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# A Comprehensive Study on Color Image Encryption Algorithms

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***ABSTRACT:One of the major challenges around the globe is the confidentiality of data or information, and several realistic approaches have been explored over the last decade by various researchers around the world. The confidentiality of the data is now a days has become a primary concern and needs further attention in order to protect the confidential data form the strikers during data transmission over communication channel. This paper presents a thorough analysis of current algorithms for color image encryption, their reliability, and compatibility with existing communication systems. In addition, this study will assist different researchers to recognize the latest problems and challenges of secrecy in color image encryption algorithms that have been used over the past few years for data secrecy. A thorough review of the existing algorithms in the RGB picture arena will also be given in the current comprehensive survey. In contrast to other types of images, such as grey scale images, color images are more common and contain huge quantities of critical data in various formats. This paper therefore focuses primarily on the problems of confidentiality and difficulties in the color image encryption domain.***

***KEYWORDS: Communication Channel,Color Image,Data Secrecy, Image Encryption, Encryption Algorithm,***

## INTRODUCTION

In order to ensure the confidentiality of the image data during transmission over vulnerable networks around the globe, the color image encryption techniques are highly requested. Numerous studies on pragmatic image encryption strategies have been investigated from the confidentiality perspectives of color images due to the development of multimedia applications worldwide[1].The techniques of color image encryption plays a key role in maintaining the privacy of the strikers' sensitive image data globally over the internet. In order to preserve the quality of the colored images, there are many ways that are used to ensure the quality of the images during decryption. Privacy is one of the tough components that require more attention to safe worldwide image data [2].In contrast to the grey images, the color images provide enormous data to be used extensively in the communication arena[3].

### *1.1 Correlation examination of the colored images:*

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.

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

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

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

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

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

*1.2 Differential examination of the colored images:*

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[4].

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

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

## LITERATURE REVIEW

Zhou et al. investigated another novel image encryption algorithm based on chaos and Line map.Data security boundaries have become increasingly blurred in the era of big data. Our

defense of privacy is undergoing a new round of testing. In particular, multimedia big data photos also hold several secrets or data regarding privacy.In the processing and transmission of image content, how to ensure protection and authorize access to sensitive data becomes a hot issue of urgency. In this post, we propose a new algorithm for symmetrical image encryption based on the skew tent map. The proposed algorithm is ideal for encryption of any image size using a new chaos-based line map [5].

Chai et al. investigated a color image cryptosystem based on dynamic DNA encryption and chaos. This paper introduces a cryptosystem of color images based on complex DNA encryption and chaos. First, the plain color image is decomposed into red, green and blue elements, and then a plain-text-dependent simultaneous intra-inter-component permutation mechanism (SCPMDP) is introduced to shuffle them. Secondly, a DNA encoding rule transforms the recombined permutable components into a DNA matrix.

## DISCUSSION

*Correlation coefficient:*

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

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

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

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

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

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

## 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.

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