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Novel Methods for Secure Image Transmission: A Comprehensive Review

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ABSTRACT: ***Owing to numerous factors such as continuous developments in technology and communication systems, a massive increase in the bulk production of image data for different purposes and many more, the confidentiality of images is becoming more difficult in the modern world. Different strategies for safe image transmission over communication networks have been studied, but in the real world, some of the latest technologies are not very suitable as the number of users grows day by day. In the world, almost every person connects with the aid of the internet through communication devices. There are several types of image formats that are transmitted by communication media.These types of images transmitted through communication media consist of either some sensitive or reserved data requiring high secrecy in order to protect the confidentiality, integrity or authentication of the images.***

KEYWORDS:Communication Channel, Correlation Coefficient, Magnetic Resonance Imaging (MRI), Picture Encryption, Wireless Media.

INTRODUCTION

Due to some variables, image confidentiality has become the most challenging task during image transmission over wireless media. Wireless multimedia has increased dramatically in everyday life for various purposes, such as image delivery, voice or video messaging, etc., and has broad applicability in numerous applications worldwide for numerous purposes[1]. Compressive sensing (CS) is becoming an approach to demand signal processing and in many sectors such as image processing, wireless communication, magnetic resonance imaging (MRI) and many more have numerous applications.One of the most important image processing processes is the segmentation of images. The segmentation of images refers to a technique in which the entire image is separated into many components called the segments of the image. This image segmentation method has numerous advantages and applicability in several domains worldwide and has been recognised in many applications as one of the most appropriate methods[2].

Many of our everyday activities are connected to the internet in today's digital world, so the protection of data or information transmitted over the internet is very critical. We transmit the secret image over the internet for many applications and that secret image may contain sensitive or private information and it may occur that any attackers or unintended individual may attempt to read this secret information[3]. Therefore, some protection is needed to protect this hidden picture that may contain sensitive or private information from any unauthorised person or attackers, i.e. from leakage. A number of methods and techniques for the protection of images have been developed[4].

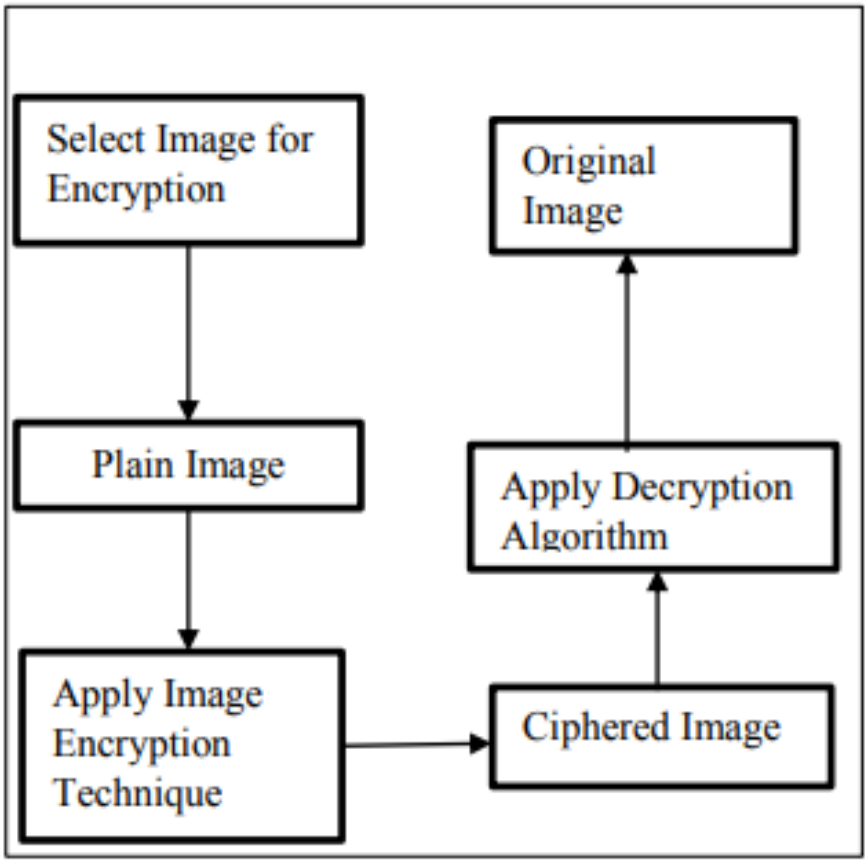

Figure 1: Illustrates the general approach for the picture encryption

The critical parameter used to calculate the absolute difference between the encrypted image E and the original source image P is MAE. Let us consider the width as well as the height of the source image, respectively, for the W and the H. The MAE expression is given below[5].

$$MAE = \frac{1}{W \times H}\sum_{i=1}^{H}\sum_{j=1}^{W}|p(i,j) - E(i,j)|$$

The correlation coefficient is another essential constraint to ensure that how much efficient is the encryption algorithm.

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

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

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

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

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

LITERATURE REVIEW

Pareek et al. conducted a research on image encryption using chaotic logistic map. In recent years, several new and effective ways of developing stable image encryption techniques have been suggested by chaos-based cryptographic algorithms. We suggest a new approach to image encryption in this communication, based on chaotic logistic maps, in order to satisfy the requirements of safe image transfer[4].

Dang et al. conducted another research on image encryption for secure internet multimedia applications. Internet multimedia applications have become very popular in recent years. However, sensitive multimedia material such as digital images is prone to unauthorised access when in storage and during network transmission. Elevated network bandwidth for transmission is also needed for streaming digital images. Therefore, both protection and bandwidth concerns must be considered for successful image transmission over the internet.

DISCUSSION AND CONCLUSION

For certain features, such as greater pixel interrelationship and mass data volume, image encryption is distinctive from text encryption. Many new algorithms, such as chaotic maps, DNA coding, compression sensing, bit plane decomposition, cyclic shift and swapping, have been studied in this paper. As it has been observed, the main space of the techniques mentioned above is wide enough to resist any attack and effective for security provision. DNA cryptography also outperformed because of its excellent characteristics as compared on the basis of computational velocity. Compression of the image should also be considered when considering protection and performance.In order to calculate the visual protection of perceptually encrypted images of poor quality, a novel visual security index (VSI) is used. For both plain and encrypted images, edge, texture and wavelet-based frequency information is used here. The edge information is initially collected using a canny edge detector. For better approximation, a multi-threshold is used. For each threshold, the edge similarity is evaluated and the average edge similarity is obtained by assigning each threshold a weight. Then, through GLCM, texture information is extracted and statistical properties such as homogeneity and energy characteristics are measured and similarity of texture is assessed.

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