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PICTURE ENCRYPTION SCHEME BY APPLYING WAVELET TRANSFORMATIONS: A COMPREHENSIVE SURVEY

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Abstract

For correspondence, medical purposes or organizational uses, photographs are commonly stored and transformed via public media. The photographs are often taken from the remote area, so the protection of the data becomes the most significant matter of concern. The most convenient way of protecting the data (image) is to encrypt it at remote locations right after capturing the images from the sensors. To date, a great number of patents have been registered. We also covered all of the benchmarks and significant encryption patents. To ensure the security of photos at the time of transmission or storage, this document provides an improved secure encryption scheme. Due to their high computational overhead and design structure, there are various encryption algorithms proposed in recent days, most of which are not suitable for image encryption. The proposed method has a comparatively low computational overhead as it uses 2D DWT to decompose the image and chaotic maps to produce pseudo random sequence numbers (PRNS).

Keywords: *DWT, Image Encryption, NPCR, UACI, Wavelet Transformations, Data protection.*

I. INTRODUCTION

In the field of image encryption, transform-based image encryption methods have been used extensively. By using the required transform model, the given image is transformed from the spatial to the frequency domain. Figure 1 demonstrates the operation of the domain-based image encryption technique for transformation [1].

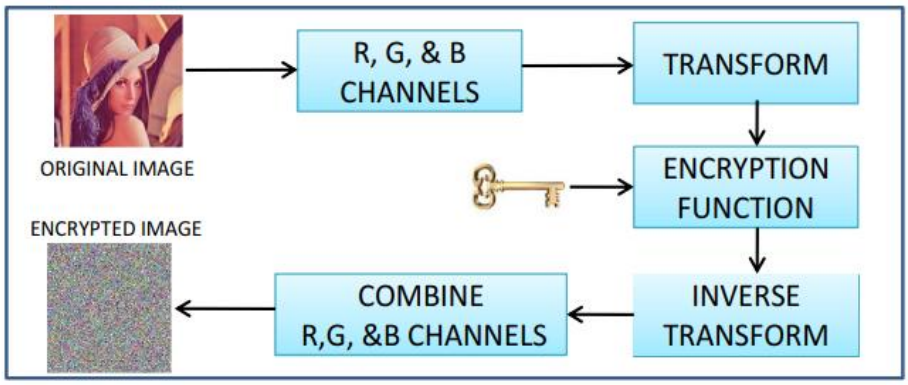

Fig. 1: Illustrates the image encryption scheme using transformations

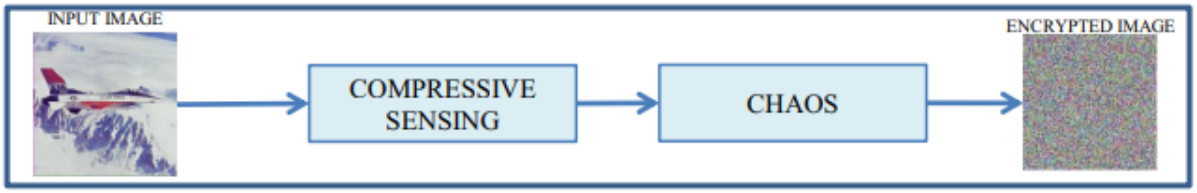

Fig. 2: Illustrates the picture encryption by Applying Wavelet Transformations.

In image encryption, CS has a significant contribution because encryption and compression can be applied at the same time to protect the sensitive images with storage reduction. Encryption is performed during sampling process [2]. CS can be implemented with chaos and optical domain to improve the security. Figure 2 shows the image encryption by applying wavelet transformations.

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

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

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

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

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

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 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 [3].

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

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

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

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

Where $C(x,y), D(x)$ and $D(y)$ may be evaluated by utilizing the following equations [4].

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

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

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

II. LITERATURE REVIEW

A survey was carried out by Hamuda et al. on image processing techniques for plant extraction and segmentation in the region. We present a detailed and critical survey on image-based techniques for plant segmentation in this study. 'Segmentation' in this sense refers to the method of classifying an image into pixels of plants and non-plants. Good performance in this process is crucial for further analysis of the plant, such as the classification of the plant (i.e. the identification of the plant as either crop or weed) and for effective action, such as the precise application of

herbicides in smart farming applications, based on this analysis. Pre-processing of images is briefly discussed in the survey, before concentrating on segmentation [5].

III. DISCUSSION AND CONCLUSION

To ensure protection during transmission, this paper presents an efficient image encryption scheme. This algorithm is based on wavelet and chaotic map transformation, so improvements have been made in the two-dimensional biometric image frequency domain and time domain. The algorithm used a chaotic sequence that is very random in nature compared to other PRNGs. The chaotic maps are often runs on low computational overhead. Most of the operations used are simple and lightweight in the proposed framework. So the machine stays lightweight and operates on low overhead computation. Some significant safety analysis was analyzed, such as histogram, correlation analysis, maximum deviation, and computation time, and the results show that the proposed algorithm is safe and efficient. For text and colour image encryption, the suggested algorithm can be expanded. The cypher text size remains the same as plain text, but as storage is often expensive and limited, the proposed scheme can easily invoke a compression technique.

IV. REFERENCES

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