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ENCRYPTION OF MEDICAL IMAGE BY APPLYING DNA CRYPTOGRAPHY: A REVIEW PAPER

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Abstract

Advanced methods like e-health, smart health, and telemedicine apps are in use in the medical field. Via open-source networks, these techniques transmit a digital medical image. The digital medical image includes patients' confidential and sensitive data. In the remote center, the transmitted digital medical images are used for diagnosis. It is therefore a major concern to provide protection and protect the confidentiality of the medical photo. DNA cryptography and dual hyper chaotic map methods are suggested in this paper to provide a digital medical image with high-level security. The scale of digital medical images is very big and takes more time to compute. The selective digital medical image encryption algorithm is proposed to reduce processing time. The permutation and diffusion method on selected pixels of digital medical images is performed in the proposed cryptosystem. All the DNA encoding rules based on the pixel location of the digital medical image are used to create the DNA structure for digital medical images. By using all DNA decoding rules based on the digital medical image's pixel value, the cypher image is achieved. The cryptosystem proposed is resistant to various forms of attacks.

Keywords: *Digital method, DNA, Encryption, Image, Smart Health, Accuracy, Protection.*

I. INTRODUCTION

In the medical sector, advanced technologies are e-health, smart health, and telemedicine. For end-to-end contact, these systems use digital medical information. Time is shortened by this digitalization, but it is open source. Thus, hackers during transmission can tamper with the digital medical picture [1]. In medical diagnosis, it is difficult to diagnose the exact illness from a tampered digital medical picture [2]. Therefore, the key issues for researchers are to

provide protection and protect the confidentiality of a medical image and to reduce the computational time of the encryption algorithm [3].

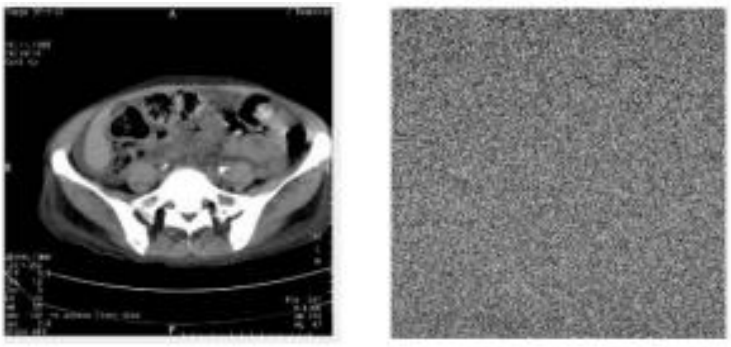

Figure 1: Illustrates the Real Images and Encrypted Image [4]

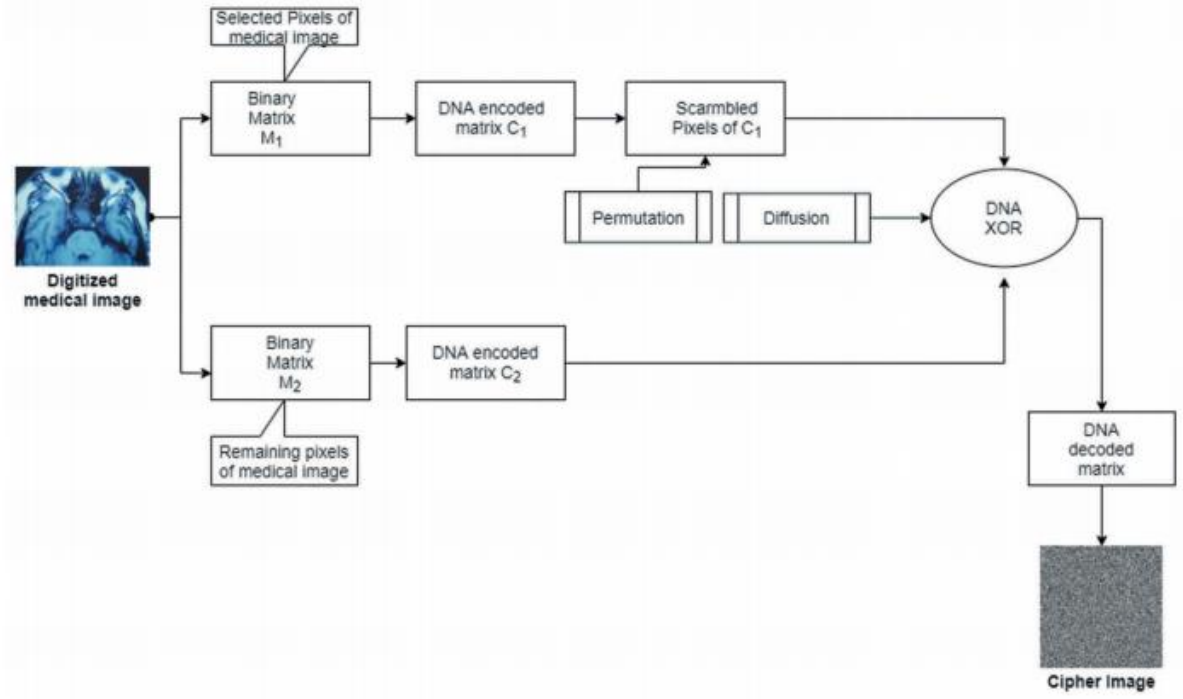

Figure 2: Illustrates the SDMIE method [5]

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

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

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

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

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

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

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

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

The correlation coefficient is another essential constraint to ensure that how much efficient is the encryption algorithm [6].

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

Where $C(x,y), D(x)$ and $D(y)$ can be evaluated by using the following equations [7].

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

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

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

II. LITERATURE REVIEW

Elhoseny et al. proposed a symmetric image encryption scheme based on 3D chaotic cat maps. Due to some inherent characteristics of images, such as bulk data capacity and high redundancy, which are usually hard to manage by conventional methods, image encryption varies from that of texts. Thanks to the extremely desirable properties of mixing and sensitivity to initial conditions and parameters of chaotic maps, Chaos-based encryption has suggested a new and efficient way to deal with the intractable problem of simple and highly protected image encryption. In this paper, for designing a real-time protected symmetric encryption scheme, the two-dimensional chaotic cat map is generalized to 3D [8].

III. DISCUSSION AND CONCLUSION

In this paper, a selective digitalized medical image encryption using dual hyper chaos map and DNA sequencing is proposed. Initially, the original medical digitized image is renovated into selected pixel DNA-encoded matrix C1 and remaining pixel DNA encoded matrix C2

using all DNA rules based on the pixel index value. The chaotic sequences are produced using parameters and system factors of the dual hyper chaotic map. The dual hyper chaotic map is employed to muddle the selected pixels of encoded DNA matrix C1. The DNA XOR method is employed to merge the scrambled DNA-encoded matrix C1 and DNA-encoded matrix C2. The combined DNA-encoded matrix is converted into binary image using all DNA decoding rules and is converted into grayscale image to get cipher image. The performance analysis illustrates that a proposed SDMIE algorithm enhances the security level and also inhibits differential, exhaustive and statistical attacks. The proposed SDMIE method takes less computational time (i.e., 0.236s) and is suitable for telemedicine, smart health, and e-health applications.

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