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# Image Encryption using Dynamic DNA Cryptography

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**Abstract -** *An image encryption using dynamic DNA Cryptography that encrypt and decrypt image file. Cryptography is always taken as the secure way while transferring secret information over internet. First image is selected then divide original image into equal blocks of RGB (Red, Green, Blue) and hash of the image is calculated. Next generate a secure Key and apply DNA on each pixel simultaneously. Further apply Lorenz system in order to produce a chaotic data and uses it to mask the images for the secure encryption.*

***Key Words:*** **Image encryption, DNA Cryptography, RGB, lorenz system, chaos**.

## 1.INTRODUCTION

The image is most generally used communication mode within the completely different spaces like medical area, analysis space, business space, military space, etc. The important image transfer over an unsecured Internet. Thus there is need of secure channel for transmitting and receiving the image to avoid the unauthorized access the Sensitive information. The cryptography could be a quite image security methodology that gives the secure transmission and storage methodology for the image over the net. DNA Cryptology combines cryptology and modern biotechnology. Single gram of DNA can store 215 petabytes of data No power is required for DNA computing while the computation is taking place DNA Cryptography can be defined as a hiding data in terms of DNA Sequence

### DNA Cryptography

DNA Cryptography is a field in which lots of researches are happened and happening and it is still expected to come up with better solution, meeting modern era problems and issues. The technologies under DNA Cryptography which are already accepted are PCR (Polymerize Chain Reaction), DNA synthesis and DNA Digital Coding. Here we used DNA Digital Coding technique in which encoding and decoding can be done with the use of binary values such as 0 and 1.DNA Digital Coding is based on biological structure such as DNA ( Deoxyribo Nucleic Acid) which is composed of four basic nucleotides such as Adenine (A), Cytosine (C), Guanine (G) and Thymine (T). The proposed system combines the traditional, currently available cryptosystems, uses DNA Digital Coding and maps digital data into biological DNA sequences and vice versa. The proposed system may be applicable to the areas of digital transactions such as credit card/debit card payments, email, SMS (Short Message Service) encryption where users wants to have more secure communication.

DNA basic nucleotides assigned with binary values. The binary values use two state levels such as combinations of 0 and 1. As the DNA digital coding uses four nucleotides (A, T, G and C) can be initialized and assigned with binary values as shown in table I [1].

Using ATGC as an initial key, every base have 2 bits like A=00, T=01, G=10, and C=11.We are going to combine one base with all other bases i.e key combination and later assigning of random values can be made respectively with their equivalent pattern values in the form of binary is as shown in table II.[1] By using this key combination table we can convert the hexadecimal value to binary form and later into DNA digital code and finally into the amplified message. From the table II, Here we are able to generate total of 72 bit keys that is 64 bits key value from key combination adding along with 8 bits of ATGC. The initial key in the form of ATGC will be used to produce

a random key at the sender will be submitted to receiver. In this system, every time we can generate key at sender with particular value will be randomly changed for different communication or transaction.

**Table -1: DNA Digital Coding**

| Binary Value | DNA Digital Coding |
|---|---|
| 00 | A |
| 01 | T |
| 10 | G |
| 11 | C |

**Table -2: Key combination**

| Key Combination | Patterns | Value |
|---|---|---|
| AA | 0101 | 5 |
| AT | 0011 | 3 |
| AG | 0001 | 1 |
| AC | 0010 | 2 |
| TA | 0110 | 6 |
| TT | 1111 | 15 |
| TG | 0111 | 7 |
| TC | 1001 | 9 |
| GA | 1010 | 10 |
| GT | 0100 | 4 |
| GG | 1000 | 8 |
| GC | 1100 | 12 |
| CA | 1110 | 14 |
| CT | 1011 | 11 |
| CG | 0000 | 0 |
| CC | 1101 | 13 |

For better understanding consider following example

**Encryption Process**

**Plain Text:** image

We convert the plain text into Unicode to get the cipher text

**Unicode:**

0069 006D 0061 0067 0065

After getting Unicode we convert the Unicode value into hexadecimal

**Hexadecimal:**

30 30 36 39 20 30 30 36 44 20 30 30 36 31 20 30 30 36 37 20 30 30 36 35

The hexadecimal value converted into the binary form by using the key combination. Every bit has the 2 bits. Suppose if the hexadecimal value is 3 then its binary value will be 0011.

**Binary Value**:

0011 0000 0011 0000 0011 0110 0011 1001 1001 0000 0011 0000 0011 0000 0011 0110 0100 0100 1001 0000 0011 0000 0011 0000 0011 0110 0011 0001 1001 0000 0011 0000 0011 0000 0011 0110 0011 0100 1001 0000 0011 0000 00110000 0011 0110 0011 0101

After the binary value it can be now converted to DNA digital coding format.

**DNA Digital coding:**

From table 1 we can write

AC AA AC AA AC TG AC GT GT AA AC AA AC AA AC TG TA TA GT AA AC AA AC AA AC TG AC AT GT AA AC AA AC AA AC TG AC TA GT AA AC AA AC AA AC TG AC TT

Now from table II, by using the DNA digital coding and the key combination we can generate amplified message that can be transferred over the network as shown below.

**Amplified Message:**

0010 0101 0010 0101 0010 0111 0010 0100 0100 0101 0010 0101 0010 0101 0010 0111 0110 0110 0100 0101 0010 0101 0010 0101 0010 0111 0010 0011 0100 0101 0010 0101 0010 0101 0010 0111 0010 0110 0100 0101 0010 0101 0010 0101 0010 0111 0010 1111

**Decryption Process:**

Now at receiver side, the receiver receives the amplified message and uses ATGC key for decryption purpose.

**Amplified Message:**

0010 0101 0010 0101 0010 0111 0010 0100 0100 0101 0010 0101 0010 0101 0010 0111 0110 0110 0100 0101 0010 0101 0010 0101 0010 0111 0010 0011 0100 0101 0010 0101 0010 0101 0010 0111 0010 0110 0100 0101 0010 0101 0010 0101 0010 0111 0010 1111

Now after receiving the amplified message it is converted to the DNA digital coding using ATGC key and key combination, to retrieve original message.

**DNA Digital coding:**

AC AA AC AA AC TG AC GT GT AA AC AA AC AA AC TG TA TA GT AA AC AA AC AA AC TG AC AT GT AA AC AA AC AA AC TG AC TA GT AA AC AA AC AA AC TG AC TT

From the table I of DNA digital coding now we can generate the binary form. Suppose if AC is DNA digital code we can convert to binary form 0011.

**Binary Value**:

0011 0000 0011 0000 0011 0110 0011 1001 1001 0000 0011 0000 0011 0000 0011 0110 0100 0100 1001 0000 0011 0000 0011 0000 0011 0110 0011 0001 1001 0000 0011 0000 0011 0000 0011 0110 0011 0100 1001 0000 0011 0000 00110000 0011 0110 0011 0101

Now we can convert binary form to hexadecimal value.

**Hexadecimal:**

30 30 36 39 20 30 30 36 44 20 30 30 36 31 20 30 30 36 37 20 30 30 36 35

The hexadecimal value is then converted to the Unicode value to get original message.

**Unicode:**

0069 006D 0061 0067 0065

Now we convert this Unicode value into plain text

**Plain Text:** image

So finally from Unicode value we can get the original message

## 2. LITERATURE SURVEY

Today, the world is going to be digitalized in all the ways. Every business units, including government and private sectors are uses the digital images to transfer the data. These images over the internet which will not be secure so anybody can see that image. So to solve this security problem we required secure way to transmitting the image. Currently, there exists various image security techniques like encryption, watermarking, steganography, etc. There are various image encryption systems to encrypt and decrypt data, and there is no single encryption algorithm satisfies the different image types.

After DNA was introduced as the most advanced form of information representation, different algorithms were developed and proposed by the researchers to provide better security. This section highlights some of the algorithms which used nucleotide sequence to encrypt and decrypt data.

One of the researcher use transposition technique for encryption process. In that they used fixed size block and the size of key matrix should be same. They convert block of plain text into ascii values and perform transposition. Simultaneously random key is generated and key is converted into DNA sequence. Then value of transposed block and DNA sequence value are added and generate new matrix. Then they perform row rotation and column rotation on that matrix. Then convert the ascii to character(Cipher text).[2]

Another researcher put forward the idea of securing the data with the method called as Digital Image Encryption Algorithm Based on Pixels. In this method they first scrambled the image pixels. Then through watermarking increase difficulty of its decode and then they use camouflaged image to hide the data.[3]

Another algorithm which was proposed by Quist Kester, Koumadi was the Cryptographic technique for image encryption based on the RGB pixel displacement in this algorithm extract RGB value from the image. Then reshape the RGB into 1dimensional array individually then transpose the new matrix as 't' then again reshape 't' into 1dimentional array and then perform the transform the vector to matrix with the same dimension of RGB of the original image and[4]

## 3. PRPOSED SYSTEM

The main idea behind our project is being taken from our observation that there are many security algorithms for text but very few algorithms for image security. Various algorithms are available for image security but they are very complex algorithm. Flow graph of our algorithm is shown below

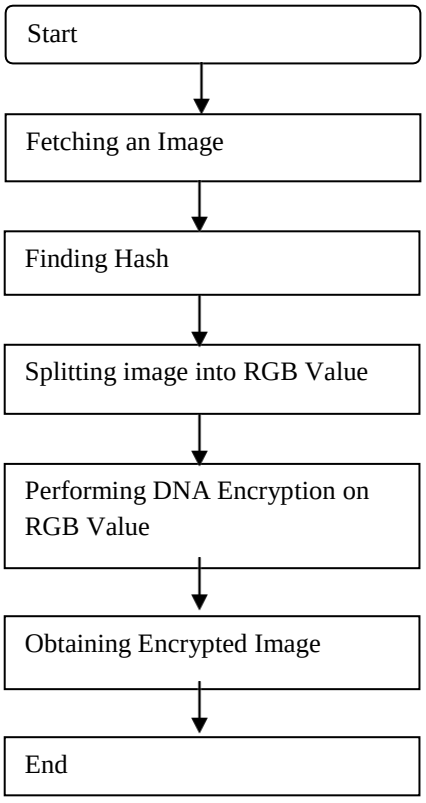


**Fig. 1.** Sender

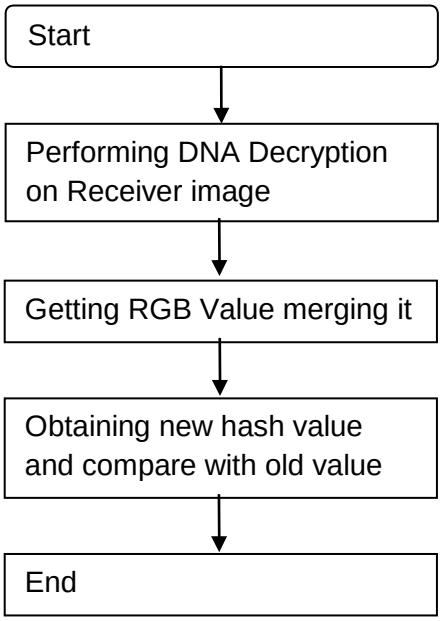


**Fig. 2.** Receiver

## 4. IMPLEMENTATION

Here we implement the code for DNA algorithm using python which encrypt and decrypt the image file which comprises following steps:

1. Import the image
2. Analyses the image
3. Manipulate the image
4. Output in which result can do altered image
5. Decrypting the encrypted image
6. Retrieving original image

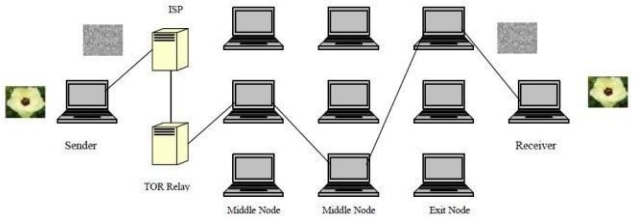


**Fig 3.** Data flow diagram

1. Import the image
   Select the image for which you want to perform the encryption. Get the location where the image is being saved. Various types of the image can be selected is grey scale image and various image with format like jpeg and jpg.

2. Analyses the image
   After selection of the image, analyze the image i.e Split the image into three parts i.e (Red, Green, Blue).

3. Manipulate the image
   Once the RGB split image is obtain apply the DNA algorithm on each RGB (Red, Green, Blue) image simultaneously in order to obtain the encrypted image

4. Output in which result can do altered image Once the encrypted image is being obtained send it to the receiver through TOR socket.

5. Decrypting the encrypted image
   Receiver receive encrypted image through TOR socket and apply DNA decryption

6. Retrieving original image
   Receiver gets RGB simultaneously, merge RGB value & gets Original image

## 5. CONCLUSION

This paper presents Image Encryption Using Dynamic DNA Cryptography is pixel based DNA encoding. By splitting image into pixel and applying Dynamic DNA encoding we have successfully encrypted & decrypted an image with Image Encryption Using Dynamic DNA Cryptography algorithm. The main feature of Image Encryption Using Dynamic DNA Cryptography is this algorithm uses pixel based encoding so any size of an image can be encoded and decode with this algorithm.

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