IOSR Journal of Computer Engineering (IOSR-JCE)
e-ISSN: 2278-0661,p-ISSN: 2278-8727,
PP 59-62
www.iosrjournals.org

Information Hiding Using Visual Cryptography

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Abstract: *The world-wide use of internet has increased the theft to the security of information that is being transferred from one system to another over the internet. In order to provide security to the information different information hiding methods have developed. One of the most widely used method to provide information security is the use of visual cryptography methods. Visual cryptography is a different encryption technique that provides information security by hiding the important data (Secret information) in the images. In this paper we propose a method that combines the Floyd-half-tone and Region incrementing approach to perform visual cryptography. The proposed method takes in the secret image and a different image as the cover image. The cover image is converted into the CMY color model and each CMY component is then half-toned and reverse half-toned. A random-select method is designed which processes every pixel of every region of the secret image in an incrementing method and embeds the processed pixels in each of the half-toned and reverse half-toned components. The shares are then generated by combining the half-toned and reverse-half-toned components. The secret image is obtained only after all the half-toned share is combined.*

Keywords:*Cover-image, CMY-color model,Floyd-halftone, Pixel-processing,Region-Incrementing,Random-select, Secret-image, Share-generation.*

I. INTRODUCTION

In Information hiding field cryptography plays an important role in hiding the secret data which is transferred from one system to another over the internet. Cryptography is defined as a technique that makes intelligent data into an un-intelligent form. To perform cryptography various encryption techniques have been defined and used like the AES, DES, Blowfish and Genetic algorithms [1, 2]. Visual cryptography is a special cryptography [3, 4] method that encodes the information within an image and cane be decoded by human visual systems. Visual cryptography method creates k-number of shares and hides the secret information with the shares. The secret information can be retrieved only if all the shares are combined together. Even if one share is missing the secret information cannot by retrieved by the human visual system.

In this paper, we have proposed a visual cryptography method that hides the secret images with in a cover image using a combinational approach of region incrementing and half-toning method[5, 6]. The proposed initially converts the cover image into CMY color model. It then designs a random select function that performs pixel processing step on the secret image and randomly embeds the processed pixels in each of the half-toned and reverse half-toned CMY components of the cover image. The shares are generated by combing the half-toned and the reverse half-toned images for each component. The secret image can be retrieved only after the generated shares are super-imposed.

The paper is organized as follows, in Section II we discuss the "related work in visual cryptography", in Section III we present our proposed algorithm, in Section IV we show the implementation results of the proposed algorithm, followed by conclusion in Section V.

II. RELATED WORK

This The paper "Enhanced Image Secret Sharing via Error Diffusion in Half-tone Visual Cryptography" [7] authored by "Nitty Sarah Alex and L. JaniAnbarasi" have proposed an algorithm wherein they have first half-toned the image. The resultant half-toned image is continuously diffused using the error diffusion methods. The error diffusion is performed so as to give the half-toned shares a please visual. Various other error diffusion techniques are performed and a comparative study is conducted. The half-tone shares quality is improved by using the Jarvis and Floyd-steinberg methods. The experimental results have shown that the visual qualities of the shares are improved.

The paper "Half-tone Visual Cryptography" [8] authored by "Zhi Zhou and Gonzalo R. Arce" have proposed an novel algorithm that uses a different half-toning method which is designed by the authors. The half-toning is based on the techniques used by the Blue Dithering principle which is combined with the void and

clustering methods so as to encode the secret binary images resulting into the generation of the multiple shares. The experimental results have shown that the visual quality of the obtained shares is better than any other cryptography techniques used.

III. PROPOSED ALGORITHM

This section provides the complete explanation of the working of the proposed algorithm for "Information Hiding Using Visual Cryptography".

Step1: Input: Cover Image and Secret image //Input by the user is the Secret image and the Cover //image.

Step2: Convert Cover image to CMY color model and extract each component of CMY model.

Step3: Apply Floyd_half-tone on each CMY component and also perform Reverse_half-tone on each CMY component. (Functions called are Half-tone(C) and Reverse_Half-tone(C))

Step4: Perform Region-Incrementing operation on the Secret image

Step4.a: Design a random_select function //this function processes every black and white pixel

Step4.b: For every pixel (i,j) of secret image

Do: call the random_select() and pass the secret image as an argument and go to L1

// encoded secret information

L1: calculate x_cor and y_cor values the random positions in the half-toned C components of the cover image and pass the secret image pixels values to the half-toned(C) component and to rever_half-toned(C) components

end

End of Step4 and goto Step5.

Step5: Repeat Stpe4 operations for the M component and the Y components and then goto Step6.

Step6: Combine the half-toned components into one forming one share and then combine the Reverse_half-toned images into one forming other share.

Step7: The secret image is retrieved by combining the two created shares.

IV. EXPERIMENTAL RESULTS

The proposed algorithm is implemented using MATLAB programing. The proposed algorithm was tested on 50 binary images as secret images. The implementation results are shown below where in the secret image is an "Athi" image and the cover image is an arbitrary RGB image.

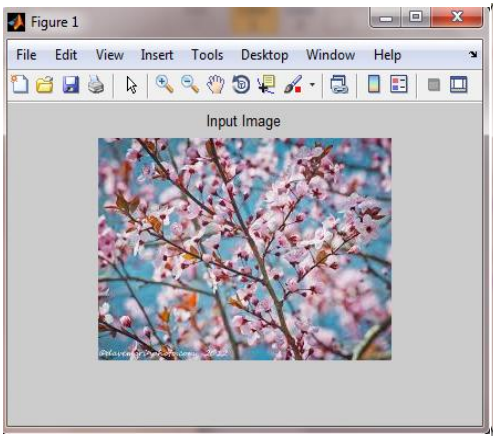

Fig1 (a): Cover Image

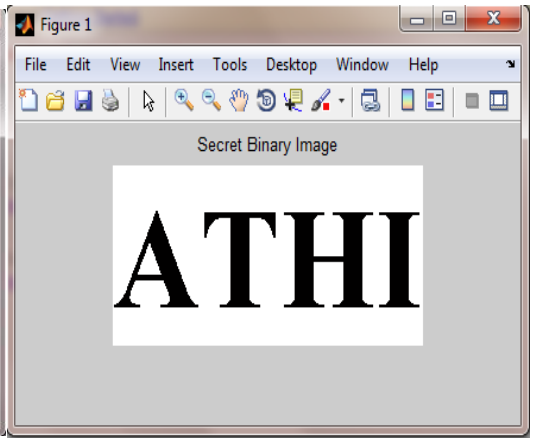

Fig1 (b): Secret Image

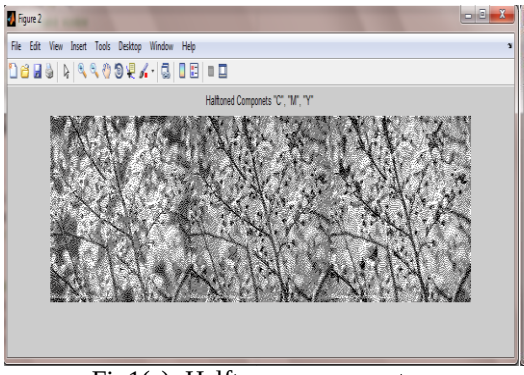

Fig1(c): Halftone-components

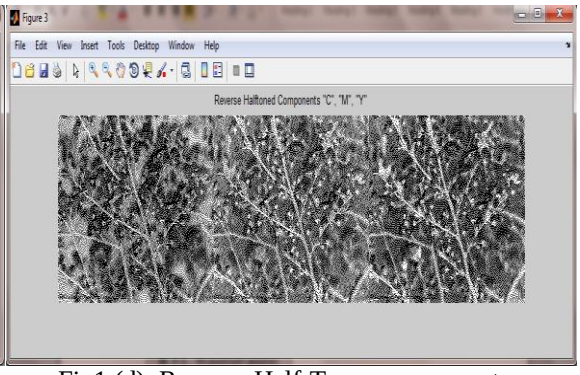

Fig1 (d): Reverse-Half-Tome-components

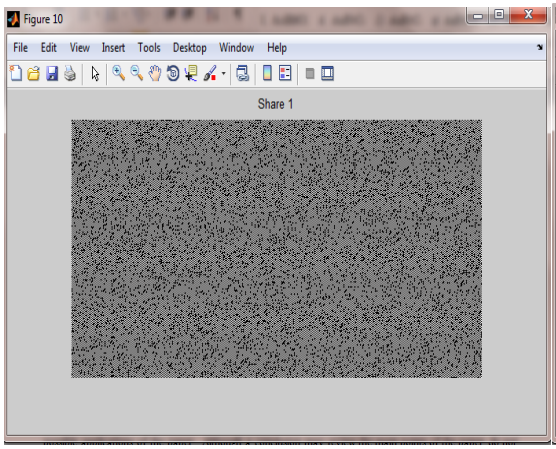

Fig1 (e): Share1

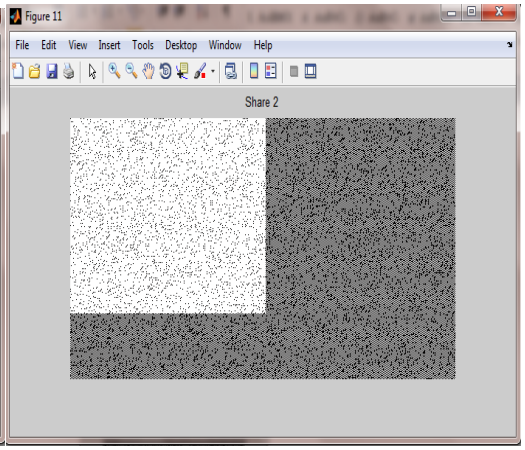

Fig1 (f): Share2

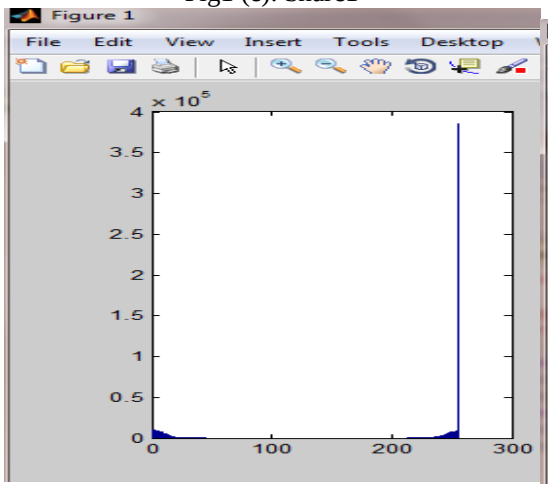

Fig1 (g): Share1-Histogram

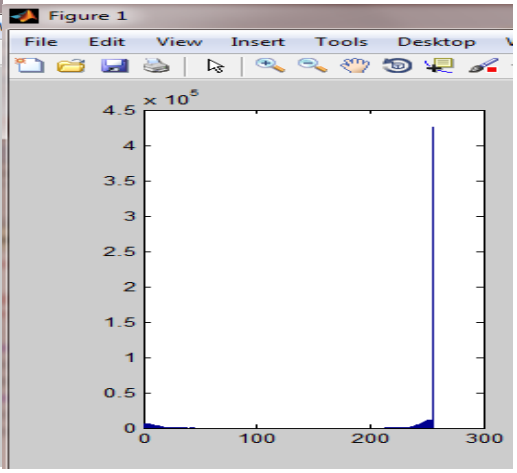

Fig1 (h): Share2-Histogram

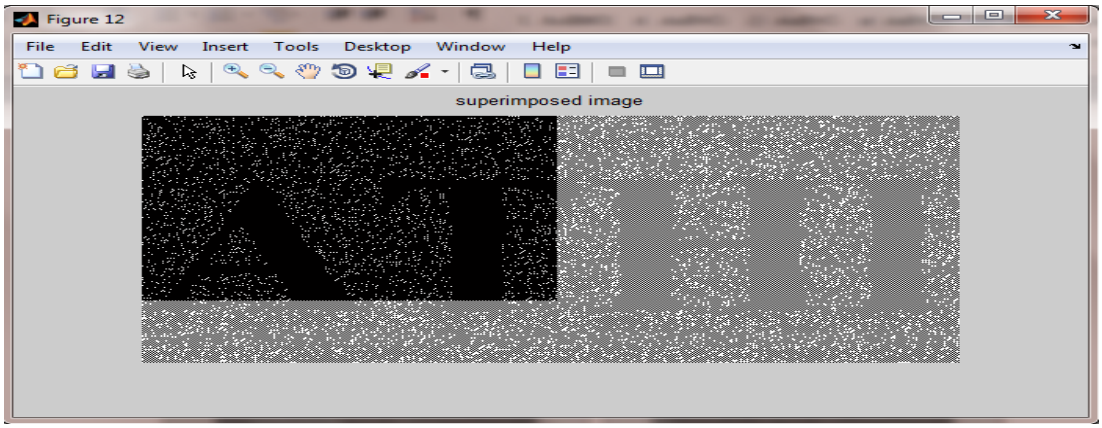

Fig1 (i): Secret Image Retrieved

The experimental results show that the secret image can be retrieved only after the shares are superimposed. A single share does not contain all the information and the histogram plots of the two shares show that both the shares carry equal amount of information. Thus to retrieve the secrete image both the shares are needed by the human visual system.

V. CONCLUSION

In this paper the proposed algorithm is based on the idea of hiding the secret image behind a cover image. The algorithm combines the advantages of Floyd-half-tone method with Region increment approach to provide security to the secret image. The experimental results have shown that the secret image can be obtained only after combining the generated shares. Also the secret image is embedded into the half-toned and reverse-half-toned CMY color components. Both the shares are obtained by combining the half-toned and reverse-half-toned color components. The histogram of the created share has proved that both the shares carry equal information.

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