adjacent pixels of the plain image as well as the cypher image, correlation plays a critical role. By utilizing the following formulas, one can calculate the correlation coefficient of the image [5].

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

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

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

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

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

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. The Number of Pixel Change Rate (NPCR) and the Unified Average Changed Intensity (UACI). The formulas for the NPCR and UACI calculation for a colored picture are given in below.

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

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

Another critical constraint is the correlation coefficient to ensure that the encryption algorithm is very accurate. The expression is given below [6].

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

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

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

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

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

II. LITERATURE REVIEW

An analysis was performed by Khan et al. on image encryption techniques. To guarantee confidential transmission and image capability over the network, image encryption plays a paramount role. Then again, due to the large amount of details used, real-time image encryption faces a more noteworthy test. With both full encryption and selective encryption policy, this paper presents an audit on image encryption in spatial, frequency and hybrid domains [7].

III. DISCUSSION AND CONCLUSION

This thorough study provides a brief overview of color image encryption algorithms that have been researched by many researchers over the past decade in order to provide more advanced solutions to the current problems related to color image secrecy. Color picture encryption is a proactive approach to protect the sensitive data from the strikers during the transmission of data over communication channel. In the modern world, confidentiality preservation of the colored photos is one of the key agenda. This paper also includes a thorough review of the output parameters of the images to verify the encryption algorithms for the quality analysis of the images. Although numerous studies have been done to provide color images with more protection, there is a vast scope in this field to explore the more advanced and fast methods of color image encryption.

IV. REFERENCES

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