International Journal of Computer Science and Software Engineering (IJCSSE), Volume 5, Issue 11, November 2016
ISSN (Online): 2409-4285 www.IJCSSE.org Page: 243-247

Analysis Compression Digital Image Compression Used Block Truncation Algorithm Coding (BTC) In Matlab 7.11

Tri Daryanto[1], Qinjie Zhao[2]and Yanming Chen[3]

[1] Computer Science Faculty, Universitas Mercu Buana Jakarta, Jakarta, Indonesia

[1, 2, 3] School of Computer Science, Beijing Institute of Technology, Beijing 100081, China

[1]tri.daryanto@mercubuana.ac.id, [2]zhaoqj@bit.edu.cn, [3]cym@bit.edu.cn

ABSTRACT

Image compression always need for many applications. Especially for the speed of accessing a send and image in various media, the sample is Internet data. If we want good quality picture we need more capacity memory to store. One way to reduce waste of memory is Used compression algorithm for the image, many compression they are created, One of the compression can be used is a Block Truncation Code (BTC). BTC algorithm has good ability to compress an image and the complexity the algorithm is not really difficult to implementation.This paper we modified reconstruction block for recorder high mean is average High and low block. We would be comparative study Modify MoBTC quality imageis better than BTC, compression ratio in the corresponds 85% for both of them methods and image quality measurement for BTC and MoBTC.

Keywords: *BTC,MoBTC, Compression, Images, and Algorithm.*

1. INTRODUCTION

The amount of image data grows time by time. Large storage and bandwidth are needed to store and transmit the images, which is quite costly. Hence methods to compress the image data are essentially now-a-days. The image compression techniques have two categorized for main classifications namely Lossy compression techniques and Lossless compression techniques [1]. Lossless compression ratio gives good quality of compressed images, but yields only less compression whereas the lossy compression techniques [2] lead to loss of data with higher compression ratio. JPEG [1] and Block Truncation Coding [3] is a lossy image compression techniques .It is a simple technique which involves less computational complexity. BTC is a recent technique used for compression of monochrome image data. It is one-bit adaptive moment-preserving quantizer that preserves certain statistical moments of small blocks of the input image in the quantized output. The original algorithm of BTC preserves the standard mean and the standard deviation [3]. The statistical overheads Mean and the Standard deviation are to be coded as part of the block. The truncated block of the BTC is the one-bit output of the quantizer for every pixel in the block. BTC is simple algorithm for lossy compression but quality image compression for litte size image not really good [2]. We modified the algorithm BTC would smooth and clear. Various methods have been proposed during last twenty years for image compression such BTC.Section 2, explains how about Block Truncation Coding (BTC) algorithm and Modified Block Truncation Coding (MoBTC). Section 3, explains about flowchart BTC algorithm in matlab, for section 4, and explains about implementation result and the last section is conclusion for this paper.

2. BLOCK TRUNCATION CODING

Most image data compression techniques achieve high data compression ratio. The trade off between data compression remains one of the difficult problems. Maintaining high compression ratios with good image quality is possible at a more or less high computational cost. One of the main goals for image data compression is to reduce redundancy in the image block a much as possible. That is, it is very important to represent an image with as few bits as possible while maintaining good image quality. Both compression and decompression algorithms should be simple and efficient. (BTC) is one of the simple and easy to implement image compression algorithms. This part introduces the BTC coding algorithm In BTC an image is segmented into n×n (typically,4×4) non–over lapping blocks of pixels, and a two-level (one-bit) quantize is independently designed for each block. Both the quantize threshold and the two reconstruction levels are varied in response to the local statistics of a block [3][7][11].

The level of each block is chosen such that the first two sample moment is preserved.

Let m = n×n, and let X_1 , X_2 , X_3 …….X_m be the pixel value in a given block of the original image. The quantities

we wish to preserve are the first and second sample moments:

$$\bar{X} = \frac{1}{m}\sum_{i=1}^{m} Xi \quad (1)$$

$$\sigma = \sqrt{\frac{1}{M}\sum_{i=1}^{M}(X_i - \bar{X}_i)^2} \quad (2)$$

The two values *x* and σ are termed as quantizers of BTC. Taking *x* as the threshold value a two-level bit plane is obtained by comparing each pixel value x_i with the threshold. A binary block, denoted by B, is also used to represent the pixels. We can use "1" to represent a pixel whose gray level is grater than or equal to *x* and "0" to represent a pixel whose gray level is less than

$$B = \begin{cases} 1, & X_i < \bar{X} \\ 0, & X_i \geq \bar{X} \end{cases} \quad (3)$$

for i = 1,2 , ...m

The reconstruction level 1 and 0 for decoder replacing A with 0 (low mean) and replacing B with 1 (high mean) given by:

$$A = \bar{X}.\sigma\sqrt{\frac{q}{m-q}} \quad (4)$$

$$B = \bar{X}.\sigma\sqrt{\frac{m-q}{q}} \quad (5)$$

Where p and q are the number of 0's and 1's in the compressed bit plane respectively

3. MODIFY BTC

This method is simple calculated, we used same BTC, but it is used for high bit is average for low bit (4) and high bit (5).

$$C = \frac{A+B}{2} \quad (6)$$

In the Modify BTC reconstruction level 1 and 0 for decoder replacing A with 0 (low mean) and replacing with 1 (high mean) with C, it is maked soft and clear the image and minimum gap for block pixel in image.

4. IMAGE QUALITY MEASUREMENTSMODIFY BTC

Image quality measures play important roles in various images processing application. Once image compression system has been designed and implemented, it is important tobe able to evaluate its performance. This evaluation should be done in such a way to be able to compare results against otherimage compression techniques. The image quality metrics can be broadly classified into two categories, subjective and objective. Subjective image quality is a method of evaluationof images by the viewers read images directly to determine their quality. In objective measures of image quality metrics, some statistical indices are calculated to indicate the image quality. On this case we used only Mean Square Error (MSE) and Peak signal to noise ratio (PSNR)

4.1 Signal to Noise Ratio (SNR)

Signal-to-noise ratio is defined as the ratio of the power of a signal (meaningful information) and the power of background noise (unwanted signal)[4][11]:

$$SNR = 10\log_{10}\left(\frac{signal}{noise}\right) \quad (6)$$

4.2 Peak Signal to Noise Ratio (PSNR)

The PSNR is most commonly used as a measure of quality of reconstruction of lossy compression. It is an attractive measure for the loss of image quality due to its simplicity and mathematical convenience. Peak signal to noise ratio (PSNR) is a qualitative measure based on the mean square error of the reconstructed image. If the reconstructed image is close to the original image, then MSE is small and PSNR takes a large value. PSNR is dimensionless and is expressed in decibel [4]. Peak signal to noise ratio Ratio (PSNR) avoids this problem by scaling the MSE according to the image range [5]. PSNR is defined as follow:

$$MSE = \frac{1}{MN}\sum_{i=1}^{M}\sum_{j=1}^{N}[y(i,j) - x(i,j)]^2 \quad (7)$$

$$PSNR = 10\ \log_{10}\left(\frac{L^2}{MSE}\right) \quad (8)$$

Where L is the dynamic range of the pixel values (255 for 8-bit grayscale images).

5. EXPERIMENTAL RESULTS

We are experimented 10 images database tif format with 2 sizes. They are 128x128 pixels with 5 images and 512x512 pixels with 5 images. Figure 2 and Figure 3 are shown the database images are used in experiment. Before experiment, we must design the algorithm works shown in flowchart and the algorithm with posecode.

5.1 Flowchart BTC

Flowchart showed the algorithm how the algorithm works. It can experiment in MATLAB programming, this flowchart created for know about Block Truncation Coding algorithm (BTC). For detail we can know in figure 1.

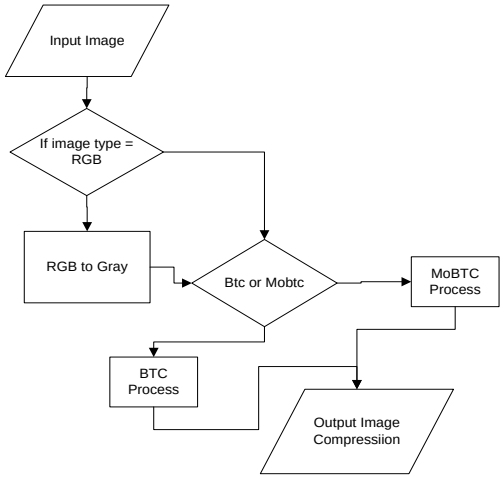
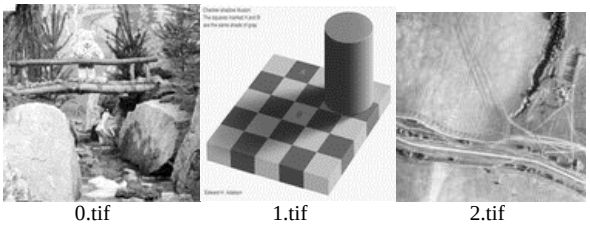


Fig. 1. Flowchart Process Compressing Image with BTC

5.2 Algorithm with Posecode

Algorithm block truncation coding (BTC) and (Modified BTC) process shown in

```
blksize=2;
mu=colfilt( Matrix block size),found mean
block size
All calculate the MU standard
q=I>mu;
q=colfilt(q,matrix block size)
m=blksize^2
length*width of block
a=mu-sigma.*(sqrt(q./m-q))        low mean
b=mu+sigma.*(sqrt(m-q./q))        high mean
H=I>=mu
elements of Bitmap
c = (a + b)/2;
        average in high bit
Y(H)=a(H)
Y(~H)=b(~H)
K(H)=a(H);
K(~H)=c(~H);
Y =ouput image(Y);
K=output image(K);
output Modified BTC image compression
```


0.tif 1.tif 2.tif


3.tif 4.tif

Figure 2. Database images size 128x128 pixels


Barbara Fishing boat


Goldhill Lena

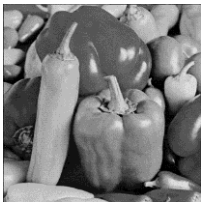
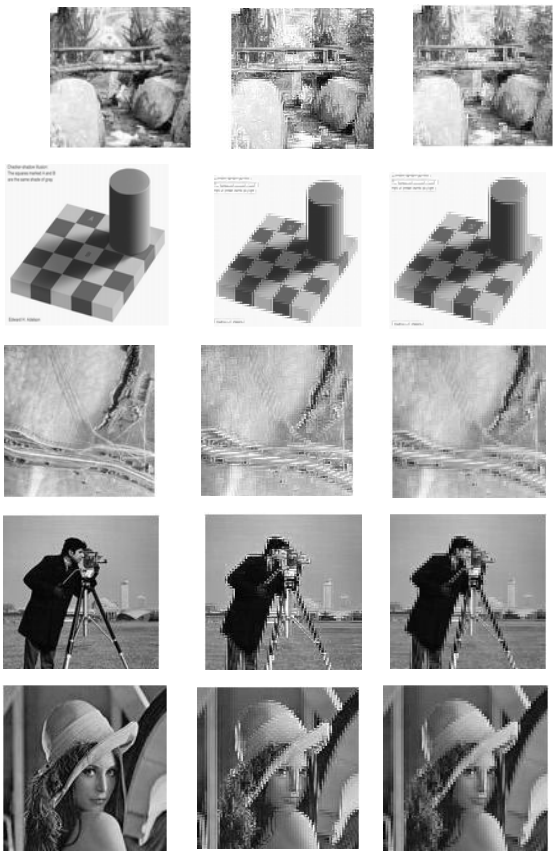

Pappers

Fig. 3. Database images size 512x512 pixels

Figure 4 shown the result for image sizes 128x128 pixel, a comparing quality images have really different smooth and clear. MoBTC compression is better quality than BTC compression. For Images size 512x512 pixels are not really differents quality image shown between MoBTC and BTC compression in figure 5. The table quality mensurements in table 1 shown MSE and PSNR MoBTC, the reconstructed image is close to the original image than BTC.



(a) (b) (c)

Fig. 4. (a). original images with size 128x128 pixels, (b) BTC Images, (c) MoBTC Images

(a) (b) (c)

Fig. 5. (a). original images with size 512 x 512 pixels, (b) BTC Images, (c) MoBTC Images

Table 1: Comparison images and analysis compression Used BTC

No	Image	Size	Capacity (KB)	MSE		PSNR	
				BTC	MoBTC	BTC	MoBTC
1	0.tif	128x128	16.3	1587.98	815.44	16.1224	19.0169
2	1.tif	128x128	16.15	505.28	303.94	21.0955	23.303
3	2.tif	128x128	3.78	567.18	286.35	20.4564	23.4244
4	3.tif	128x128	3.46	1262.01	648.43	17.1202	20.0122
5	4.tif	128x128	4.1	1005.46	510.14	17.9003	20.8471
6	Barbara.tif	512x512	258	851.99	429.29	18.2272	21.204
7	Fishing Boat.tif	512x512	258	429.96	218.95	21.7965	24.7274
8	Goldhill.tif	512x512	258	287.96	143.93	22.8281	25.8399
9	Lena.tif	512x512	258	217.01	108.62	24.4185	27.4241
10	Pappers.tif	512x512	258	318.23	162.95	22.1313	25.0383

6. CONCLUSION

In this paper, image compression using block truncation coding has been investigated. Two algorithms were selected namely, the original block truncation coding (BTC) and Modified block truncation coding (MoBTC). The two algorithms are based on dividing the image into non overlapping blocks and uses a two-level quantize. The two techniques were applied to different grey level test image each contains 128x128 pixels and 512×512 pixels with 8 bits/pixel (256 grey levels). The corresponds to 85% compression for all of the methods. Compare performance evaluate the image quality we used: Mean-Square-Error (MSE) and Peak Signal to Noise Ratio (PSNR). This paper shown the image compression using MoBTC provides better image quality than image compression using BTC at the same bit rate 2 bpp.

REFERENCES

[1] Rafael C. Gonzalez, Richard Eugene; "Digital image processing", Edition 3, 2008, page 466
[2] M. Ghanbari "Standard Codecs: Image Compression to Advanced Video Coding" Institution Electrical Engineers , ISBN: 0852967101, 2003 , CHM , 430 pages.
[3] M M. Almrabet, A R. Zerek, A Chaoui AA. Akash, "Image Compression Using Block Truncation Coding", IJ-STA, Volume 3, N° 2, December 2009, pp. 1046−1053.
[4] A. M. Eskicioglu and P.S. Fisher, "Image quality measures and their performance," IEEE Trans. Communications, vol. 34, pp. 2959-2965, Dec. 1995.
[5] M. Doaa, A.C. Fatma ""Image Compression Using Block Truncation Coding", Journal of Selected Areas in Telecommunications (JSAT), February Edition, 2011
[6] N. Yamsang and S. Udomhunsakul,"Image Quality Scale (IQS) for compressed images quality measurement", Proceedings of the International Multiconference of Engineers and Computer Scientists,vol. 1, pp. 789- 794, 2009.
[7] Delp, E. J., Saenz, M., and Salama, P., 2000, Block Truncation Coding (BTC), Handbook of Image and Video Processing, edited by Bovik A. C., Academic Press, pp. 176-181.
[8] Franti P, Nevalainen O, Kaukoranta T. Compression of Digital Images by Block Truncation Coding: A Survey, The Computer Journal, Vol. 37, No. 4, 1994.
[9] C. C. Tsou, S. H. Wu, Y. C. Hu, "Fast Pixel Grouping Technique for Block Truncation Coding," 2005 Workshop on Consumer Electronics and Signal Processing (WCEsp 2005), Yunlin, Nov. 17-18, 2005.
[10] M.D.Lema, O.R.Mitchell, "Absolute Moment Block Truncation Coding and its Application to Color Image", IEEE Trans. Coomun., Vol. COM-32, No. 10, pp. 1148-1157, Oct. 1984.
[11] Somasundaram, K.and I. Kaspar Raj. "Low Computational Image Compression Scheme based on Absolute Moment Block Truncation Coding". May 2006. Vol. 13.