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# An Outline of Various Secret Sharing Techniques

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**Abstract:** ***Data is progressively important in our every day life. Data gets more esteem when imparted and shared to others. Due to advancement of technology, specially in networking and communication area, now it becomes very convenient to impart the data like speech or audio ,video and images effectively. It may offer ascent to security related issues. Visual cryptography, a developing cryptography engineering, uses the attributes of human vision to decrypt encrypted digital signals (Image). It does not need any cryptography learning and complex calculation. For security concerns, it additionally guarantees that programmers can't see any pieces of information around a secret image from individual share image. Since Naor and Shamir proposed the fundamental model of visual cryptography, specialists have distributed numerous related studies. A large portion of these studies, in any case, concentrate on paired pictures; few of them proposed systems for handling gray level and true color images. This paper gives you an outline of various technique for visual cryptography of gray level and RGB images focused around past studies in high contrast visual cryptography, and the halftone engineering. Our routines not just hold the preferences of high contrast visual cryptography, which abuses the human visual framework to decode secret image without processing, additionally have the retrograde similarity with the past results in highly contrasting visual cryptography, for example, the t out of n limit conspire, and could be connected to black and white images effortlessly.***

**Keywords:** Visual Cryptography, Image Processing, Data hiding, Secret Sharing technique.

## 1. Introduction

Suitable strategies are obliged to prevent unlawful utilization of data. Such strategies are called as Secret sharing technique. G.r. Blakley and Adi Shamir independently discovered secret sharing scheme in 1979[1, 2]. In the matter of visual data or information like image and video, it is termed as Visual secret sharing technique. Visual cryptography (VC) is a system utilized for securing image based secret information. Moni Naor and Adi Shamir proposed the fundamental model of visual cryptography [3]. The principle idea of the first visual cryptography plan is to encode a secret image into a few shares. Secret data can't be uncovered with few shares. All shares are important to consolidate to uncover the secret image. There has been a relentlessly developing enthusiasm toward visual cryptography. Visual cryptography is easy, secure and successful cryptographic scheme. Since the root of this, different expansions have been created to enhance the things. So far numerous researchers have done heaps of examination in the field of visual cryptography. For instance: there are some numerous secret data imparting plan. Moreover some of them have enhanced their calculation to safe their secret data from interloper. Additionally, because of the progression in machine period, it encourages the improvement of electronic gadgets, for example, advanced cams, computerized pictures have been generally utilized as a part of numerous territory. Therefore, the secret offering strategy uncovered the security issue identifying with the insurance of secret images, for example, military administrations, keeping money, and personal image. Consequently, securing picture based privileged insights turns into a discriminating issue in secret imparting.

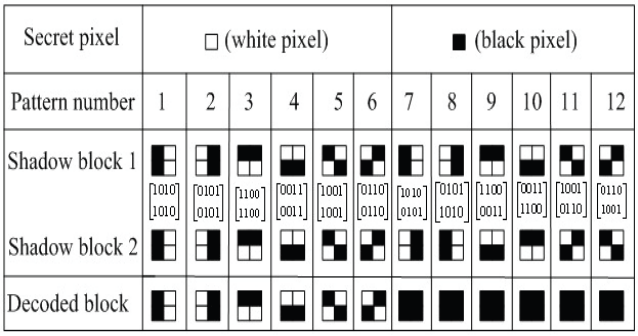
These expansions to essential visual cryptography are sketched out in this paper in Segment II, which incorporates Basic visual cryptography model,(2, 2) Visual Cryptography Scheme, (k, n) visual cryptography plan, Visual cryptography plan for General Access Structure, Recursive Threshold Visual cryptography plan, Halftone visual cryptography plan, Visual Cryptography plan for Gray pictures, Visual Cryptography plan for shade pictures, Multiple Secret Offering Scheme, Extended Visual Cryptography plan, Dynamic Visual Cryptography plan, Region Increasing Visual Cryptography plan and Segment based Visual Cryptography Scheme.

## 2. Various Visual Cryptography Schemes

### A. (2, 2) Visual Cryptography Scheme

In (2, 2) Visual Cryptography Scheme, original image is divided into 2 shares. Each pixel in original image is represented by non-overlapping block of 2 or 4 sub-pixels in each share. Anyone, having only one share will not be able to reveal any secret information. Both the shares are required to be superimposed to reveal the secret image [3]. There are many techniques for encoding the pixels of original image. In a technique, in which each pixel in original image is represented by two sub-pixels in each share, while reading the pixels in original image, if a white pixel is encountered, one of the first two rows in Figure 1 is selected with probability 0.5, and the shares are assigned 2 pixel blocks as shown in the third and fourth columns in figure 1. Similarly, if a black pixel is encountered, one of the last two rows is selected with probability 0.5, from which a sub-pixel block is assigned to each share. When two shares are superimposed, if two white pixels overlap, the resultant pixel

will be white and if a black pixel in one share overlaps with either a white or black pixel in another share, the resultant pixel will be black. This implies that the superimposition of the shares represents the Boolean OR function. The last column in Figure 1 shows the resulting sub-pixel when the sub-pixels of both the shares in the third and fourth columns are superimposed [3].




### B. (k, n) Visual Cryptography Scheme

In (2, 2) visual cryptography, both the shares are required to reveal secret information. If one share gets lost due to some technical problem, secret information cannot be revealed. So there is a restriction of keeping all the shares secure to reveal information and user can not afford to lose a single share. To give some flexibility to user, basic model of visual cryptography proposed by Naor and Shamir can be generalized into a visual variant of k out of n visual cryptography scheme [3]. In (k, n) visual cryptography scheme, n shares can be generated from original image and distributed. Original image is recognizable only if k or more shares stacked together, where value of k is between 2 to n. If fewer than k shares stacked together, original image cannot be recognized. It gives flexibility to user. If user loses some of the shares still secret information can be revealed, if minimum k number of shares is obtained.

### C. Visual Cryptography Scheme for General Access Structure

In (k, n) visual cryptography scheme, all n shares have equal importance. Any k out of n shares can reveal the secret information. It may compromise the security of system. To overcome this problem, G. Ateniese, C. Blundo, A. DeSantis, and D. R. Stinson extended (k, n) visual cryptography model to general access structure [4]. In general access structure scheme, given set of n shares is divided into two subsets namely qualified and forbidden subset of shares as per the importance of shares. Any k shares from qualified subset of shares can reveal secret information, but less than k shares from qualified subset of shares can not reveal any secret information. Even k or more shares from forbidden set can‟t reveal secret information. So, Visual cryptography for general access structure improves the security of system

### D. Recursive Threshold Visual Cryptography Scheme

In (k, n) visual secret sharing scheme, a secret of ‘b’ bits is distributed among „n‟ shares of size at least ‘b’ bits each. Since only k out of n shares is needed to reveal secret, every bit of any share conveys at most 1/k bits of secret. It results in inefficiency in terms of number of bits of secret conveyed per bit of shares. To overcome this limitation Abhishek Parakh and Subhash Kak proposed “Recursive threshold visual cryptography” [5]. The basic idea behind Recursive threshold visual cryptography is recursive hiding of smaller secrets in shares of larger secrets with secret sizes doubling at every step, and thereby increasing the information, every bit of share conveys to (n-1)/n bit of secret which is nearly100%.

### E. Halftone Visual Cryptography Scheme

Halftone visual cryptography uses Halftoning technique to create shares. Halftone is the reprographic technique. It simulates continuous tone imagery through the use of dots, which may vary either in size, in shape or in spacing. Zhi Zhou, Gonzalo R. Arce, and Giovanni Di Crescenzo proposed halftone visual cryptography [6].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. By using halftone cells with an appropriate size, visually pleasing halftone shares can be obtained. It maintains good contrast and security and increases quality of the shares.

### F. Visual Cryptography Scheme for Grey images

All previous visual cryptography schemes were only limited to binary images. These techniques were capable of doing operations on only black and white pixels. It is not sufficient for real life applications. Chang-Chou Lin, Wen-Hsiang Tsai proposed visual cryptography for gray level images [7]. In this scheme a dithering technique is used to convert gray level image into approximate binary image. Then existing visual cryptography schemes for binary images are applied to create the shares.

### G. Visual Cryptography Scheme for Color images

Visual cryptography schemes were applied to only black and white images till year 1997. Verheul and Van Tilborg proposed first color visual cryptography scheme [8]. In this visual cryptography scheme one pixel is distributed into m sub pixels, and each sub pixel is divided into c color regions. In each sub pixel, there is exactly one color region colored, and all the other color regions are black. F.Liu, C.K.Wu, X.J. Lin proposed a new approach for colored visual cryptography scheme [9]. They proposed three different approaches for color image representation:

1. In first approach, colors in the secret image can be printed on the shares directly. It works similar to basic visual cryptography model. Limitations of this approach are large pixel expansion and quality of decoded image is degraded.
2. In second approach separate three color channels are used. Red, green, blue for additive model and cyan, magenta, yellow for subtractive model. Then normal visual cryptography scheme for black and white images is applied to each of the color channels. This approach reduces the pixel expansion but quality of image gets degraded due to half toning process.
3. In third approach, binary representation of color of a pixel is used and secret image is encrypted at bit-level. This results in better quality of image.

### H. Multiple Secret Sharing Scheme

All the previous researches in visual cryptography were focused on securing only one image at a time. Wu and Chen [10] were first researchers, who developed a visual

cryptography scheme to share two secret images in two shares. In this scheme, two secret binary images can be hidden into two random shares, namely A and B, such that the first secret can be seen by stacking the two shares, denoted by A⊗ B, and the second secret can be obtained by rotating A by 90 degree anti-clockwise. J Shyu et al [11] proposed a scheme for multiple secrets sharing in visual cryptography, where more than two secret images can be secured at a time in two shares.

### I. Extended Visual Cryptography Scheme

In traditional visual cryptography scheme, shares are created as random patterns of pixel. These shares look like a noise. Noise-like shares arouse the attention of hackers, as hacker may suspect that some data is encrypted in these noise-like images. So it becomes prone to security related issues. It also becomes difficult to manage noise-like shares, as all shares look alike. Nakajima, M. and Yamaguchi, Y., developed Extended visual cryptography scheme (EVS) [12]. An extended visual cryptography (EVC) provide techniques to create meaningful shares instead of random shares of traditional visual cryptography and help to avoid the possible problems, which may arise by noise-like shares in traditional visual cryptography.

### J. Region Incrementing Visual Cryptography Scheme

In traditional visual cryptography scheme, one whole image is considered as a single secret and same encoding rule is applied for all pixels of one image. So it reveals either entire image or nothing. It may be the situation that different regions in one image can have different secrecy levels, so we can't apply same encoding rule to all pixels. Ran-Zan Wang developed a scheme "Region Incrementing Visual cryptography" for sharing visual secrets of multiple secrecy level in a single image [14]. In this scheme, different regions are made of a single image, based on secrecy level and different encoding rules are applied to these regions.

### K. Progressive Visual Cryptography Scheme

In this scheme the (k,n) shares are generated and out of k any number of n shares is able to retrieve the original signal (image) from shares. As the number of shares increases the quality of picture also increases.

### L. A Novel Secure Image Steganography Method Based On Chaos Theory In Spatial Domain

This paper exhibits a novel methodology of building a protected information concealing system in computerized pictures. The picture Steganography system exploits constrained force of human visual system (HVS). It employments picture as cover media for installing secret message. The most imperative prerequisite for a steganographic calculation is to be vague while amplifying the span of the payload. In this paper strategy is proposed to encode the mystery bits of the message in light of bedlam hypothesis before inserting into the spread picture. A 3-3-2 LSB insertion system has been utilized for image Steganography. Exploratory results demonstrate a considerable change in the Peak Signal to Noise Ratio (PSNR) and Image Fidelity (IF) estimation of the proposed system over the base method of 3-3-2 LSB insertion.

## 3. Conclusion

A secure LSB technique for image steganography has been proposed in this paper using the LSB Matching and LSB Replacement technique and a novel approach of Progressive visual cryptography technique is also proposed for image hiding and secret sharing.Successful implementation of both the technique in a combined frame work using GUI.

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