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A STATE-OF-THE-ART REVIEW ON PICTURE ENCRYPTION TECHNIQUES BY APPLYING LOGISTIC CHAOTIC MAP

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Abstract

In this paper, we proposed a new algorithm for image encryption based on varied logistic chaotic map and dynamic algorithm parameters. The parameter-varied logistic map can cure logistic map vulnerabilities and resist the assault of phase space reconstruction. To shuffle the plain image, we use a parameter-varied logistic map and then use a dynamic algorithm to encrypt the picture. In order to evaluate its efficiency, we conduct numerous experiments, including histogram analysis, data entropy analysis, sensitivity analysis, key space analysis, correlation analysis and computational complexity. The results of the experiment show that this algorithm is highly secure and can be competitive with image encryption.

Keywords: *Algorithm, Chaotic Map, Encryption, Multimedia Communication, Compression, Disguise.*

I. INTRODUCTION

Multimedia communication has become more and more important with the exponential growth of internet technology and multimedia technology [1]. Image encryption has therefore become an extremely serious and desperately necessary problem. Traditional encryption algorithms such as RSA, DES and IDEA, however, are not suitable for image encryption due to the intrinsic properties of the image, such as bulky data power, strong redundancy and strong adjacent pixel correlations [2].

$$MSE = \frac{\sum_{i=1}^{H}\sum_{j=1}^{W}[P(i,j) - E(i,j)]^2}{W \times H}$$

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

Figure 1: Illustrates the real and encrypted images

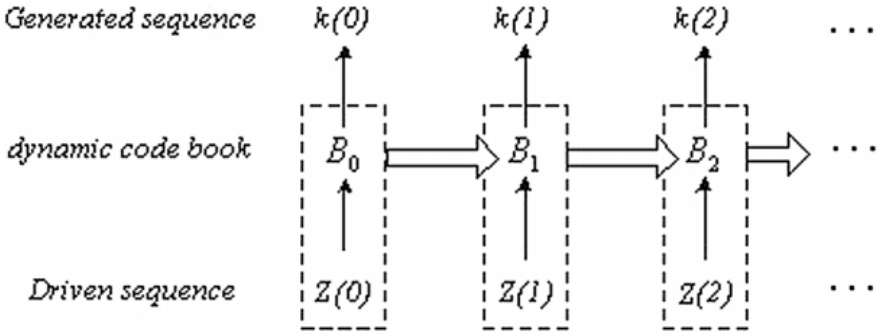

Figure 2: Illustrates the Block diagram of bio cryptosystem [3]

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

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

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

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

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

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

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

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

The correlation coefficient is another essential constraint to ensure that how much efficient is the encryption algorithm [4].

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

Where $C(x,y)$, $D(x)$ and $D(y)$ can be evaluated by using the following equations [5].

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

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

II. LITERATURE REVIEW

Manjari et al. conducted a survey on the topic of various image compression techniques: lossy and lossless. Picture compression is a data compression implementation that encodes certain bits of the real image. The goal of image compression is to reduce the redundancy and irrelevance of image data that is capable of recording or sending data in an efficient manner. The compression of the picture thus reduces the transmission time on the network and increases the speed of transmission. In the Lossless image compression process, no data is lost when compressing. Various methods for image compression are used to overcome these types of problems [6].

III. DISCUSSION AND CONCLUSION

A new image encryption algorithm based on a parameter-varied chaotic map and dynamic algorithm is suggested in this paper. In the given parameter set, the varied parameters are regulated by zero mean logistic maps and hopping. We show that the proposed logistic map can resolve the common limitations of and is capable to resist phase space reconstruction. In order to demonstrate the safety and efficiency of the proposed image encryption method, we conduct several tests, including histogram analysis, data entropy analysis, sensitivity analysis, key space analysis, correlation analysis and computational complexity. The experimental findings show that our algorithm is highly secure and can compete with some other proposed algorithms for image encryption.

IV. REFERENCES

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