Survey on Various Visual Cryptographic Techniques

Reshma, Department of Computer Science, NMAMIT, Nitte, Karnataka, India

Vijay Murari T, Department of Computer Science, NMAMIT, Nitte, Karnataka, India

Abstract—Security is the important aspect during the transmission of information cryptography is concerned with the confidentiality, integrity and authentication of the data during the transmission. Visual Cryptography is a technique of cryptography where the image to be visible only to the receiver is encoded into numerous shares and on decryption original image is obtained by superimposing the encrypted multiple shares. The decryption process in visual cryptography does not require a complex algorithm or computation overlapping of shares reveal hidden original image that can be visualized by the human eye. There are different techniques of visual cryptography. In this paper review of few visual cryptographic techniques are performed. Extended visual cryptography scheme is a combination of visual cryptography and biometric schemes.

Keywords— Visual Cryptography (VC)

I. INTRODUCTION

Information security is major concern in the present world due to the high rate of data exchange through the internet. There exist several cryptographic techniques like advanced encryption standard algorithm, data encryption standard algorithm, blowfish algorithms which will be used in network security. All this algorithms at the senders end encrypt the original data using a key that is shared between the sender and the receiver based on some policies and scramble the data into non human readable format, at the receivers end receiver needs to decrypt the encrypted data by using the same key so as to obtain the original information.

Visual cryptography is a technique in which a hidden image will be encrypted into multiple number of shares of groups of black and white pixel so that the unique shares do not show any information regarding the original hidden image. During decryption the multiple shares are stacked together so that the overlapping of the multiple shares reveals the original secret image which can be seen by the human eye. Visual cryptography do not need any complex algorithms during decryption.

Extended Visual cryptography is a scheme in which the hidden image is divided to multiple shares like visual cryptography but only difference is that extended visual cryptography uses hyper-graph colorings for the production of multiple shares as a result the resultant image produced is of poor quality.

Hierarchical visual cryptography encrypts the secret in number of levels. First the secret is split into two share called share a and share b. Each of these shares is encrypted independently which produces 4 shares namely share a1, share a2, share b1 and share b2. Then, from these four shares, any three shares will be randomly chosen so as to form the key share. The superimposition of key share with the remaining share reveals the secret information.

All the prior visual cryptographic techniques could only be applied to black and white images. Dithering and halftoning are visual cryptographic technique that can be applied to the grayscale image to obtain multiple shares and these multiple shares are then overlapped to obtain the hidden secret image that is being transmitted.

Initial visual cryptographic techniques produced multiple shares based on the visual cryptographic scheme used but when overlapped or stacked together they would produce resultant image of poor visual quality which could not be perceived by human eye. Advances in visual cryptography makes use various cryptographic techniques which produces resulting image of high quality which can be seen by human eye on overlapping of multiple shares.

II. RELATED WORKS

The concept of visual cryptography was first put forward by Naor and Shamir[1], it is a hidden image sharing scheme based on binary image. In this scheme the original cover image is encoded into many secret share image and these multiple secret share images individually do not reveal any data relevant to the original cover image. Only when all the secret shares are stacked together it reveals the hidden cover images. The required number of stacking of secret image shares is dependent on the visual cryptographic scheme being used. Stating in general a (u,v) visual cryptography scheme produces v number of shares but it requires stacking of u number of shares to reveal the original secret image.

Later on visual cryptography was applied to grayscale images using a new technique called as dithering and halftoning in which specific algorithm is used to convert grayscale scale image into black and white image but the problem in using these scheme is that it produces image with reduced image quality. Further these schemes are also improvised so as to produce image of high quality.

III. VISUAL CRYPTOGRAPHY

A. Review of Visual Cryptography By Using a Void-And-Cluster

E. Myodo, S. Sakazawa and Y. Takishima [2] has proposed a visual cryptographic technique for images in which the shares are generated using threshold arrays which are generated using the void-and-cluster technique. These share images which are generated by threshold arrays when overlapped produce a high quality secret image which can be clearly perceived by human visual system. Advantage with this paper is that it can be applied to (2,3) and (3,3) techniques as well as the shares individually do not reveal any information regarding the original image and when overlapped it clearly decodes original hidden image. This technique was applied only to binary images.

B. Review of VC For Color Images Based On Halftone Technique

Wei Qiao, Hongdong Yin and Huaqing Liang [3] has proposed a visual cryptography technique for the RGB image. In normal visual cryptographic scheme shares generated from secret image are random black and white pixels but in this method initially a RGB image is taken and further this RGB image is split into three individual share images of CMY scheme later halftoning technique is used to transform these individual CMY images into binary images finally secret shares are generated by using the normal secret sharing scheme for black and white images. To obtain the halftone images Floyd-Steinberg Algorithm is being used. Advantage is that this scheme can be used for natural image processing.

C. Review of Enhanced Visual Secret Sharing through Halftoning Technique

In Extended VC shares are encoded from a secret image by using the hypergraph colorings but the quality of reconstructed image is not good.

E.Sangeetha Devi [4] has proposed a scheme of halftoning

in which halftoning technique is used for secret share generation. In this technique void and cluster algorithm is used to generate n number of halftone shares. The advantage with this method is that the quality of halftone shares will be significantly better.

D. Review of transmission of secret image based on error diffusion technique

Emi Myodo, Koichi Takagi, Satoshi Miyaji, Yasuhiro Takishima [5] has proposed a novel VC technique the secret image will be embedded within a two high quality cover images. The secret image will be reconstructed by superimposing the carrier cover images. To improve the usability of VC schemes error diffusion halftoning technique is used.

E. Review of Improved Halftoning Technique Used In Extended VC

M. Desiha and Vishnu Kumar Kaliappan [6] has proposed a improved halftoning technique. In this paper a improved dithering halftone technique is proposed. The advantage is that is that it includes a preprocessing technique which reduces the time required for generating the halftone image and also improving the perception quality of the secret image.

F. Review of VC Scheme for Producing Reconstructed Image of Same Sizes As That of The Original Secret Image

Ch. Ratna Babu, M. Sridhar and Dr. B. Raveendra Babu [7] has proposed a new scheme in which the size of the reconstructed image will be same as the size of the original secret image. Visual information can be hidden by using pseudo randomization and reversing the pixel. The proposed scheme has reduced pixel expansion but quality of the reconstructed image is poor. The reconstructed image will be darker than the original secret image. Disadvantage is that this technique cannot be used for the dark natural images.

G. Review of VC Scheme based on Fast Fourier Transform Technique

Ali Makki Sagheer, Salah Sleibi Al-Rawi and Laith Hamid Abed [8] has proposed a VC scheme based on Fast Fourier Transform also called as FFT. FFT is used for dividing the image into multiple shares and each of the share is encrypted using Multilayer Security Method. When dividing the image pixels will be expanded to eliminate this image compression technique is employed. Advantage is that by using image compression technique to eliminate pixel expansion image security is provided and quality of reconstructed image is better. Disadvantage is that it is limited only to grayscale images.

H. Review of Technique for Producing Optimal Shares using VC Scheme

J.K. Mandal and Subhankar Ghatak [9] proposed a (2, y+1) VC Scheme where y number of secret images has been encoded based on a randomly generated master shares as a common share for all secrets that can be decoded in conjunction with master share out of y+1 generated shares. It is secure and easy to implement.

I. Review of Improved Secret Sharing production Using the Error Diffusion in Halftone VC

Nitty Sarah Alex and L. Jani Anbarasi [10] proposed a improved method for secret share generation through using error diffusion halftone VC. Several methods of error diffusion are applied to further improve the quality of the halftone shares. In halftone method secret image pixels will be inserted into the already existing uncoded halftone shares. By using VC scheme along with halftoning the continuous tone image will be initially converted to a binary image and then the secret sharing is employed. The

secret image will be encrypted into halftone images by usage of error diffusion on halftone shares.

J. Review of Extended VC Technique Without The Pixel Expansion For Halftone Images

N. Askari, H. M. Heys and C. R. Moloney [11] proposed a new technique for Extended VC in which the quality of the shares and reconstructed image is better and the size of the shares and the size of the reconstructed image is same as that of the original halftone image itself.

IV. CONCLUSION

Each of the proposed method has its own advantages and disadvantages. With this survey we can get to know the advantages and disadvantages of each of the visual cryptographic methods based on the quality of the reconstructed image, time required to reconstruct the image, quality of the shares.

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