

SECURE ONLINE PAYMENT WITH VARIOUS TYPES OF VISUAL CRYPTOGRAPHY

NABAJIT KUMAR BARMAN
*Department of Electronics
Engineering
Pondicherry University
Pondicherry, Puducherry-14
India
barman.nabajit@rediffmail.com*

DR. K ANUSUDHA
*Department of Electronics
Engineering
Pondicherry University
Pondicherry, Puducherry-14
India*

Abstract—In the last few years, the online shopping market has been growing tremendously. More people are involved with the online market to shop day to day need. But on the other hand, we have faced a critical task to secure our personal and banking information. The intension behind this project is to improve the security of online transaction between sellers and buyers. We consider an online payment system that provides a reliable security using visual cryptography and steganography. Visual cryptography hides the banking details of the customers by generating shares whereas image steganography embeds the shares with password which results in secure transmission of shares to banks.

Keywords— *Online shopping, Information security, Visual cryptography, Steganography.*

I. INTRODUCTION

Online shopping is a process of buying necessary items from internet instead of using local stores. Customers are moving towards online shopping because they get a wide range of variety of selection. Over the last few years the numbers of internet user has increased gradually, which gives a fuel to the online shopping. Though customers are focusing on online shopping rather than traditional shopping yet there are some thread regarding leak of personal information through phishing. Phishing is an unethical way to steal the user personal data from online retailers as well as banking data. Some technical professionals are used to hack this data from online retailers so that they can misuse this data.

To prevent for stealing data between customer and online retailer we have to use Secure Socket layer (SSL) encryption.[1] By this encryption technique we can make sure

that the data will be enclosed and excavated in such a way that no one can hack it. But still there is some fault as data will be available with merchant, so retailer should be maintain the trust of customer not to use their personal data for retailer's personal use.

In this paper, two method of visual cryptography is discussed for securing secure online payment between customer and online retailer as well as we can see that which is more secure than other. It will minimize the risk of sharing the banking data to endeavor. By using those technique, fund will be transferred by sharing less information and high security.

The rest of the paper organized as follows: Part II provides details about steganography and visual cryptography. Part III gives brief about related works. Part IV provides proposed works. Part V contains simulation results and part VI gives conclusion.

II. STEGANOGRAPHY AND VISUAL CRYPTOGRAPHY

Steganography [2] technology is hiding of one message underneath the other message, so that it is very difficult to distinguish the hidden message. The advantages of this type of message is that it won't be visible. We can use number of formats to hide or cover the data using steganography. Audio[19], video[20], text[1] and images[21] are some of the formats which are popularly used. If we can take the example of text steganography, there are number of ways to hide the message. The main key behind steganography is that the message cannot detect by normal eye which is transmitted.

Visual cryptography [15] is an encryption method where secret image is divided into sufficient number of shares based on bank schemes and then stacking those sufficient number of shares will help in revealing the

secret image. This is a method which is used for protecting image based secretes. This method also does not required any computation process for decrypting the image. No information can be rebuild by any single share.

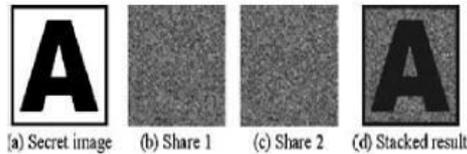


Figure 1: illustration of visual cryptography

III. RELATED WORK

A deep survey is done about the proposed work in the area of secure inline transactions based on steganography and visual cryptography.

Sarita Swamy, Reshma Gulwani approaches a different way to the steganography where they used text to hide the secret code under some ASCII code and made an encrypted code. This method gives a platform for secure online payment [1].

B.Srikanth, G.Padmaja, Dr. Syed Khasim, Dr. P.V.S.Lakshmi, and A.Haritha develops a visual cryptography technique where signature of the applicant will be used as input and this input will be divided into number of shares depending on bank scheme. One share will be with bank and another share will be with the customer. During transaction customer provides shares to bank and bank overlaps that share with bank share and authentication is checked using correlation technique [13].

Souvik Roy and P. Venkateswaran gives a new approach where limited information are needed to be shared with third party for money transfer while transaction for online shopping. End users personal information is also secured from identity theft. They have used steganography and visual cryptography for the implementation [3].

Zhi Zhou, Gonzalo R. Arce, Giovanni Di Crescenzo uses Halftone Visual cryptography where they show two types of halftone cryptography to encrypt a secret binary image to high quality halftone image. This method provides a new dimension to ensure the security of sharing images for this project [7].

Souvik Roya, P. Venkateswaranb approaches with a unique way to the English text based steganography with Indian root. In this method, attributes of English language like use of periphrases, inflexion and fixed word order are used [4].

S.R. navale, S.S. Khandagle, R.A. Malpekar and Prof. N.K. Chouhan presents a text based steganography and RG- based visual cryptography to propose secure E-payment system where a customer payment information is directly forwarded to payment portal and merchant cannot get the customers information, not even in encrypted form [14].

IV. PROPOSED VISUAL CRYPTOGRAPHY

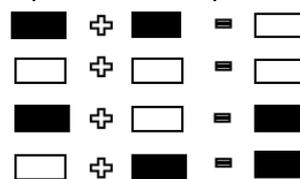
In the proposed system, two types of visual cryptography is used for secure online payment system. Our main motive is to share minimal no of information to the online retailer. They are RG based Visual cryptography and Halftone based Visual Cryptography.

A. RG based Visual Cryptography

Naor and Shamir [17] had proposed a technique that has a drawback of multiplying the every share of pixel to 4 times of original pixel, which leads to increase in size of the pixel as well as the increase in amount of space required to save that pixel as it will occupy 4 times more space. This technique results in more time utilization as it has to encrypt and decrypt the more number of pixel. Also transferring this high memory pixels through network is also time consuming. To rectify this Kafri and Keren came up with a new idea which does not multiply the pixels using the random grid. This proposed receives original image and converts this to number of cipher-grids, cipher-grids does not give any information about original image. But it comes with the solution as it does not required pixel multiplication. By using this, time can be saved for encrypting and decrypting the image by retaining the original size of image. It gives better outputs compared to others techniques.

Algorithm

- Step 1: Generate R1 as a random grid.
- Step 2: For each pixel convert into number of cipher-grids.
- Step 3: Generate two shares of random grid.
- Step 4: No need of pixel multiplication.
- Step 5: Overlapped both share.
- Step 6: Get the output.



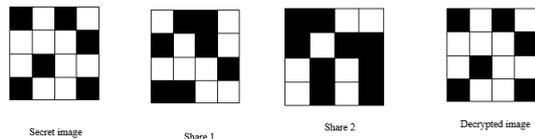


Fig 2: RG-Based Visual Cryptography Advantages:

1. This cryptography prevents end user personal and banking information from unscrupulous use at retailer side.
2. More security is achieved by CA. By using this, one can transfer money more securely to many parties.
3. As the image is split in two or more share, it is difficult to recreate original image from few number of shares.

B. Halftone Based Visual Cryptography

This method of secret sharing expanded on Naor and Shamir’s original sanding in the 2-out-of-2 secret sharing scheme. It also took extended visual cryptography a step further. The Halftoning technique that used could be applied to colour and grayscale images. Halftoning simulates a continuous tone through the use of dots, varying either in size or in spacing. Based on the idea of the general framework of halftone visual cryptography by Zhou, Arce and Crescenzo, a halftone scheme was proposed in which the quality of the shares was improved by using contrast enhancement techniques. Here, we encrypts a secret image into high quality halftone images or halftone shares. In particular, the proposed method applies the rice theory if blue noise halftoning to the construction mechanism used in conventional visual cryptography to generate halftone shares, while the properties of security are still maintaining. The share still contains some significant information.

Algorithm

- Step 1: Take a binary image.
- Step 2: Convert it to a halftone image.
- Step 3: Generate R1 as a random grid.
- Step 4: For each pixel convert into number of cipher-grids.
- Step 5: Generate two shares of random grid.
- Step 6: No need of pixel multiplication.
- Step 7: Overlap both share.
- Step 8: Output.

Advantages:

1. Halftone is the reproofing technique.
2. It replicates continuous tone imagery through the use of dots, which may

vary either in size, in shape or in spacing

3. In halftone visual cryptography, a secret binary pixel is encoded into an array of sub pixels, called as halftone cell, in each of the n shares.

Pixel	white		Black	
				
Prob.	50%	50%	50%	50%
Share1				
Share2				
Stack share1 & 2				

Fig 3: Construction of two-out-of-two VC scheme

V. SIMULATION RESULT

A. RG based Visual Cryptography

Simulation result for RG based Visual cryptography is given below, which shows the original image, share 1 and share 2 images and overlapping output image. To compare this, we took a 261 x 127 image which is divided into two no. of shares. The MSE value is 18.57 and PSNR value is 35.48 dB.

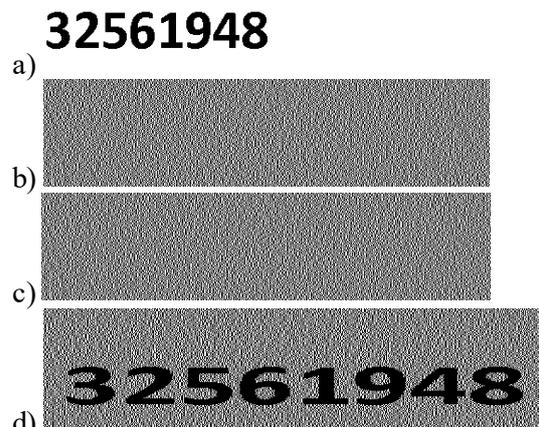


Fig 4: RG based VC a) original image, b) Share 1, c) Share 2, d) overlapped Share1 & 2

B. Halftone based Visual Cryptography

Simulation result for RG based Visual cryptography is given below, which shows the original image, Halftone Image, share 1 and share 2 images and overlapping output image. For this comparison, we took a 450 x 450 image which is converted into halftone image of same dimension. The MSE value is 0.98 and PSNR value is 48.25 dB.

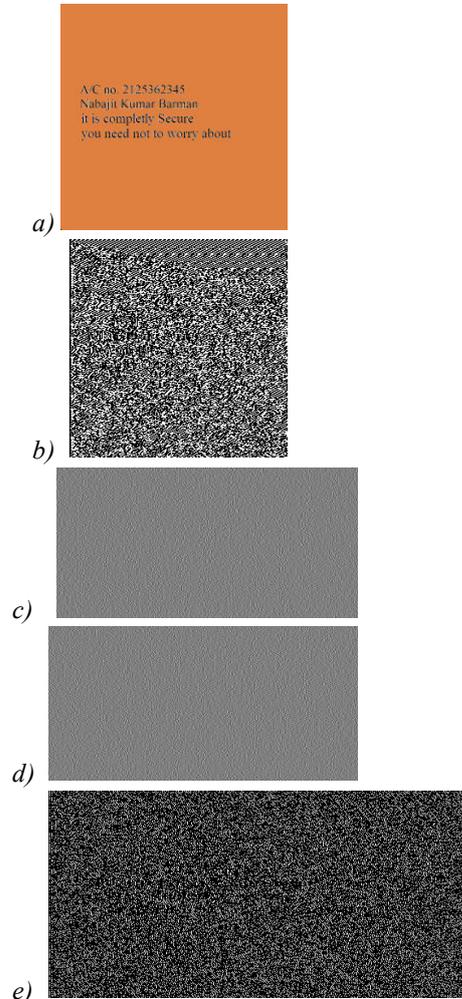


Fig 5: Halftone based VC a) a) original image, b) Halftone Image, c) Share 1, d) Share 2 e) overlapped Share1 & 2

C. Comparison

According to performance view visual cryptography is more secure as there they generate number of shares. One cannot decrypt an image with single number of share. As seen in those image Halftone based VC is more secure as it can distinguish only through naked eyes compare to RG based VC. On the other hand, in Halftone based VC, we can use a colour image, which can't be possible in RG based VC.

VI. CONCLUSION

We can transfer images securely through VC. The main advantage of visual cryptography is that only human eyes can detect a decrypt secret images with no computation required. Visual Cryptography allows easy decoding of the secret image by a simple stacking of the printed share transparencies. In this paper, only two different method of visual cryptography is discussed and compare between them. In future, one can compare other visual cryptography and compared with this result.

REFERRENCE

- [1] Sarita Swamy, Reshma Gulwani, "Secure E-pay using steganography and Visual Cryptography", International Journal of Advanced Computational Engineering and Networking, ISSN: 2320-2016 volume-5, Issue-7, July-2017.
- [2] K. Bennet, "Linguistic Steganography: Survey, Analysis, and Robustness Concerns for Hiding information in Text", Purdue University, Cerias Tech Report 2004 2013.
- [3] Souvik Roy and P. Venkateswaran, "Online Payment System using Steganography and Visual Cryptography", 2014 IEEE Students Conference on Electrical, Electronics and Computer Science.
- [4] Souvik Roy, P.Venkateswaranb, "A Text based Steganography Technique with Indian Root", International Conference on Computational Intelligence: Modelling Techniques and Applications (CIMTA) 2013.
- [5] Zhongmin Wang, Student Member, IEEE, Gonzalo R. Arce, Fellow, IEEE, and Giovanni Di Crescenzo, Halftone Visual Cryptography Via Error Diffusion, IEEE Transactions On Information Forensics And Security ,Vol. 4,No.3,September 2009
- [6] Jrgen Cederlf and Jan-ke Larsson Security Aspects of the Authentication Used in Quantum Cryptography, IEEE Transactions On Information Theory, Vol. 54, No. 4, April 2008
- [7] Zhi Zhou, Member, IEEE, Gonzalo R. Arce, Fellow, IEEE, and Giovanni Di

- Crescenzo, Halftone Visual Cryptography, IEEE Transactions On Image Processing, Vol. 15, No. 8, August 2006.
- [8] J. Chen, T. S. Chen, M. W. Cheng, "New Data Hiding Scheme in Binary Image", Proceeding of Fifth International Symposium on Multimedia Software Engineering, pp. 88-93, 2003.
- [9] Frdric Dupuis, Omar Fawzi, and Stephanie Wehner Entanglement Sampling and Applications, IEEE Transactions On Information Theory, Vol. 61, No. 2, February 2015.
- [10] Tzonelih Hwang, Kuo-Chang Lee, and Chuan-Ming Li Provably Secure Three-Party Authenticated Quantum Key Distribution Protocols, IEEE Transactions On Dependable And Secure Computing, Vol. 4, No. 1, January-March 2007
- [11] S.Suryadevara, R.Naaz, Shweta, S. Kapoor, "Visual Cryptography improvises the security of tongue as a biometric in banking system", Proceedings of 2011 2nd International Conference on Computer and Communication Technology (ICCT), pp. 412 415, 2011.
- [12] K. Thamizhchelvy, G. Geetha, "E-Banking Security: Mitigating Online Threats Using Message Authentication Image (MAI) Algorithm", Proceedings of 2012 International Conference on Computing Sciences (ICCS), pp. 276 280, 2012.
- [13] B.Srikanth, G.Padmaja, Dr. Syed Khasim, Dr. P.V.S.Lakshmi, A.Haritha, "Secured Bank Authentication using Image Processing and Visual Cryptography", International Journal of Computer Science and Information Technologies, Vol. 5 (2), 2014, 2432-2437.
- [14] S. R. Navale, S. S. Khandagale, R. A. Malpekar, Prof. N. K.Chouhan, "Approach for Secure Online transaction using Visual Cryptography Text Steganography", International Journal of Engineering Research Technology (IJERT) ISSN: 2278-0181 IJRTV4IS030775 www.ijert.org (This work is licensed under a Creative Commons Attribution 4.0 International License.) Vol. 4 Issue 03, March-2015 894.
- [15] Jaya, Siddharth Malik, Abhinav Aggarwal, Anjali Sardana, "Novel Authentication System Using Visual Cryptography", Proceedings of 2011 World Congress on Information and Communication Technologies, pp. 1181-1186, Mumbai, India, 2011.
- [16] Kumari Saarita, "A Research Paper on Cryptography Encryption and Compression Techniques", International Journal of Engineering and Computer Science ISSN: 2319-7242, Volume 6 Issue 4 April 2017, Page No. 20915-20919.
- [17] M. Naor and A. Shamir, "Visual cryptography", in Proc. EUROCRYPT, 1994. LNCS, vol. 950, pp 1-12, 1995.
- [18] Shyamalendu Kandar Department of Computer Sc. & Engineering, Haldia Institute of Technology Haldia, India, Bibhas Chandra Dhara, Department of Information Technology, Jadavpur University, Kolkata, India, "K-N Secret Sharing Visual Cryptography Scheme on Colour Image using Random Sequence", International Journal of Computer Applications (0975 -8887), Volume 25-No.11, July 2011.
- [19] Deniel Gruhl, Anthony Lu, Walter Bender, "Echo Hiding", proceedings of the First international workshop on Information Hiding, pp. 293-315, Cambridge, UK, 1996.
- [20] Hu ShengDun, U. KinTak, "A Novel Video Steganography Based on Non-uniform Rectangular Partition," Proceeding of 14th International Conference on Computational Science and Engineering, pp. 57-61, Dalian, Liaoning, 2011.
- [21] J. Chen, T. S. Chen, M. W. Cheng, "A New Data Hiding Scheme in Binary Image," Proceeding of Fifth International Symposium on Multimedia Software Engineering, pp. 88-93, 2003.