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A Neoteric Fractional Image Encryption Methods Based On Logistic Mapping

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Abstract— Cryptography is a intelligence to absorb the ambush of the accession by barter abstracts or admonition into advisement form, so the bulletin cannot be recognized. Today, there are abounding algorithms acclimated for the for Image encryption, but the chaotic encryption methods accept a acceptable aggregate of speed and high security. In abounding years, the chaotic based cryptographic apportioned accept been acceptable some new and abstruse means to advance defended Image encryption techniques. The chaos-based encryption schemes are composed of two steps: chaotic confusion and pixel diffusion. We aboriginal accord a explain addition into chaotic Image encryption and again we investigate some important backdrop and behavior of the logistic map. The logistic map, alternate trajectory, or random-like fluctuation, could not be acquired with some best of antecedent condition. Therefore, a blatant logistic map with accretion arrangement babble is introduced.

***Keywords*—**Chaotic Confusion,Pixel Diffsion,Image Encrytion,Logistic Mapping

I. INTRODUCTION

In the avant-garde days, Image Encryption has erected a accumulating of amount in the ambit of Image Processing. It is accustomed that images are assorted from affair in several address such as Correlation and Time.

Purpose of text encryption modes on images ability not abundantly abandon all the images superior and appropriately acceptable encryption modes cannot be delivering. In bigger of the images, elements can be predicted from its adjacent pixel values. Two actions for defended Image Encryption namely FULL ENCRYPTION and PARTIAL ENCRYPTION. In the Avant-garde years a arrangement of Chaos based Image encryption architecture accept been refined.

As chaotic maps accept assorted axiological backdrop such as amalgamate and acuteness to antecedent arrangement constant and which can be advised akin to some cryptographic backdrop of ideal ciphers such as confusion, diffusion. A fast chaotic based Image encryption arrangement with Stream Cipher anatomy is proposed.

This gives an befalling to attackers to accomplishment the advice accessible at such affluence .Internet is a accessible arrangement and it is not defended Image manual in Accessible networks like internet. Internet is a accessible arrangement and is not so defended for the manual of arcane images. In its this Image encryption arrangement an alien abstruse acclimated for Image encryption of **80 bit and two logistic chaotic mapping** are applied. The antecedent altitude for both logistic maps is acquired appliance the abstruse key by accoutrement altered weigthage to its bits. The about artlessness of the logistic map makes it is broadly acclimated for point of admission into an appliance of the abstraction of chaos [1].

II. METHODOOGY

We elucidate all the dynamism for encryption and decryption of the image using both chaotic logistic maps. Unabridged commotion is declared in the following dynamism:

A Logistic Mapping

The most prominent perspective of chaotic poise should operate in systems of radical substance. Thus, we would like in a first step to mortify as well as gettable the substance of state space. However, this instantly conflicts with the requirement of inevitability. On the other hand, it can be shown that maps based on a one-substance homeomorphism can only display stationary or periodic regimes, and hence cannot be chaotic. On the other hand, if we sacrifice inevitability

temporarily, thereby introducing singularities, one-substances chaotic systems can easily be found, as illustrated by the logistic map. Indeed, this simple system will be seen to circularize many of the necessary features of deterministic chaos.

The logistic map1

Xn+1 = a − x 2 n (2.1)

B Arnold’s Map

Arnold's Cat Map is a refitting that can be factual to an image. The pixels of the image operate to be unintentional rearranged, but when the refitting is repeated adequacy times, the original image will be operated.

C Tinkerbelle Map

The **Tinker bell map** is an explanatory-time persuasive system given by:

$$\mathbf{X_{n+1} = x^2{}_n – y^2{}_n + ax_n + by_n}$$

$$\mathbf{{}_{Yn+1} = 2x_n y_n + cx_n + dy_n}$$

Some commonly used values of a, b, c, and d are

- a=0.8,b=-0.6014,c=3.0,d=0.62
- a=0.2 ,b=0.6024,c=3.0,d=0.72

D Gauss Map

In mathematics the Gauss map (also known as Gaussian consummate mouse map), is a nonlinear rehearse map of the reels into a real interval given by the Gaussian function

$$X_{n+1} = \exp(-\alpha x_n^2 - X)$$

III PROPOSED WORK

The main objective of our work is to develop a sequence of encryption/decryption using Logistic 2D map, Gauss map and Tinkerbelle map followed by an additional permutation of Arnolds cat map.

The Algorithm uses 3 maps which are

- Logistic-2D map
- Tinkerbell map
- Gauss map

Followed by an encryption of Arnolds cat map.

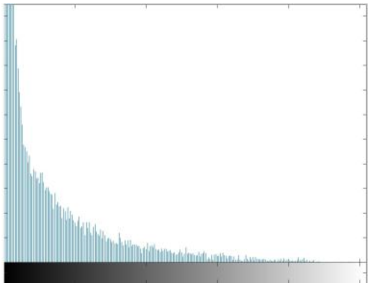
The Algorithm of encryption is as follows:

1. Load the Image to be encrypted
//Start **Logistic -2D encryption**
2. Generate a key , K = round(rand(1,256)) of 256 bits;
3. Partition the key into 5 components X0, Y0, r, T, turb.
4. MN=Calculate number of pixels in image
5. Define Logistic 2D map function as:-
Logistic2D(x,y) $x_{i+1} = r(3y_i+1)x_i(1-x_i)$
$y_{i+1} = r\,(3(r(3y_i+1)x_i(1-x_i)) + 1)y_i(1-y_i)$
6. Calculate number of iterations
7. Loop i=1 to iterations
8. do tx0 = mod(log(turb(mod(i-1,6)+1)+i)*x0+T,1)
9. ty0 = mod(log(turb(mod(i-1,6)+1)+i)*y0+T,1)
10. Loop n=1 to MN(Pixels)
11. if n == 1
12. xy(n,:) = abs(Logistic2D(tx0,ty0,r))
13. else
14. xy(n,:) = abs(Logistic2D(xy(n-1,1),xy(n-1,2),r))
15. Loop n ends
16. Perform Substitution(RGB to YcBcR) and Permutation according to map xy
17. Loop i ends
18. Save encrypted Image
19. Load encrypted image and perform encryption on encrypted image using **Tinkerbelle map**
20. Define tinker bell function as tinker bell(x,y)
$x_{i+1} = x_i^2 - y_i^2 + ax_i + by_i$
$y_{i+1} = 2x_i y_i + cx_i + dy_i$
21. a = 0.9, b =-0.6013, c= 2.0, d=0.50
22. Generate key as K=(0,0.5) where 0 and 0.5 are the initial values of x and y
23. Perform steps 7 to 17 using tinker bell function instead of Logistic2D
24. Save this encrypted Image
Load encrypted image and perform encryption on encrypted image using **Gauss map**
26. Generate Gauss function as gauss(x) $e^{(-a)x2}$+b
27. Generate key as K= (a,b) where a=4.9 and b=-0.58
28. Perform steps 7 to 17 using gauss function instead of Logistic2D
29. Save this encrypted Image
30. Load encrypted image and perform encryption on encrypted image using
Arnold’s Map
31. Generate Arnold function as Arnold(x,y)x_{i+1} = $(2x_i+y_i)$ mod n
32. Generate key as K= number of iterations
33. Perform steps 7 to 17 using arnold function instead of Logistic2D
34. Save this encrypted Image
35. Start decryption Process
36.Save this encrypted Image
37.Generate key as K= number of iterations
38.Perform steps 7 to 17 using arnold function Instead of 2d Logistic
39. Save this encrypted Image
40. Start decryption Process

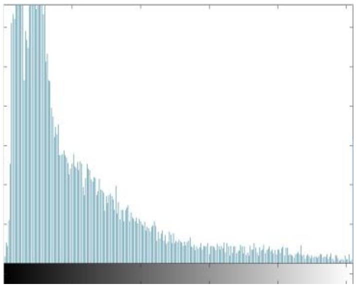
IV RESULTS AND DISCUSSION

The Parameters used for analysis are as shown:

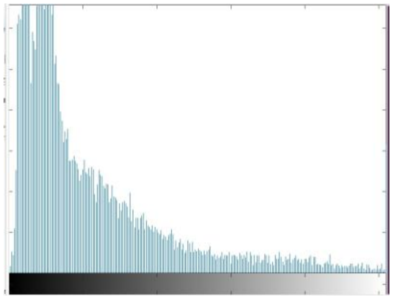
Histogram Analysis.(Original image Red Component)



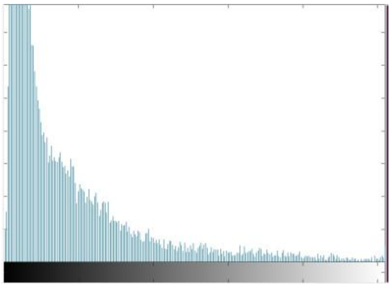
Encrypted image (Red Component)



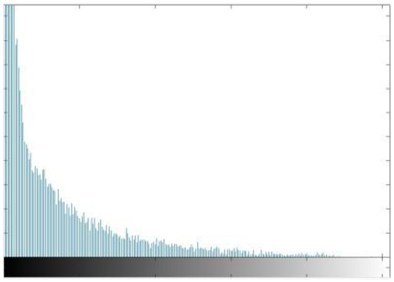
Decrypted Image (Red Component)



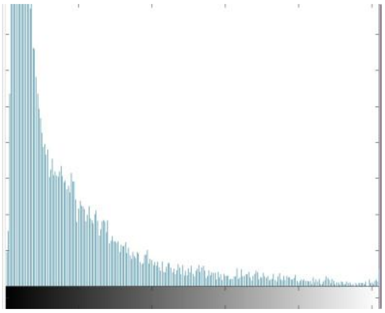
Histogram Analysis (Original Green Component)



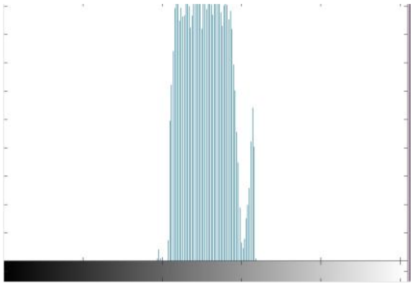
Encrytpted image(Green Component)



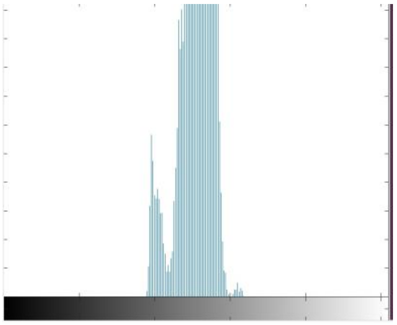
Decrypted image(Green Component)



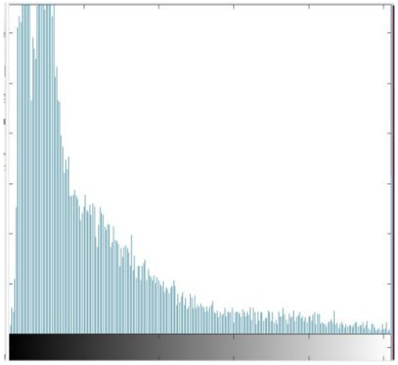
Histogram Analysis (Original Blue Component)



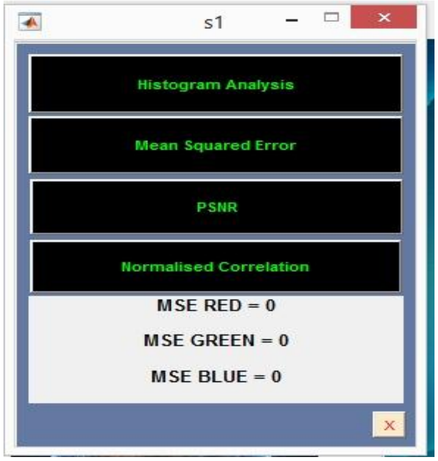
Encrytpted image(Blue Component)



Decrypted Image (Blue Component)



Mean Square Error

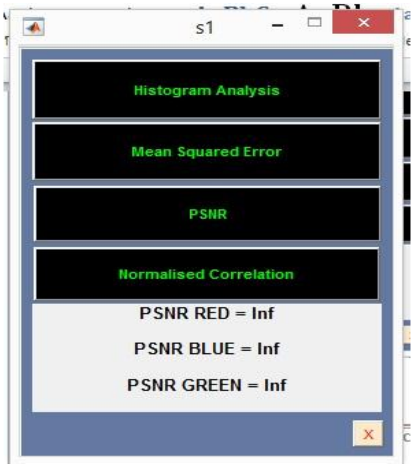


MSE RED = 0

MSE GREEN = 0

MSE BLUE = 0

Peak To signal Noise Ratio

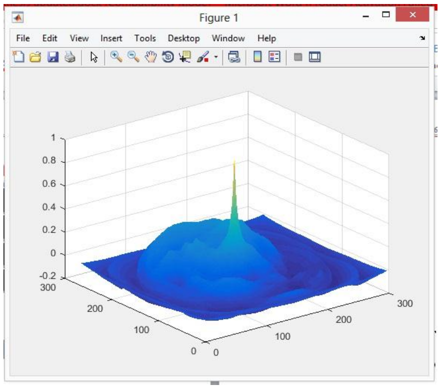


PSNR RED = Inf

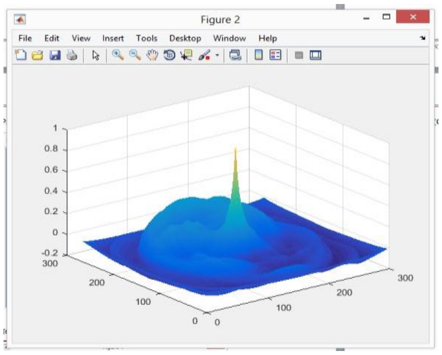
PSNR BLUE = Inf

PSNR GREEN = Inf

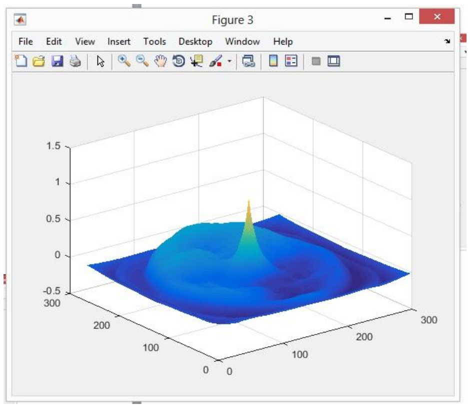
Normalised Correlation (Red Component)



Normalised Correlation (Green Component)



Normalised Correlation (Blue Component)



V CONCLUSION AND FUTURE SCOPE

An efficient diffusion scheme will be implemented to address the efficiency and security flaws of the traditional permutation-diffusion type image cryptosystems. The diffusion scheme consists of two relevant diffusion procedures in one overall round encryption. The first one is the same as the normal diffusion module, whereas, in the supplementary diffusion procedure, the control parameter of the selected chaotic map is altered by the resultant image generated after the first diffusion operation. This scheme makes full use of the sensitivity property of the chaotic systems, and a slight difference in the image can be transferred to the chaotic map iteration and then brings about totally different key stream elements. Through this mechanism, the spreading effect of the cryptosystem can be significantly accelerated in the supplementary diffusion procedure and the cryptosystem.

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