Scientific Journal of Impact Factor (SJIF) : 3.134

ISSN (Print) : 2348-6406
ISSN (Online): 2348-4470

International Journal of Advance Engineering and Research Development

Image Encryption Using Modified Chaos Based Algorithm

Ankita Gaur[1],Deepti Nain[2]

[1]*M.Tech Scholar, ECE Department, SKIET, ankitagaurkkr@gmail.com*
[2]*Head and Asst. Professor, ECE Department, SKIET,nain.deepti@gmail.com*

Abstract- *Secure communication is one of the most important task of any communication system. In order to provide security to the information which can be in the form of text, image, audio or video, encryption is used.In this paper an image encryption algorithm is proposed which is based on chaos theory. Two chaotic maps, Arnold's cat map and modified logistic map, are used in this proposed algorithm. Arnold cat map is used for image scrambling and linear logistic map is first modified and then is used for key generation. This key is then used for image encryption. This algorithm provides uniform histogram and also reduces the correlation coefficients of encrypted image.*

Keywords: Chaos theory, Arnold's cat map, logistic map etc.

I.INTRODUCTION

Today is the age of information technology in which information can be treated as an asset that has a worth like any other asset. So information needs to be secured from unauthorized access. In order to provide security, information should be hidden from unauthorized user(confidentiality), protected from unauthorized change (integrity), and available to authorized users (availability). Text encryption algorithms such as AES cannot be used for image encryption because of large size of image. So number of image encryption algorithms is proposed in last two decades.

Chaos theory has an application in the field of image encryption, in which pixels of image are rearranged randomly with the help of chaotic maps like Arnold's cat map etc. In this proposed work, logistic map is first modified and then used in combination with Arnold's cat map.

Logistic map:1-D logistic map was proposed by RM may. This map is simplest non linear chaotic system which is defined as : x n=0,1,2…. is the variable, and is the system parameter in which So the modified logistic map is defined as the tangent function of $x_n$as:

where x_n (0, 1), a (0, 1.4], b [5, 43], or x_n (0, 1), a (1.4, 1.5], b [9, 38], or xn (0, 1), a (1.5, 1.57], b [3, 15]. The ranges of a and b are obtained by iteration experimental analysis.

Arnold cat map: it was demonstrated by Vladimir Arnold in 1960s by using an image of a cat. Arnold cat map uses the concept of linear algebra to change the position of pixels of original image. Original image is divided into blocks and then Arnold transformation is done.

II.PROPOSED WORK AND RESULTS

Three images of different size (200*200,300*300 and 512*512) are selected. The proposed algorithm is implemented in six steps. Fig 1 shows the flow chart of algorithm.

Steps for image encryption algorithm are:

1. Original image is loaded.
2. Gray scale conversion of original image.
3. Image is scrambled using Arnold's cat map.
4. Key is generated using modified logistic map.
5. Using generated key Image is encrypted.
6. Encrypted image is checked on different parameters like histogram etc.

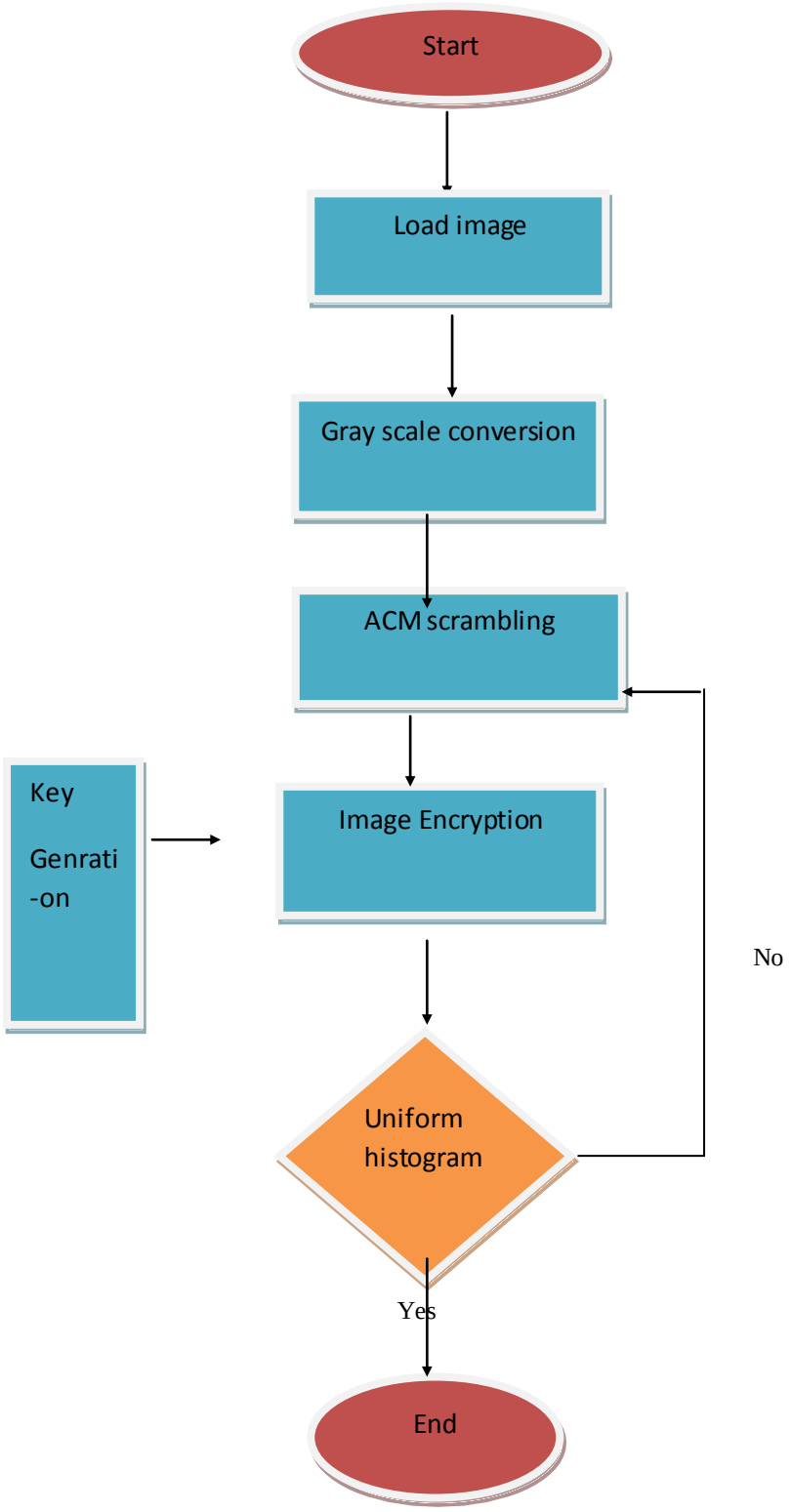

Fig. 1 flow chart of algorithm

Fig. 2(a) : Original image

Fig 2(b) : Gray Scale image

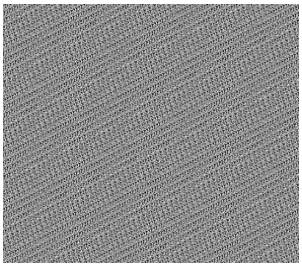

Fig. 2(c) : Scrambled image

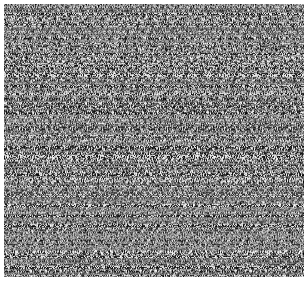

Fig. 2(d): Encrypted image

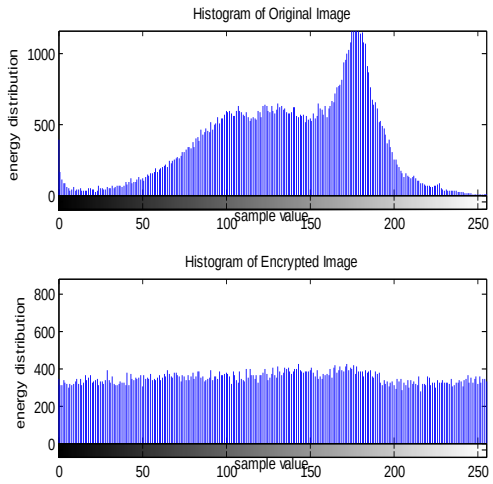

Fig 2(e): comapision of histograms

Fig 2 shows the result of an image encryption algorithm. Fig. 2(a) shows original image of size 300*300, Fig. 2(b) is gray scale conversion of original image. Fig 2(c) shows image after ACM scrambling and Fig 2(d) shows encrypted image. Fig 2(e) gives the comparison between histograms of original image and encrypted image. This algorithm reduces the correlation coefficients of encrypted image. Table 1 shows horizontal and vertical correlation coefficients.

Table 1: correlation coefficients

Image Size	Horizontal Correlation coefficient.	Vertical Correlation coefficient.
200*200	-0.1007	-0.5500
300*300	-0.2590	-0.7157
512*512	-0.3310	-0.7530

III CONCLUSION AND FUTURE SCOPE

In this work encryption based on Arnold's cat map have been enhanced. The encryption key used for encryption requires security and unpredictability. This work is done with help oflogistic map which is first modified. This proposed work provides uniform histogram and reduction in correlation coefficients of encrypted image.For future work Mathematical analysis of the chaos of the higher dimensional Arnold's maps is yet to be explored and the encryption of image after higher order scrambling by Arnold's cat map is yet to be observed.

REFRENCES

[1] HaojiangGao ,Yisheng Zhang, Shuyun Liang, Dequn Li," A new chaotic algorithm for image encryption" ©2005 Published by Elsevier Ltd.

[2] ShiguoLian, Jinsheng Sun, Zhiquan Wang," Security Analysis of A Chaos-based Image Encryption Algorithm" The paper was accepted by Phisica A, Elsevier Science, 2005.

[3] Linhua Zhang et.al, "An image encryption approach based on chaotic maps", Chaos, Solitons and Fractals 24 (2005) 759–765.

[4] Yuanzhi Wang et.al ," Image Encryption Method Based on Chaotic Map", 1-4244-0737-0/07/$20.00_c 2007 IEEE

[5] ZHANG Xuefeng et.al, "Extended Logistic Chaotic Sequence and Its Performance Analysis", *TSINGHUA SCIENCE AND TECHNOLOGY* , pp156-161Volume 12, Number S1, July 2007, *ISSN 1007-0214 28/49*.

[6] Mao-Yu Huang and Yueh-Min Huang, "Image Encryption Algorithm Based on Chaotic Maps", 978-1-4244-7640-4/10/$26.00 ©2010 IEEE.

[7] Yunpeng Zhang et.al," A New Image Encryption Algorithm Based on Arnold and Coupled Chaos Maps", 978-1-4244-6947-5/10/$26.00 ©2010 IEEE

[8] Panduranga H.T. et al, "Hybrid approach for Image Encryption Using SCAN Patterns and Carrier Images", *(IJCSE) International Journal on Computer Science and Engineering*, Vol. 02, No. 02, 2010, pp 297-300.

[9] Yicong Zhou, Long Bao, C. L. Philip Chen," Image Encryption Using a New Parametric Switching Chaotic System" ©2011 Published by Elsevier Ltd.

[10] Jolly Shah and Dr. VikasSaxena," Performance Study on Image Encryption Schemes" *IJCSI International Journal of Computer Science*, Vol. 8, Issue 4, No 1, July 2011

[11] VarshaS.Nemade and R.B.Wagh," Review of different image encryption techniques" Proceedings of " National Conference on Emerging Trends in Computer Technology (NCETCT-2012)" Held at R.C.Patel Institute of Technology, Shirpur, Dist. Dhule,Maharashtra,India. April 21, 2012

[12] Pawan N. Khade and Prof. Manish Narnaware, "3D Chaotic Functions for Image Encryption" IJCSI *International Journal of Computer Science*, Vol. 9, Issue 3, No 1, May 2012,ISSN (Online): 1694-0814

[13] MrinalKantiMandal et.al, "An Image Encryption Process based on Chaotic Logistic Map", *IETE TECHNICAL REVIEW*, Vol29 , ISSUE 5 , SEP-OCT 2012.

[14] Ruisong Ye and Wenping Yu," An Image Hiding Scheme Using 3D Sawtooth Map and Discrete Wavelet Transform*" I.J. Image, Graphics and Signal Processing*, 2012, 6, pp 52-60

[15] ShubhanginiP.Nichat, Prof.Mrs.S.S.Sikchi," Image Encryption using Hybrid Genetic Algorithm" *International Journal of Advanced Research in Computer Science and Software Engineering*, Volume 3, Issue 1, January 2013 ,*ISSN: 2277 128X*

[16] Ravindra K. Purwar, Priyanka, "An Improved Image Encryption Scheme Using Chaotic Logistic Maps" *International Journal of Latest Trends in Engineering and Technology (IJLTET)* ,Vol. 2, Issue 3 May 2013, *ISSN: 2278-621X]*

[17] Pia Singh, Prof. Karamjeet Singh, "Image Encryption And Decryption Using Blowfish Algorithm In Matlab" *International Journal of Scientific & Engineering Research*, Volume 4, Issue 7, July-2013.

[18] Pan Tian-gong et.al, "A Novel Image Encryption Using Arnold Cat", *International Journal of Security and Its Applications*, Vol.7, No.5 (2013), pp.377-386.

