ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

An Improved Edge Adaptive Grid Technique To Authenticate Grey Scale Images

Ishwarya.M[1], Mary shamala.L[2]

M.E, Dept of CSE, IFET College of Engineering, Villupuram, TamilNadu, India[1]

Associate Professor, Dept of CSE, IFET College Engineering, Villupuram, India[2]

ABSTRACT: As digital images can be easily altered electronically without any traces left, a security concern is how to verify their integrity and how to detect malicious tampering. The main challenge is to invariantly establish the Edge Adaptive Grid (EAG) and to select the Data Carrying Pixel Locations (DCPLs) because flipping the selected edge pixels for data hiding can interfere with the local image. An improved Edge Adaptive Grid technique is proposed to authenticate grey scale images through Contour Tracer. Contour tracer is used to select the good Data Carrying Pixel Locations associated with L-shape patterns. By maintaining and updating a location status map, a protective mechanism is applied to preserve the context of each DCPL and their corresponding outcomes. Edge adaptive grid techniques is robust against the interferences caused by contours, image noises, and invariantly select the same sequence of data carrying pixel locations in grey scale image. The main advantage of the proposed technique is to keep the size of the cover image as constant as the secret message increased in size and also provides good trade-off between large payload and minimal visual distortion.

I. INTRODUCTION

Steganography or information hiding is the science of concealing messages within harmless appearing cover data such as images, video or audio files. Watermarking refers to the use of steganography to put control over the cover data itself, for example embedding copyright labels in a copyrighted image that is distributed over file-sharing networks. Digital images can be easily altered electronically without any traces left a security concern are how to verify their integrity and how to detect malicious attacks. Several works have described for hybrid authentication schemes, which are integration of data hiding and cryptographic techniques. The recent issue in data hiding is how to robustly identify a large number of good data carrying pixel locations. The primary objective of the project is to authenticate grey scale images by an improved Edge Adaptive grid technique for protecting the secret message from malicious tampering or unauthorized user access. The secondary aim of the project is to select good Data Carrying Pixel Locations for hiding secret information into grey scale cover image and achieve good trade-off between payload and perceptional quality of the image.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

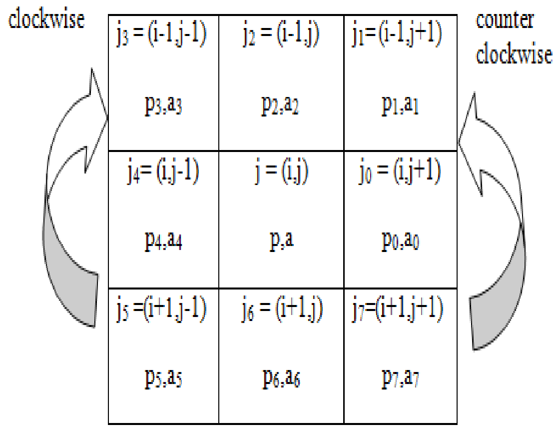

Figure 1.1 Contour Tracer

To matches 100 pairs of 5-pixel long interchangeable contour patterns to hide data in text images. Rank the flipping priority for each pixel by measuring its "flippability" score based on the smoothness and connectivity in 3*3 patterns. Random shuffling is used to evenly re-distribute the good flippable pixels and to enhance the security [15]. By dividing the shuffled image into a number of blocks, each block embeds a secret bit by enforcing its odd/even feature. Similarly, select the 4*4 embeddable superblocks, each for hiding a secret bit, by analyzing patterns of their 3*3 sub-blocks. The propose a matrix embedding based stegnographic scheme, which achieves large payload at the expense of relatively poor visual quality on the flipped pixels selected. Suggests to use a distance reciprocal distortion measure (DRDM) to select flippable pixels and one secret bit is embedded in each selected 8*8 block. To proposed three connectivity preserving criteria for selecting good embeddable blocks.

II. MODIFIED EDGE ADAPTIVE GRID TECHNIQUE

An improved Edge Adaptive Grid technique is proposed to authenticate grey scale images through Contour Tracer. Contour tracer is used to selects the good Data Carrying Pixel Locations associated with L-shape patterns. By maintaining and updating a location status map, a protective mechanism is applied to preserve the context of each DCPL and their corresponding outcomes. Edge adaptive grid technique is robust against the interferences caused by contours, image noises, and invariantly selects a same sequence of data carrying pixel locations in grey scale image. The main advantage of the proposed technique is to keep the size of the cover image as constant as the secret message increased in size and also provides good trade-off between large payload and minimal visual distortion.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

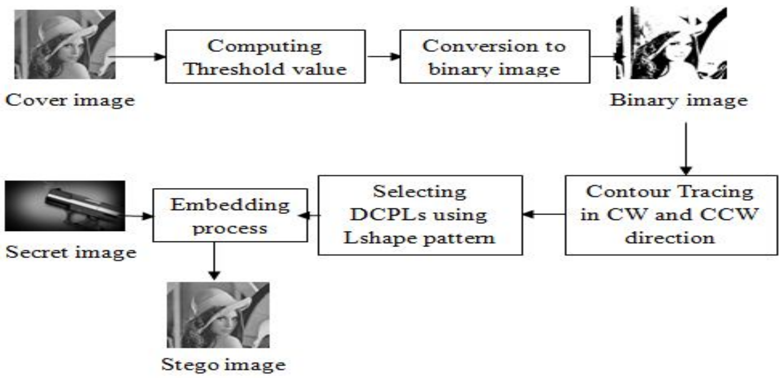

Figure 2.1 Modified EAG for data embedding process

Figure 2.1 shows the modified EAG for data embedding process in that the grey scale cover image is converted to the binary image by computing the threshold value. Apply the contour tracing method in clockwise (CW) and counter clockwise (CCW) direction in binary image to select the Data Carrying Pixel Location in Lshape pattern.

For embedding process

1. If the pixel value of DCPL is 0 then embeds it with pixel 1 of the secret image otherwise embed with pixel 0 of the secret image.
2. If the pixel value of DCPL and the secret image is same then no need to flip the pixel.

For selecting same sequence of DCPL's using edge adaptive grid through L-shape patterns, where flipping the centre pixel location can extract secret bits from the cover image. Three consecutive blocks is equal to one contour segment. At this moment, the previously suspended scanning is restarted from the next location to search for new contour starting locations and for new CSs. The entire process ends either when the required number of DCPLs are found or when the entire input image is scanned.

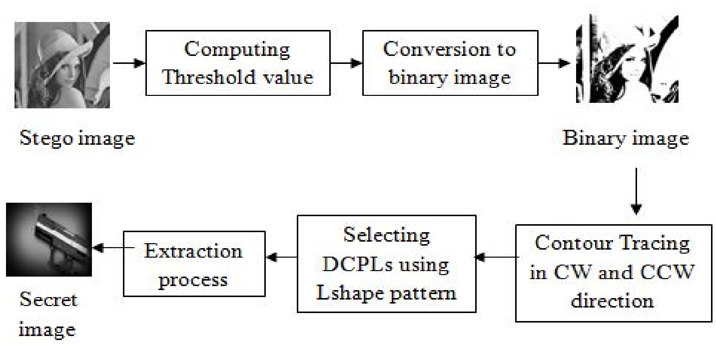

Figure 2.2: Modified EAG for data extraction process

Figure 2.2 shows the modified EAG for data extraction process in that the stego image is converted to the binary image by computing the threshold value. Apply the contour tracing method in clockwise and counter clockwise direction in binary image to select the Data Carrying Pixel Location in Lshape pattern.

For extraction process

1. If the pixel value of DCPL is 0 then flip it as pixel 1 otherwise flip it as pixel 0.
2. If the pixel value of DCPL is same then no need to flip the pixel. Thus the secret image is obtained after extraction.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

III. SYSTEM DESIGN

The proposed edge adaptive grid technique is to promote the secure communication in the distributed file networks against malicious attacks. An improved Edge Adaptive Grid (EAG) technique is proposed to authenticate grey scale images. Edge adaptive grid technique is established through contour tracer to select good Data Carrying Pixel Locations (DCPLs).Edge adaptive grid technique is robust against the interferences caused by contours, image noises, and invariantly selects a same sequence of DCPLs in grey scale image.

Data carrying pixel locations is selected using L-shape patterns for hiding secret image in the grey scale cover image. The input image is scanned entirely using contour tracer to select data carrying pixel locations. When number of DCPLSs obtained can embed secret bits into that grey scale image [9]. Grey scale image contains 0' to 255' so fit the secret data in the sequence then protect those DCPLs for authentication purpose. EAG invariantly selects the same sequence of DCPLs in receiver side while extracting the secret data. Contour Tracer is used to select the border of the image or edges of the image to increase the processing speed and to reduce the computational complexity.

3.1 Image Preprocessing

Binary images can be obtained from gray-scale images by thresholding operations. A thresholding operation chooses some of the pixels as the foreground pixels that make up the objects of interest and the rest as background pixels. Given the distribution of gray tones in a given image, certain gray-tone values can be chosen as threshold values that separate the pixels into groups. In the simplest case, a single threshold value T is chosen.

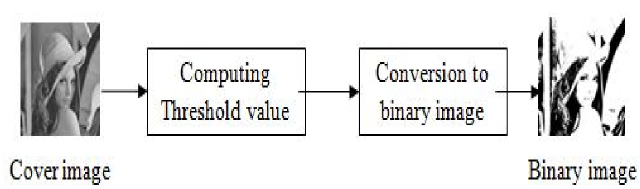

Figure 3.1 Image Preprocessing

Figure 3.1 shows Image Preprocessing to obtain binary image from grey scale by computing threshold value. All pixels whose gray-tone values are greater than or equal to T become foreground pixels and all the rest become background. This threshold operation is called threshold above.

There are many variants including threshold below, which makes the pixels with values less than or equal to T the foreground; threshold inside, which is given a lower threshold and an upper threshold and selects pixels whose values are between the two as foreground; and threshold outside, which is the opposite of threshold inside. Now the grey scale image is converted into binary image to reduce the computational complexity.

3.2 Contour Tracing Using L-Shape Patterns

Contour tracing is a technique that is applied to digital images in order to extract their boundary. A digital image is a group of pixels on a square each having a certain value. bi level images i.e. each pixel can have one of 2 possible values namely: 1, in which case consider it a "black" pixel and it will be part of the pattern, OR 0, in which case consider it a "white" pixel and it will be part of the background.

The boundary of a given pattern P, is the set of border pixels of P. Since we are using a square tessellation, there are 2 kinds of boundary (or border) pixels: 4-border pixels and 8 border pixels. A black pixel is considered a 4-border pixel if it shares an edge with at least one white pixel. A black pixel is considered an 8-border pixel if it shares an edge or a vertex with at least one white pixel [6]. The idea behind the contour tracing algorithm is very simple; this could be attributed to the fact that the algorithm was one of the first attempts to extract the contour of a binary pattern. Given a digital pattern i.e. a group of black pixels, on a background of white pixels i.e. a grid, locate a black pixel and declare it as start pixel. Locating a start pixel can be done in a number of ways, start at the bottom left corner of the grid, scan each

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

column of pixels from the bottom going upwards starting from the leftmost column and proceeding to the right- until encounter black pixel that can be a start pixel.

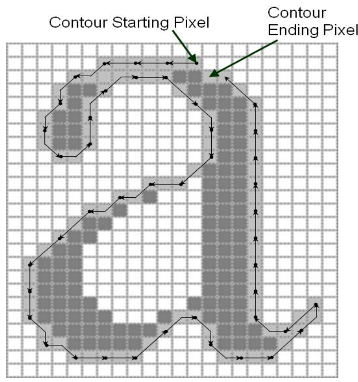

Figure 3.2 Border Tracing

Figure 3.2 explains a point worth mentioning is that it is not enough to merely identify the boundary pixels of a pattern in order to extract its contour. It is an ordered sequence of the boundary pixels from which can extract the general shape of the pattern. Contour tracing is one of many preprocessing techniques performed on digital images in order to extract information about their general shape [1]. Once the contour of a given pattern is extracted, its different characteristics will be examined and used as features which will later on be used in pattern classification. Therefore, correct extraction of the contour will produce more accurate features which will increase the chances of correctly classifying a given pattern. Well, the contour pixels are generally a small subset of the total number of pixels representing a pattern. Therefore, the amount of computation is greatly reduced when run feature extracting algorithms on the contour instead of on the whole pattern. Since the contour shares a lot of features with the original pattern, the feature extraction process becomes much more efficient when performed on the contour rather on the original pattern.

3.3 Data Embedding

Edge adaptive grid is used to select good carrying pixel location through L-shape patterns, where flipping the centre pixel causes minimal visual distortion because the edge line length connectivity is less in that pixel. The selected DCPL locations are stored in the stack.

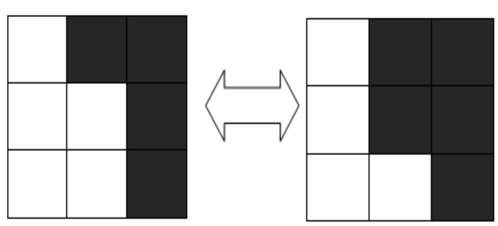

Figure 3.3 A pair of L-shape patterns

Figure 3.3 illustrates the pair of inter-changeable L shape patterns to flip the pixel for embedding secret bit. Where flipping the center pixel causes minimal visual distortion due to its less edge line segment connectivity. The two pairs of interchangeable contour segment pattern and idea for flipping the centre pixel of L-shape pattern without affecting the neighbour pixels and also improve the visual quality of the stego image. For embedding process

1. Check the DCPLs whether it is obtained from the L-shape pattern.
2. Else apply the contour tracing steps again.

3. If the selected data carrying pixel location value is 1 means flip the pixel value as 0 otherwise flip the pixel value as 1.
4. If the selected DCPL pixel value and secret pixel value are same means no need to flip the pixel.
Assign the protection value 0 for invalid pixel and 1 for valid pixel.
5. Protect each DCPL by assigning the status value 1 after embedding process gets over.

3.4 Data Extraction

To extract the secret message from the stego image the receiver wants to scan the image to get starting and ending pixel location using contour tracing algorithm. After getting starting pixel location apply the L-shape pattern to select DCPLs like embedding process.

For extraction process
1. Apply the contour tracing steps to identify DCPLs.
2. Check the DCPLs whether it is obtained from the L-shape pattern.
3. Else apply the contour tracing steps again.
4. If the selected data carrying pixel location value is 1 means flip the pixel value as 0 otherwise flip the pixel value as 1.
5. If the selected DCPL pixel value and secret pixel value are same means no need to flip the pixel.
Compare the original DCPLs with the extracted DCPLs using location status map.

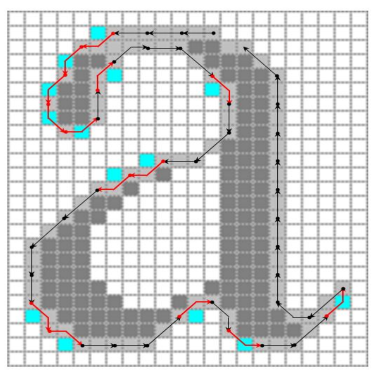

Figure 3.5 Selections of DCPLs

Figure 3.5 selection of DCPLs explains the border following method and selects edge pixels of the image.

IV.PERFORMANCE EVALUATION

To validate the invariance property of our algorithm implementation for EAG establishment and DCPL selection on extremely noisy binary images, such as random noise images and reported this finding in our preliminary work. Such a success is unprecedented in previous contour based bi-level data hiding works [8].

$$\sum_{k=0}^{7}\left(\prod_{n=0}^{3}\left(p_{k+n}\cdot\bar{p}_{k-n-1}\right)\right)=1$$

…….. (1)

Where, "." is the logical "And" operation P = denote logical "Not p", Pk = pk-8, if k>7 and Pk = pk+8, if k<0.
Perceptional Quality

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

Embeddability criterion does not enforce strict matching to LSP criterion in Eqn (1). But, it is worth to note that even in an unmatched case, the visual distortion caused by flipping our selected DCPLs is small as our edge connectivity is ensured due to the CS re-traceability criterion that we enforce. In this experiment, we study the average perceptional quality of our selected DCPLs in terms of both Edge Line Segment Similarity (ELSS) distortion and the flippability score. Contrary to the distortion measures for gray-level or color images, e.g. IW-SSIM, both ELSS and flippability score are specially designed for binary images and for data hiding applications.We first use the core engine in Figure 3.5 to select the DCPLs and then analyze each of their average perceptional quality [3]. The average quality for different types of cover images are tabulated in Table 4.1 For the text images of a good resolution, i.e. 600 dpi, and for the thick-line and solid-filling cartoon images, we observe that more than 99% of our selected DCPLs match with the LSP criterion in Eqn (1). Such percentages drop when the average line thickness becomes as thin as single-pixel wide.

Table 4.1 Average Perceptional Quality of Different style Images

Image Type	Resolution (dpi)	LSP (%)	Ave. FS	Ave. ELSS
English text(font size=12)	150	79.33	0.547	1.190
	300	95.30	0.607	0.883
	600	99.97	0.625	0.717
Chinese text(font size=12)	150	82.15	0.556	1.190
	300	97.02	0.614	0.834
	600	99.85	0.624	0.763
Cartoons	Thin line	86.70	0.575	1.185
	Thick line	99.95	0.625	0.695
	Solid filling	99.95	0.625	0.735

V. CONCLUSION AND FUTURE ENHANCEMENT

An improved Edge Adaptive Grid technique is proposed to authenticate grey scale images by selecting good data carrying pixel locations. Edge Adaptive Grid technique achieves large payload and good perceptional quality of image using L-shape pattern. Experimental results indicates that the improved edge adaptive grid technique is efficient compared to block based grid approach. The improved edge adaptive grid technique can be applied to authenticate the color images and to provide good trade-off between large payload and perceptional quality of image.

REFERENCES

[1] H. Cao and A. C. Kot, "EAG: Edge adaptive grid data hiding for binary image authentication," in Proc. Asia-Pacific Signal & Information Processing Association Annual Summit and Conference (APSIPA ASC),pp. 1-6, 2012.
[2] I. J. Cox, J. Kilian, F. T. Leighton, and T. Shamoon, "Secure spread spectrum watermarking for multimedia," IEEE Trans. on Image Proc., vol. 6, pp. 1673-1687, 1997.
[3] A. M. Bruckstein and T. J. Richardson, “A holographic transform domain image watermarking method,” CSSP Journal Special Issue, vol. 17-3, pp. 361-389, 1998.
[4] I. J. Cox, M. L. Miller, and J. A. Bloom, “Digital Watermarking,” Sam Mateo, CA: Morgan Kaufmann, 2001.

ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization) Vol.2, Special Issue 1, March 2014

Proceedings of International Conference On Global Innovations In Computing Technology (ICGICT'14)

Organized by

Department of CSE, JayShriram Group of Institutions, Tirupur, Tamilnadu, India on 6th & 7th March 2014

[5] H. Cao and A. C. Kot, "Lossless data embedding for electronic ink," in Proc. IEEE Int. Conf. on Acoustics, Speech and Signal Processing (ICASSP'09), pp. 1381-1384, 2009.

[6] S. C. Pei and J. M. Guo, "Hybrid pixel-based data hiding and block based watermarking for error-diffused halftone images," IEEE Trans. on Circuits and Systems for Video Technology, vol. 13, pp. 867-884, 2003.

[7] C. H. Tzeng and W. H. Tsai, "A new approach to authentication of binary images for multimedia communication with distortion reduction and security enhancement," IEEE Communications Letters, vol. 7, pp. 443-445, 2003.

[8] H. Yang, A. C. Kot and S. Rahardja, "Orthogonal data embedding for binary images in morphological transform domain-a high-capacity approach," IEEE Trans. on Multimedia, vol. 10, pp. 339-351, 2008.

[9] H. Yang and A. C. Kot, "Binary image authentication with tampering localization embedding cryptographic signature and block identifier," IEEE Signal Processing Letters, vol. 13 (12), pp. 741-744, 2006.

[10] Y. A. Ho, Y. K. Chan, H.-C. Wu and Y. P. Chu, "High-capacity reversible data hiding in binary images using pattern substitution," Computer Standards & Interfaces, vol. 31 (4), pp. 787-794, June 2009.

[11] H. Y. Kim and A. Afif, "Secure authentication watermarking for binary images," in Proc. SIBGRAPI, 2003, pp. 199-206.

[12]http://www.imageprocessingplace.com/downloadsV3/rootdownloads/tutorials/contour-tracing Abeer Georg Ghuneim/index.html.

[13]Website: https://sites.google.com/site/sstarcao.