International Journal of Applied Engineering Research ISSN 0973-4562 Volume 13, Number 6 (2018) pp. 3425-3429

Block Truncation Coding (BTC) Technique for Regions Image Encryption

Shaymaa Abed Yasseen Alkufi[1], Professor Hind Rustum Mohammed[2], Mohammed S. Mechee[3]

[1,2,3] Faculty of Computer Science & Mathematics, University of Kufa, Najaf, Iraq.

Abstract

An amendment has been applied to Block truncation coding (BTC) technique Through which any regions in Image Is chosen to encryption. In order to prove that Block truncation coding (BTC) technique for regions application has been made Encryption is Performance evaluation standards are: histogram, standard deviation, minimum, maximum mean and variance. The method proved to be successful and used the Matlab programming environment

Keywords: Block truncation coding, Encryption technique, regions Image, Encryption

INTORDUCTION

Delp and Mitchell find In 1979 block truncation coding (BTC) method simple technique to good quality image it Technique for digitizing gray images.

Block Truncation coding is to perform moment preserving quantization for values blocks of pixels by quality of image data to remain acceptable and storage space will decrease. In order to reduce the calculations of the image and obtain a high accuracy of results compared to traditional encryption methods there must be a hybrid methods of encryption. Block truncation coding has simple compute complexity compared to other methodes based coding techniques [1,2,3].

In this paper you will copy a method block truncation coding Encrypt the digital images and how to encrypt image components and internal areas for image .

Qrganized paper: Section 2 deals block truncation coding (BTC) techniques. Section 3 presents the proposed encryption method . Section 4 measure. environment test and experimental results. The conclusions of this study are given in Section 5.

BLOCK TRUNCATION CODING (BTC) TECHNIQUES [1,2,3]

The advantage of Block Truncation Coding makes it useful in image applications Special image encryption methods . It has fundamental limit in each block is reconstructed by two values, segmented the original images into blocks of pixels $n \times n$ and uses a quantizer to reduce the number of grey levels in each block.

Steps for block truncation coding (BTC) :

Step1. Input and read the Image for encryption than segmented the original images into non over lapping blocks of pixels that is $n \times n$.

Step2. Original block is 8×8 pixels. Explain as following:

10 : VAR00004 Visible: 8 of 8 Variab

	VAR0000 1	VAR0000 2	VAR0000 3	VAR0000 4	VAR0000 5	VAR0000 6	VAR0000 7	VAR0000 8
1	91.00	10.00	10.00	115.00	119.00	123.00	119.00	107.00
2	10.00	117.00	120.00	121.00	123.00	116.00	10.00	94.00
3	10.00	114.00	115.00	117.00	114.00	10.00	87.00	79.00
4	10.00	10.00	111.00	116.00	116.00	10.00	90.00	83.00
5	92.00	10.00	113.00	116.00	124.00	126.00	114.00	10.00
6	88.00	10.00	126.00	133.00	148.00	154.00	141.00	127.00
7	10.00	122.00	137.00	147.00	153.00	153.00	139.00	127.00
8	140.00	144.00	140.00	147.00	141.00	131.00	117.00	10.00

Step3. We replace the last four rows by the first four rows of the same block. Then we replace the last four columns of the last block by the first four columns of the same block and vice versa. Explain as following:

Visible: 8 of 8 Variables

	VAR0000 1	VAR0000 2	VAR0000 3	VAR0000 4	VAR0000 5	VAR0000 6	VAR0000 7	VAR0000 8
1	92.00	10.00	113.00	116.00	124.00	126.00	114.00	10.0
2	88.00	10.00	126.00	133.00	148.00	154.00	141.00	127.0
3	107.00	122.00	137.00	147.00	153.00	153.00	139.00	127.0
4	140.00	144.00	140.00	147.00	141.00	131.00	117.00	10.0
5	91.00	10.00	10.00	115.00	119.00	123.00	119.00	10.0
6	10.00	117.00	120.00	121.00	123.00	116.00	10.00	94.0
7	10.00	114.00	115.00	117.00	114.00	10.00	87.00	79.0
8	10.00	10.00	111.00	116.00	116.00	10.00	90.00	83.0

	VAR0000 1	VAR0000 2	VAR0000 3	VAR0000 4	VAR0000 5	VAR0000 6	VAR0000 7	VAR0000 8
1	124.00	126.00	114.00	10.00	92.00	10.00	113.00	116.00
2	148.00	154.00	141.00	127.00	88.00	10.00	126.00	133.00
3	153.00	153.00	139.00	127.00	10.00	122.00	137.00	147.00
4	141.00	131.00	117.00	107.00	140.00	144.00	140.00	147.00
5	119.00	123.00	119.00	107.00	91.00	10.00	109.00	115.00
6	123.00	116.00	10.00	94.00	10.00	117.00	120.00	121.00
7	114.00	10.00	87.00	79.00	10.00	114.00	115.00	117.00
8	10.00	90.00	83.00	10.00	10.00	111.00	116.00	116.00

Step 4. Find factors mean $\bar{y}$ and standard deviation σ. Both values are calculated for each block of Image by using following equations.

$$\bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i \quad (1)$$

$$\sigma = \sqrt{\sigma^2} \;, \quad \text{where} \quad \sigma^2 = \frac{\sum_{i=1}^{n}(y - \bar{y})^2}{n-1} \quad (2)$$

International Journal of Applied Engineering Research ISSN 0973-4562 Volume 13, Number 6 (2018) pp. 3425-3429

Here yi represent the ith pixel value of block and n is represents total number of pixel in special block.

Step 5. Find minimum and maximum for each block of sum Image**.**

THE PROPOSED ENCRYPTION METHOD

In this section we will explain the mechanism of application Block truncation coding (BTC) Encrypts any component taken from the image or any area From the picture With some steps modified to the original method

Figure 1 represents a portion of the images in which the proposed method is applied by cutting any area of the image

Figure 1: Samples of the images in which the proposed method

If we take the example in the second section of the paper, which represents the 8 * 8 block matrix of the image We applied it Block truncation coding (BTC) With some changes as follows:

After computation in section 2 of the matrix (BB(8*8)) and matrix (CC(8*8)) find the shape of the area segmentation from the image and shapes of conversion to the two matrix (BB) and matrix (CC).Figure 2 showed the shapes regions segmentation of AA,BB and CC matrixes.

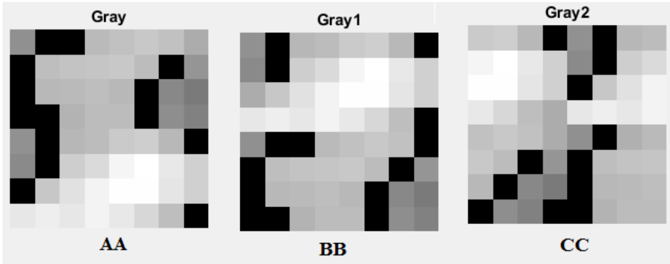

Figure 2: Shapes regions segmentation of AA,BB and CC matrixes.

The encryption process that occurred for region segmentation pixels from the image and the change of location according to the sequence of rows and columns. In order to showed the changes that occurred in the coding we found the histogram of the original region segmentation pixels image fragment and the resulting parts after the pixel changes. Figure 3 showed histogram of region segmentation pixels for AA,BB and CC matrixes.

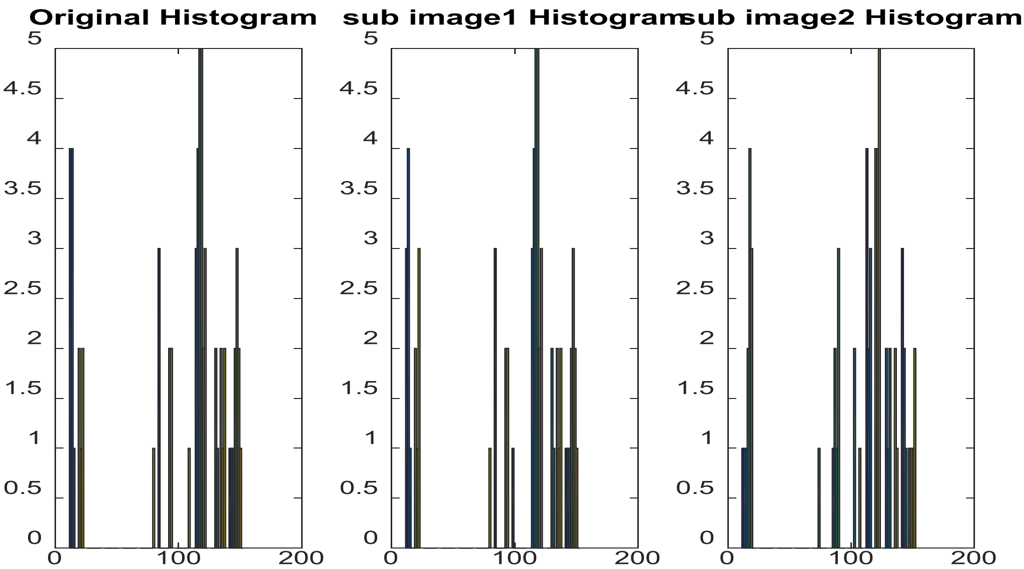

Figure 3: Histogram of region segmentation pixels for AA,BB and CC matrixes.

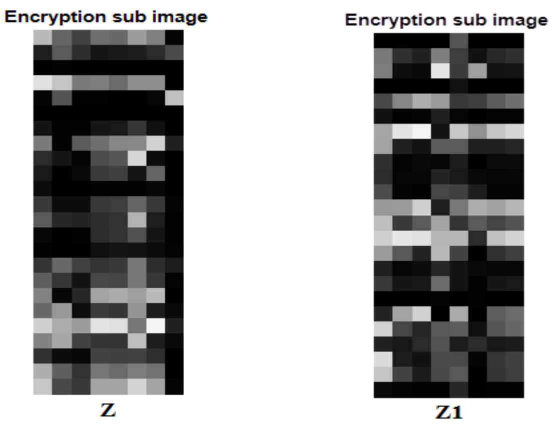

Figure 4: Regions matrices Z(24*24) and Z1 (24*24)

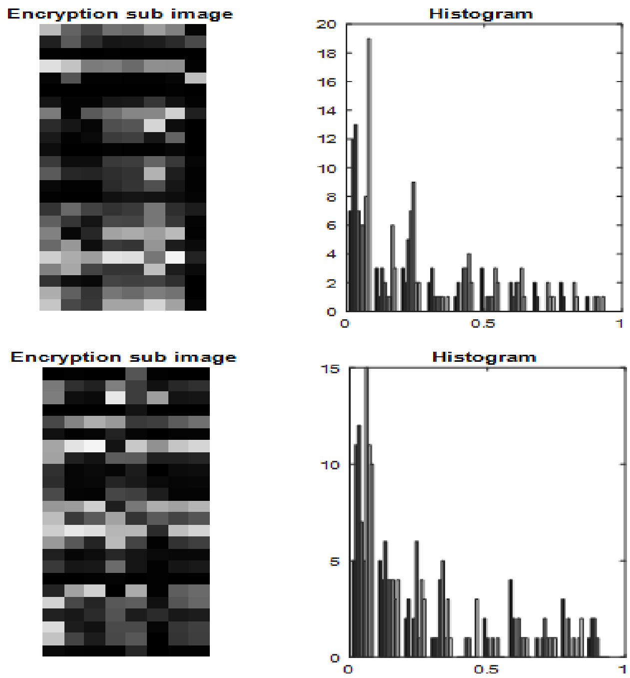

Figure 5: Histograms pixels spread in both regions matrices Z(24*24) and Z1 (24*24)

In order to make the encoding more accurate we additional pixels(Random values) to the region segmentation pixels to train values and convert them to real values So that we have two regions matrices Z(24*24) and Z1 (24*24).Figure 4 showed regions matrices Z(24*24) for BB matric and Z1 (24*24) for CC matric

Figure 5 showed the histograms which shows how the pixels are spread in the form of both regions matrices Z(24*24) for BB matric and Z1 (24*24) for CC matric

RESULTS AND DISCUSSION (TEST ENVIRONMENT)

In this section, the results are discussed and in order to ensure their validity, the performance criteria should be chosen of the proposed method.

Performance appraisal standards are : histogram , standard deviation, minimum ,maximum mean and variance. In order to compare the input with the results, it must be the same size(8*8) , For this we compress the values of the two arrays Z(24*24) and Z1 (24*24) to size(8*8) So that we can apply performance appraisal criteria.

Figure 6 showed the histograms where we notice a significant difference from the spread of encrypted region segmentation pixels in terms of their location between the components and areas of the image after the operations on the region pixels for original image

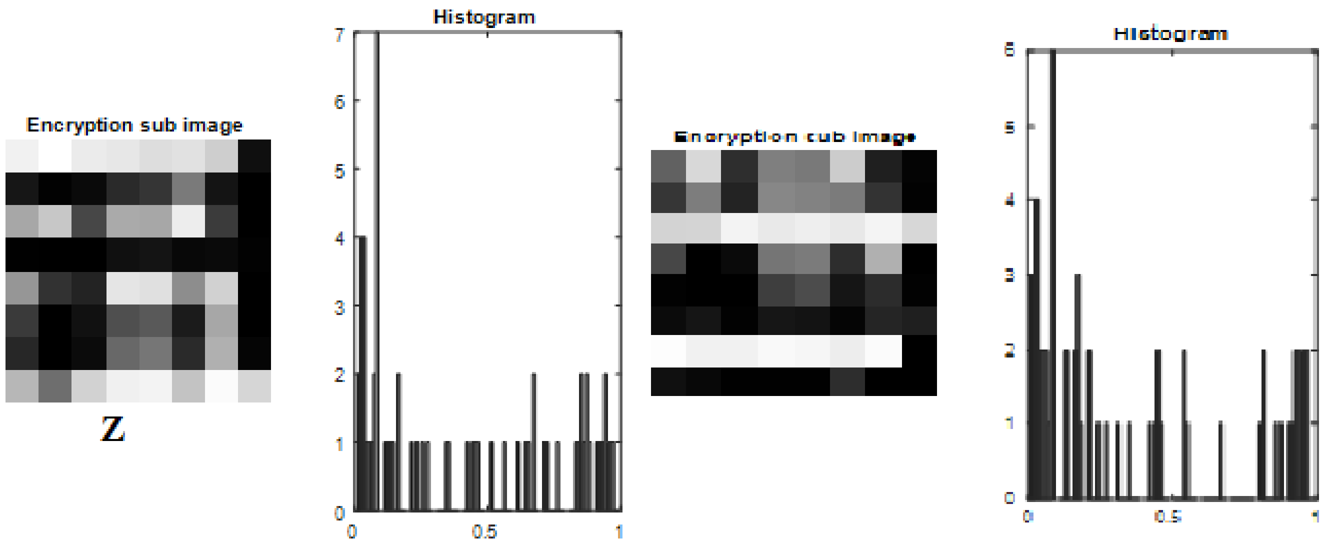

Figure 6: Histograms of two arrays Z(24*24) and Z1 (24*24) After converting the size Z (8*8) and size1 Z (8*8)

Tables 1, 2, 3, 4 and 5 showed the final values to the Performance appraisal standards are: histogram, standard deviation, minimum, maximum mean and variance for encrypted region segmentation pixels to AA(8*8),BB (8*8), CC(8*8) matrixes size Z (8*8) and size1 Z (8*8).

Tables 1. Performance appraisal standards for encrypted region segmentation pixels to AA(8*8)

Descriptive Statistics AA

Minimum	Maximum	Mean	Std. Deviation	Variance
10.00	140.00	56.3750	52.18631	2723.411
10.00	144.00	67.1250	61.71232	3808.411
10.00	140.00	109.0000	41.42463	1716.000
115.00	147.00	126.5000	13.91813	193.714
114.00	153.00	129.7500	15.26668	233.071
10.00	154.00	102.8750	58.89564	3468.696
10.00	141.00	102.1250	42.05587	1768.696
10.00	127.00	79.6250	46.52476	2164.554

Tables 2. Performance appraisal standards for encrypted region segmentation pixels to BB(8*8)

Descriptive Statistics BB

Minimum	Maximum	Mean	Std. Deviation	Variance
10.00	140.00	68.5000	51.13009	2614.286
10.00	144.00	67.1250	61.71232	3808.411
10.00	140.00	109.0000	41.42463	1716.000
115.00	147.00	126.5000	13.91813	193.714
114.00	153.00	129.7500	15.26668	233.071
10.00	154.00	102.8750	58.89564	3468.696
10.00	141.00	102.1250	42.05587	1768.696
10.00	127.00	67.5000	50.81338	2582.000

Tables 3. Performance appraisal standards for encrypted region segmentation pixels to CC(8*8)

Descriptive Statistics CC

Minimum	Maximum	Mean	Std. Deviation	Variance
10.00	153.00	116.5000	45.32108	2054.000
10.00	154.00	112.8750	46.32320	2145.839
10.00	141.00	101.2500	42.41546	1799.071
10.00	127.00	82.6250	47.53626	2259.696
10.00	140.00	56.3750	52.18631	2723.411
10.00	144.00	79.7500	58.60948	3435.071
109.00	140.00	122.0000	11.36410	129.143
115.00	147.00	126.5000	13.91813	193.714

Tables 4. Performance appraisal standards for encrypted region segmentation pixels to Z(8*8)

Descriptive Statistics Z

Minimum	Maximum	Mean	Std. Deviation	Variance
.01	.95	.4205	.39708	.158
.00	.99	.3724	.37454	.140
.00	.96	.3254	.36256	.131
.02	.94	.5033	.36872	.136
.02	.96	.5057	.37059	.137
.00	.98	.5034	.35990	.130
.03	.95	.4870	.42656	.182
.00	.86	.1223	.29791	.089

Tables 5. Performance appraisal standards for encrypted region segmentation pixels to Z1(8*8)

Descriptive Statistics Z1

Minimum	Maximum	Mean	Std. Deviation	Variance
.00	.96	.6110	.36231	.131
.00	.92	.4176	.33486	.112
.00	.99	.4962	.38982	.152
.00	.98	.4670	.37138	.138
.06	.83	.3386	.24068	.058
.00	.93	.2816	.35538	.126
.00	.91	.4658	.33904	.115
.00	.95	.5088	.34730	.121

CONCLUSION

In this paper selected any regions in image to encryption based block truncation coding. Replaced between the rows and the columns form original block in the same block and found mean , standard deviation , minimum and maximum for each blocks, from the results of the mean explain that the matrix AA and BB are optimum from the others matrix and from the results of the variance explain that the matrix Z and Z1 optimum because the less dispersion, the more homogenous the data.

REFERENCES

[1] Z. Wang, A. Bovik, H. Sheikh, E. Simoncelli, Image quality assessment: From error visibility to structural similarity, IEEE Trans. Image Process. 13 (4) (2004).

[2] Pratishtha Gupta , Varsha Bansal and G. N. Purohit ,Block Truncation Encoding For Image Compression Technique , International Journal of Emerging Research in Management &Technology, ISSN: 2278-9359 (Volume-4, Issue-4),2015.

[3] Doaa Mohammed, Fatma Abou-Chadi ,Image Compression UsingBlock Truncation Coding, Cyber Journals: Multidisciplinary Journals in Science and Technology, Journal of Selected Areas in Telecommunications (JSAT), February Edition, 2011.