ADVANCES in NATURAL and APPLIED SCIENCES

ISSN: 1995-0772
EISSN: 1998-1090
2016 September 10(13): pages 101-111

Published BY **AENSI Publication**
http://www.aensiweb.com/ANAS
Open Access Journal

Lossy Compression Algorithm Using Advanced Quantization Technique for Color Image

[1]S. Anantha Babu, [2]P. Eswaran and [3]C. Senthil Kumar

[1]Assistant Professor, V V College of Engineering, Tirunelveli, India
[2]Assistant Professor, Alagappa University, Karaikudi, India
[3]Associate Professor, Erode Arts & Science, Erode, India

Received 7 June 2016; Accepted 12 September 2016; Available 20 September 2016

Address For Correspondence:
S.Anantha Babu, V V College of Engineering, Computer Science & Engineering, Tisaiyanvillai, Tirunelveli, India.
E-mail: ananth@vvcoe.org

Copyright © 2016 by authors and American-Eurasian Network for Scientific Information (AENSI Publication).
This work is licensed under the Creative Commons Attribution International License (CC BY).
http://creativecommons.org/licenses/by/4.0/

Open Access

ABSTRACT

With the lot of invention of internet and communication network, the amount of data sharing and transmitting has been automatically increased. Usage of images has been increasing day by day in many digital image processing applications. Image compression plays vital role in saving space and saving time while sending images over the network. Digital images frequently consist of lots of redundant information and thus they are usually compressed to remove redundancy and reduce the repository or transport bandwidth. The existing quantization techniques only support for grayscale and 2- bandwidth images, but not used for color images and higher band images. To overcome these drawbacks, it needs to propose a new Advanced Quantization Technique [AQT]. The proposed method gets color image and separates its RGB spaces. The isolated color component is passed to Advanced Quantization Technique [AQT]. The AQT generates a histogram table and finds the minimum and maximum range. Based on the histograms, AQT modifies all original gray scale value into various sub quantization tables. From the table, the number of bits required to represent compressed data are calculated. Finally, Compression ratio is determined for all sub blocks. This process repeats for all components wise. The compression ratio has achieved better results compared to the existing compression scheme. The proposed Advanced Quantization Technique is tested and implemented through quality measurement parameters such as RMSE,MSE, BR, PSNR and CR by using MATLAB.

KEYWORDS: RGB Space, Isolated Color Components, Advanced Quantization Techniques (AQT), Histogram, MSE,RMSE and PSNR.

INTRODUCTION

Today, Compression is one of the key techniques for reducing the memory storage. Image compression attain the redundancy of rebate within the substantial quantity of data, with or without quality information loss in equity open with some principles through a restore and aggregate. Lossy compression is simply opposite to the lossless compression, when the data is compressed and decompressed means then the retrieved data might be slightly different from the original data, but it is quite close to the original image [25].

Several compression algorithms remain like DPCM, JPEG, SPIHT and JPEG2000. Different applications for compression has been used up the continuous improvement of images. The rule ought to provide effective and progressive compression and decompression for gray scale and binary images. The existing algorithm provides efficient and functional compression for an image (.bmp) picture with volatile compression ratios by applying in transmission of pictures, repository of images besides as image database [1]. Lossy image compression is the paramount method for storing still and moving images, due to its high compression ratios

To Cite This Article: S.Anantha Babu, P. Eswaran and C. Senthil Kumar., Lossy Compression Algorithm Using Advanced Quantization Technique for Color Image. **Advances in Natural and Applied Sciences**. 10(13); Pages: 101-111

and its ability to reconstruct images that are adjacent enough to the original, uncompressed image. Information is lost during the Lossy compression of an image [1], and cannot be exactly improved during the decompression procedure. The reconstructed image always takes some degree of reconstruction errors caused by the lossy compression process [2]. That is

Reconstructed pixel value = true pixel value + reconstruction error.

The most extensively used Lossy image compression method is block transform coding using the Discrete Cosine Transform (DCT). This has turned out to be a simple, yet effective algorithm in the image compression domain [3]. It is near-optimal in energy compaction and thus utilized in popular lossy image file formats such as JPEG [4]. Transform-coded images have a huge significance in the modern multimedia world. The DCT is used to compress photographs (JPEG) and movies (MPEG) and to encode low-bit-rate video-conferencing. The MPEG format is used in digital television transmission, as easily as the widely-popular DVD format [5]. The interaction between ratio pixels presents to be absent in color-quantized images; despite, mentioned images fixed assign the visible equalizes and have huge dependency in the adjoining pixels as consistent color images. Consequently, most methods [6, 7] follow a color re-indicant method to fix the lacking interaction between indexes, and then compress the re-indexed image using some traditional techniques such as DPCM and DCT.

Normally, color ratio is such that sequences of signs are assigned to perceptibly identical colors [6, 8]; when guessing lossless compression applied, an improved color counderpart range is to reduce the resulting auguring errors between ratios [7]. Several compression methods are again studied, like as simulated annealing algorithm [6], PM heuristic method [7] and YCP compression method [9] although the distinct color interaction and compression algorithms are used. They all endeavor to create a linear list procedure of the color of signs. The theory of continuous color refinement is initially received in [9] as a resolution clarification in Wavelet Coding. Dynamic coding of color signs refers to the reproduction of a fixed bit-stream so that the receipt of code routines can break off at any period to reach an useful compression of the authentic image with a restrain number of colors.

Quantization is a process technique used for display image, change the content, storage of images in Internet based applications, computer graphics and animation. But color quantization is another advanced technique with a digitalized of 8-bit resolution [10]. Therefore, each color image entails 24 bits to represent of color pixel on the screen. So, presently available monitors can display color with a circumscribed number of bits such as 8, 12,16 where each value is applied as an index into a tabular array of colors. The color code book is likewise practiced in many other image processing operations such as Color Contrast Enhancement, Detection of edge, Pseudo coloring [11]. The algorithms for color quantization method had been produced. The above algorithms can be separated into two processes (i) Image-dependent (ii) Image-independent. In this research paper, the researchers are working to design an image-independent color code books which can be utilized for both display and color image processing [11].

This paper is organized as follows; Section 1 presents the basic introduction of compression and its characters. The researcher makes a basic definition of color space and images. Section 2 reveals the literature review of the lossy compression in the color image quantization with technique and Section 3 gives the basic color image representation. Section 4 explains how Advanced Quantization Techniques proposed method implementations. Section 5 discusses the experimental results with comparison of different compression of color quantization images. The conclusion and future guidance are discussed in Section 6 and 7. The contribution of work discussed in Section 8.

2. Related Works:

Lossy compression methods, except when applied at minimum bit rates, suggest compression artifacts. An image reconstructed after acting Lossy compression consist of perversion relative to the original image. Often times this is due to Lossy compression scheme that completely discards redundant information. However, Lossy schemes are efficient of reaching very high compression. Lossy methods are particularly appropriate for legitimate test images such as photos in utilization where small (consistently undetectable) destruction of fidelity is adequate to reach a real degradation in bit rate. The lossy compression is obtained minimal variations can be assigned visually lossless [12]. Monochrome images are almost always input to a digital image processing as an arrangement of uniform-length binary code words. In the literature, the binary code is regularly called a Pulse Code Modulation (PCM) code. Because uniform-length code words are used for any image sample, the sum of amplitude quantization levels is eventful by the relationship

$$L = 2^{B} \tag{1}$$

Where B performs the sum of code bits allow to separate sample and L is the sum of Level Quantization[20].

In predictive coding, information is sent or available to use to conclude possible values, and the novelty is coded. After all, this is complete in the image or spatial domain, it is comparably uncomplicated to assign and is efficiently developing into local image aspect. The differential pulse code modulation is one distinct method of predictive coding. Transform coding, also the first transforms of images. Afterwards, its spatial domain model of the different types of image is testing certain popular transform as well as the codes reconstruct values (coefficients). This technique transfer a higher data compression related to divining methods, nevertheless the overhead of leading computational necessaries [12].

Many image compression algorithms have been suggested so far [13, 14]. The color quantization is one of the most dominant Lossy compression methods [15, 16]. The possible benefit of this algorithm from the perspective of the image receiver site is the lenience to reconstruct a quantized digital image. Usually, the color quantization tries to obtain an equal set of palette color that can be applied to map the original colors of a digital image [15]. The lossy image compression attains the modified capacity of the human perceptual system which is efficient of appropriate lesser thousand colors. Using the color quantization to RGB color image frame of size 640×480 pixels, the resulting image of 256 color palettes will be cut to only 307,456 bytes which is approximately one-third of the original image size. This causes the color quantization process fluently exploited in many applications, particularly in computer artwork and image processing.

The image is to be encoded that carry along with 256 colors, as well as the color quantization or devaluation algorithm must be approved with the illustration of data prior to the compression method. The mechanism of color quantization contains particularly dispose of colors from the image to lower the quantity of data. The selection technique can be random or it may be set beyond search equivalent repetition of the occurrence or the perceptive indication of the color image. The color choosing procedure element an enormous arrangement of control over the visible character of the quantized image [17].

The color contraction method appropriate to GIF compression is the reliable subdivision algorithm, it level the sum of colors in an image by constantly build up the depth steps that are convenient in respective of the red, green and blue color code channels [17]. Color quantization of color pictures with compression had researched extensively over the past two decades. Although color quantization can also be utilized as a means for image data compression, it is expedient to discuss color quantization in the context of frame buffer image display. The past few years, a lot of considerable research work has finished towards finding the color palette [18]. In geometric domain applying the RGB color cube approach, which is a deep, color space illustrative that employ by numerous advanced video output devices to develop color video output.

The RGB color histogram is the fundamental ways to group of color presentment. The three-dimensional RGB color histogram space is allot into properly spaced cubes (bins). As the image is scanned, the bin counts are incremented for any identical pixel. This is fast, as exclusively a single scan through the image is taken. This technique is usually cited to as the Histogram Population Method. [19] A very popular method for designing image dependent pallet is the Median Cut Algorithm. This algorithm invented by the author Heckbert.

The theory ensuring this algorithm is that any color within the color palette is consumed for performing almost the equal representation of pixels in the actual image [20]. Let us, consider a 24-bit image and compute the color histogram of the image. For a 24-bit image, there can be a maximum of 16 million different colors. A histogram with that many entries could be hard to manage. Hence, Heckbert proposed to "pre-quantized" the original image into a 15-bit representation by using a 5-bit uniform quantizier for each color channel. Hence there are 32,768 colors after this step. Whereas, the color histogram, the Median Cut Algorithm repeatedly subdivides the color cube within smaller and decreased rectangular boxes [21].

Popularity Algorithm builds the color code book by finding K most frequently appearing colors in the original image. The colors are stored via histogram. The K most frequently by occurring colors are extracted and they are contrived the entries with color table original image cannot be quantized [22]. The Variance-Based Algorithm (VBA) also divides the color space in rectangle boxes. Nevertheless, in VBA the box with the largest mean squared error is between colors with the corner. The reconstructed image could not compare to original image. From the above literature survey, the existing method of quantization with color image for compression is not sufficient to get more compression ratio as well as picture quality. To overwhelm the above said problem, it needs to produce and design a new proposal Advanced Quantization Technique Lossy compression algorithm for color image.

3. Color Image Representation:

The color image is represented by red, green, and blue used for tristimulus values or any sequential or random method of the tristimulus code. Assuming that the combination of tristimulus values is to be quantized unusually, the approbation of the code selects the quantization group order to get the related ordinary comparison as for a consistent image. The source image is executed by combinations of red, green and blue is modified to three factor are quantized. Besides, the quantized segment is transformed back to the original correlative model, enduring the quantized tristimulus values. The following Fig.1 shows the color image quantization model.

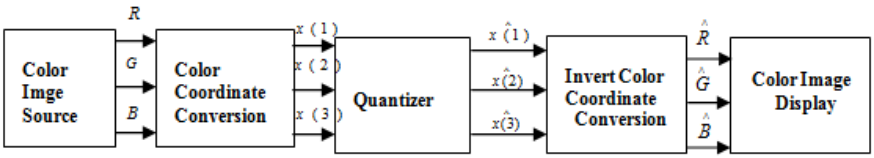

Fig. 1: Color Image Quantization Model

Which reveals completely partitions the color field of the color correlate x(1), x(2), x(3) into quantization cells and is defined a single color value to all colors within a cell. The most efficient of three color components x(1), x(2), x(3) should be quantized together. After all, the implementation considerations often dictate the independent quantization of the color components [21]. An $m \times n$ image of I is a grayscale vector method represent on a rectangular grid of pixels of $i \times j$, where is the row index $i, 0 \le i < m - 1$ and $j, 0 \le j < n - 1$ is the column index. The color of the pixel (I, j), indicate by I (I, j) proceeds values with RGB space of color. The color value of column vector is represented as $C = [r_i g_i b_i]$. The color quantization is sampling of the color space C which indicates the results in a discrete subset of N colors well-known as the color code book [22]. The original color image of each color component is defined by an 8-bit pixel. Thus, each pixel needs up to 24-bits of image storage unit. For a common display, the input value of the R,G,B and their visual intensities are combined through the non-linear similarity approximated as

$$I_r = r^{\gamma} \tag{2}$$

Where I_r is intensity, r is the display unit $\gamma \approx 2.3$ Therefore, all images are secure devices, to require for this nonlinear between the input primary and its luminance [23].

4. Proposed Method:

4.1 Theoretical Foundations:

Quantization is the sampled data by a finite number of levels based on the some criteria such as minimization of quantizer distortion. The quantizer design includes input decision levels and output representation of a number of levels . The following subsection describes the Advanced Quantization technique.

4.2 Advanced Quantization Technique:

A traditional or conventional lossy compression method is not suited when researcher applied it to color mapped images. This is due to most present coding schemes assuming that neighboring pixels have similar intensity levels. When processing a grayscale image, many operators can be defined in a natural fashion. The proposed approach takes two conversions such as an encoder and decoder. The proposed encoder gets sub block from the original image. The given input original image grayscale values may be in the range of 0 to 255. The total number of grayscale values in the image may be 256. Each grayscale value carries 8 bits to store the pixel of the image. The proposed Advanced Quantization Technique [AQT] converts the available 256 gray level group into 16 groups gray level value by dividing 16, thus reducing the number of bits needed to carry an image can be downplayed. For example, let us consider the following grayscale sub image.

$$\text{subimage} = \begin{bmatrix} 2 & 8 & 6 & 4 & 8 & 2 & 6 & 3 & 8 & 5 & 8 & 3 & 7 \\ 3 & 8 & 5 & 4 & 7 & 6 & 3 & 8 & 2 & 8 & 4 & 7 & 3 \\ 3 & 8 & 4 & 7 & 4 & 8 & 2 & 3 & 8 & 2 & 7 & 4 & 8 \\ 3 & 8 & 4 & 7 & 2 & 7 & 6 & 2 & 1 & 6 & 5 & 3 & 0 \\ 2 & 0 & 4 & 3 & 8 & 8 & 5 & 4 & 7 & 1 & 2 & 8 & 3 \end{bmatrix}$$

The above sub block image is having minimum gray value as 0 and maximum grayscale value as 8. The pixel needs to store 4 bits since sub block image maximum gray value is 8. The block should be compressed 4 bits to 2 bits per pixel (i.e.) N = 4 gray level group. The histogram for the above block is represented in Table 1 Histogram of sub blocks.

Table 1: Histogram Sub blocks

Gray	Frequencies
0	** (2)
1	** (2)
2	********* (9)
3	********** (11)
4	********* (9)
5	**** (4)
6	***** (5)
7	******** (8)
8	********** (15)

The total 65 pixels can be down to 4 gray levels, such as 0,1,2,3. The best ranges are indicated in Color Code Table.

Table 2: Color Code Table

Group	Gray value	Occurrences
Group 0	0,1,2	13
Group 1	3,4	20
Group 2	5,6	09
Group 3	7,8	23

The reconstructed sub image becomes by applying the Advanced Quantization Technique and replaces all 4-bit pixel value of 2-bit value. The effect of sub block is reorganized as bellow.

$$subimage = \begin{bmatrix} 0 & 3 & 2 & 1 & 3 & 0 & 2 & 1 & 3 & 2 & 3 & 1 & 3 \\ 1 & 3 & 2 & 1 & 3 & 2 & 1 & 3 & 0 & 3 & 1 & 3 & 1 \\ 1 & 3 & 1 & 3 & 1 & 3 & 0 & 1 & 3 & 0 & 3 & 1 & 3 \\ 1 & 3 & 1 & 3 & 0 & 3 & 2 & 0 & 2 & 2 & 2 & 1 & 0 \\ 0 & 0 & 1 & 1 & 3 & 3 & 2 & 1 & 0 & 0 & 0 & 3 & 1 \end{bmatrix}$$

An original sub image is represented with 4 bits since the maximum number is 8, so the total number of bits needs to store $= 5 \times 13 \times 4 = 260$ bits. Since, the reconstructed image is represented with 2 bits $= 5 \times 13 \times 2 = 130$ bits. In this above block, all pixels are reducing the 2 bits per pixels. The compression ratio is evaluated by equation 3.

$$\text{Compression Ratio} = \frac{\text{Original Size}}{\text{Reduced Size}} \tag{3}$$

4.3 Proposed Procedure:

The completed proposed AQT diagram for encoding and decoding is presented in Fig.2. In compression encoder is generated for each block. Similarly decoder is generated for the inverse of compression to get the original data. The proposed Encoding and Decoding algorithms can be described in the following subsection.

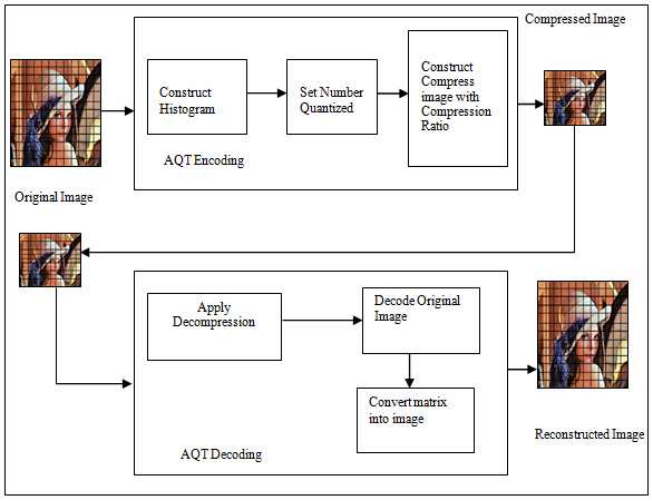

Fig. 2: Proposed AQT Diagram

4.4 Encoding Algorithm for Color Image:

Input : // Original Image
Output : // Compressed Image

Step 1 : Load any color image as input
Step 2 : Convert to the required size by reshape
Step 3 : Make component separation for Color image
Step 4 : Convert image elements to block grayscale value
Step 5 : Divide sub block and convert matrix format
Step 6 : Arrange the histogram based on pixel frequencies.
Step 7 : Divide the number of quantized images.
Step 8 : Apply AQT to the block image.
Step 9 : Construct compressed image
Step 10 : Repeat step 4 to step 9 for all components
Step 11 : Concatenate all components
Step 12 : Stop

4.5 Decoding Algorithm for Color Image:

Input : // Get compressed image
Output : // Reconstructed image

Step 1 : Get a compressed image with a number of quantized ranges.
Step 2 : Get the histogram table.
Step 3 : Divide into a number of non-overlapping blocks.
Step 4 : Apply reverse AQT to the histogram table.
Step 5 : Decode the compressed grayscale value to the original value.
Step 6 : Make the conversion matrix to an image.
Step 7 : Display the Reconstructed image.
Step 8 : Compare with quality measurement
Step 9 : Generate CR Table with other parameter quality
Step10 : Stop.

RESULTS AND DISCUSSION

5.1 Experimental Results:

The experiments are done are several color image databases to affirm the proposed AQT algorithm and it is made as far as execution time is concerned, the proposed AQT algorithm out classes all previously published gray quantization algorithm. Some of the sample images are loaded from different 24-bit color image. The proposed method separates and an individual component as it is stored in the original image. It is made as far as execution time is concerned; the proposed AQT algorithm outclasses all previously published gray quantization algorithm. Three color images such as, Lena, Mandrill, Pepper, each of 256 × 256 pixels are used as the cover images. The experiments are taken out within the different block size like 16 × 16, 32 × 32 to 256 × 256. The AQT algorithm which proposes in histogram based pixel classification of the whole image. For every set of test images is separated component such as red, green and blue. Unfortunately, the combination of three components for image concatenates to get the reconstructed images. In this paper, compression and decompression have been used along three different color pictures with different memory size. The Lena, Mandrill and Pepper images for compression and decompression are presented below Fig 3 (a), Fig 4 (a) and Fig 5 (a) indicates the sample original color as the input image. The corresponding experimental results of the proposed method for separated images for red component and reconstructed images are shown in Fig 3(b) to Fig 5(b). Similarly, Green component is shown in Fig 3(c) to Fig 5(c) and also Fig 3(d) to Fig 5(d) is shown in Blue component. Finally, Fig 3 (e) to Fig 5 (e) is represented separated images and reconstructed images respectively. The obtained decompressed images for all three input images resembles in the corresponding original images when the proposed method is applied to the input images. So the results proposed approach performs better than the other image compression technique.

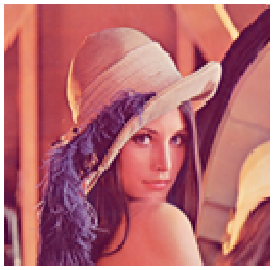

Fig. 3a: Original Image

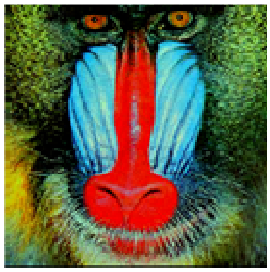

Fig. 4a: Original Image

Fig. 5a: Original Image

Fig. 3b: Red Component

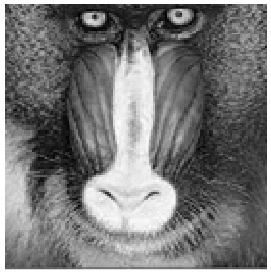

Fig. 4b: Red Component

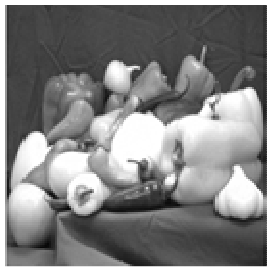

Fig. 5b: Red Component

Fig. 3c: Green Component

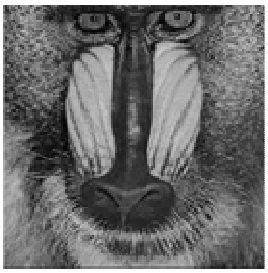

Fig. 4c: Green Component

Fig. 5c: Green Component

Fig. 3d: Blue Component

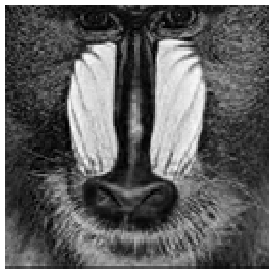

Fig. 4d: Blue Component

Fig. 5d: Blue Component

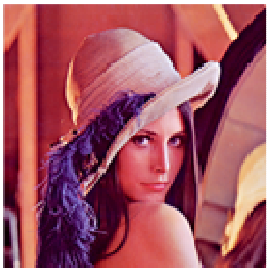

Fig. 3e: Reconstructed Image

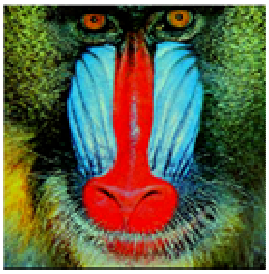

Fig. 4e: Reconstructed Image

Fig. 5e: Reconstructed Image

5.2 Performance Analysis of quality measurement:

An image quality of greater importance is given to sharpness rather than tone reproduction. Subjective image quality measurements are mean square error, PSNR, CR, Bit, Computation Time. When the quality of the images is considered indirectly by means of MSE, it is obvious that AQT has approximately equal degree of MSE. This is to pronounce, the MSEs of the following original Lena color image used with different block size like 16×16 to 256×256. The MSE is the cumulative squared error between the compressed and original image. The equation is defined as

$$MSE = \frac{1}{m \times n} \sum_{m=1}^{M} \sum_{n=1}^{N} [f(m,n) - g(m,n)]^2 \quad (4)$$

The PSNR is defined as

$$PSNR = 10 \times \log_{10} \left[\frac{255}{\sqrt{MSE}} \right] \quad (5)$$

The bit rate is defined as

$$BR = B/CR. \quad (6)$$

Where *B* is the number of bits per pixel of the uncompressed image and CR is the compression ratio. The three image quality parameter is implemented through MATLAB version 2013a.

Table 3: Quality Measurement for Lena Image

Block-Size	No.of Quantization	MSE	RMSE	PSNR	Original Size	Compression Size	CR	BR	CT
16× 16	16	268	16.49	15.46	4096	221	18.53	1.64	0.18
32× 32	32	142	11.91	21.41	8192	350	23.40	2.42	0.22
64× 64	64	80	08.94	28.52	16384	501	32.70	3.96	0.23
128× 128	128	52	07.21	35.36	65536	1523	43.03	4.89	0.26
256 ×256	256	42	6.48	39.35	261244	5012	52.12	5.02	0.30

In Table 3, the results are based on the original Lena test image data. Measurement of this table states the quality of the image which calculates Peak Signal to Noise Ratio, Mean Square Error, Compression Ratio, Bit Rate and Computation Time measurement of Lena image. It achieves the 256 color quantized image MSE value is 42 and PSNR value is 39.35. After execution of this process, it gives with fastest achievements in 0.18*ms* computation time.

Table 4: Quality Measurement for Mandrill Image

Block-Size	No.of Quantization	MSE	RMSE	PSNR	Original Size	Compression Size	CR	BR	CT
16× 16	16	652	25.53	9.98	4096	208	19.69	1.64	0.21
32× 32	32	335	18.30	13.93	8192	312	26.25	2.42	0.24
64× 64	64	121	11.00	23.18	16384	488	33.43	3.96	0.28
128× 128	128	83	9.11	27.99	65536	1420	46.15	4.89	0.32
256 ×256	256	51	7.14	35.71	261244	4788	54.56	5.02	0.39

The Table 4 shows the results of RMSE, PSNR, CR, BR and CT for Mandrill image. It is observed that the proposed method achieves minimum MSE values is 51 and maximum PSNR value is 35.71. At the same time compression ratio is gradually increasing while the quantization color increased. It is noted that the computation time for 256 bit color quantization is 0.39 whereas the block size 16 bit color quantization is 0.21*ms*.

Table 5: Quality Measurement for Pepper Image

Block-Size	No.of Quantization	MSE	RMSE	PSNR	Original Size	Compression Size	CR	BR	CT
16× 16	16	495	22.24	11.46	4096	198	20.68	1.64	0.13
32× 32	32	294	17.14	14.87	8192	278	29.46	2.42	0.22
64× 64	64	125	11.18	22.80	16384	462	35.46	3.96	0.26
128× 128	128	78	8.83	28.87	65536	1356	48.33	4.89	0.27
256 ×256	256	41	6.40	39.84	262144	4501	58.04	5.02	0.29

In order to analysis of quality measurement and time of CPU working with compressed and decompressed color image, it is evaluated some quality measurement parameter such as MSE and Computation time with a number of quantization level from 16 to 256. In Table 5, the results are presented with the original Pepper test

image data. It achieves the Quantization level 128 gets the Minimum MSE value 41 and the Compression ratio is 39.84. The execution time for compression and decompression for maximum bits of color quantization 256 and bits of color quantization 16 are 0.29ms and 0.19 *ms* respectively.

5.3 Comparative Studies:

Finally, Table 6 compares the MSE values within the existing methods to the proposed AQT. The existing method such as Center cut, Median-Cut, Variance based and Octtree are applied to the tested images [24]. The proposed methods achieve a minimum MSE value is used for evaluating the quantized error compared to other existing methods for different kinds of color image database with different quantization level. In computation time can be an analysis of the best achievements in 16, 32, 64, 128 and 256 color quantization of three different standard images like Lena, Mandrill and Pepper.

Table 6: MSE Comparison of Existing Methods with AQT

Image	No.of Quantization	Center-cut	Median cut	Variance based	Octtree	AQT
Lena	16	314	292	241	480	268
	32	199	164	138	274	142
	64	132	97	82	138	80
	128	82	59	52	84	52
	256	48	39	33	49	42
Mandrill	16	799	779	698	1194	652
	32	447	448	440	699	335
	64	278	282	270	384	121
	128	193	183	171	256	83
	256	129	119	109	158	51
Pepper	16	638	515	515	1068	495
	32	375	345	313	625	294
	64	264	234	158	319	125
	128	154	155	96	148	78
	256	103	99	63	102	41

Fig.6 shows the MSE value of comparative performance analysis of Lena image. In Fig.7 presents MSE value of Mandrill with existing methods. Fig.8, Pepper image compares MSE values of existing methods with proposed AQT methods.

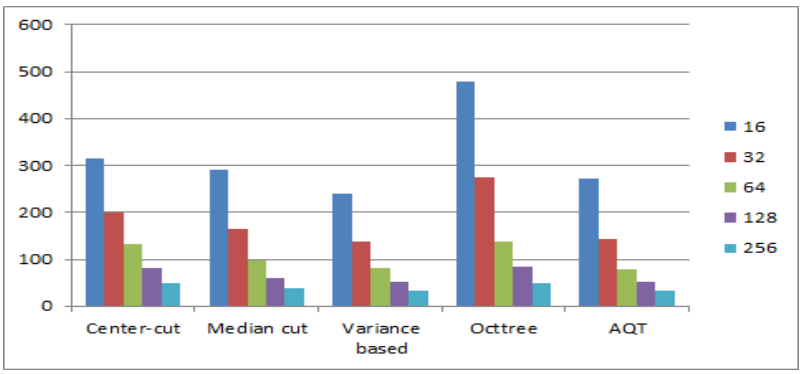

Fig. 6: MSE Comparisons Lena Image

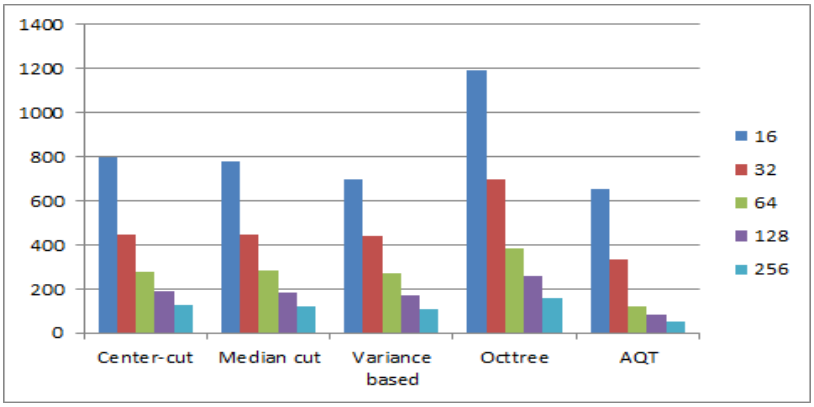

Fig. 7: MSE Comparison Mandrill Image

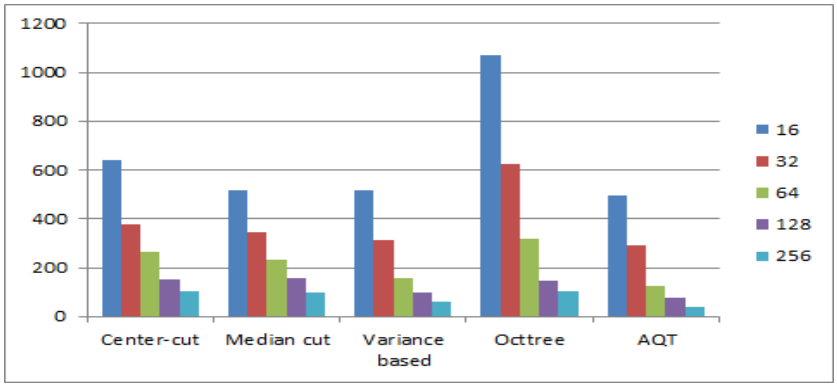

Fig. 8: MSE Comparison Pepper Image

Conclusion:

The merits of the proposed algorithm are the progressive coding of color pixel, so that the compression and decompression can recover the image with finer image quality. In this research paper, the different size of a color image is given to the proposed algorithm and contains the bit of quantization based on the input image. It is concluded that the Advanced Quantization Technique for compression and decompression gives a better compression ratio compared to the existing algorithm. The research proposed AQT work implements a reasonable compression ratio with high quality in the sense of information loss. If user considers time as one of the factors, time consuming is included computation time to execute the algorithm.

Future Work:

The proposed method AQT is better efficiency and quality, there are many ways to improve the proposed algorithm. The image compression is concerned with minimizing the number of bits required to represent an image. The application of compression is primarily in the transmission and storage of information. The compression covers broadcasting television, remote sensing, satellite, military communication, teleconferences, medical images, weather map, geological survey and so on. The lossy compression can be extended to the following areas,

1. The lossy compression uses the proper construction of neural network.
2. It extends video and audio images.
3. Extend to motion pictures framework.
4. Finally, it extends to the genetic algorithm.

Contributions:

The author's contribution had studied thoroughly prove the reviewed literature of a lossy compression algorithm using different types of technique. Those techniques are failing to get good reconstructed images. Since, the most of the information are loss in the compression. To rectify this issue, the authors develop Advanced Quantization Technique (AQT) to improve the quality of the reconstructed image. In this research work contribution, the AQT method presents a better compression ratio and implemented good quality of high resolution color image.

REFERENCES

1. Rashmita Sahoo Saranya, R., S. Raja Mohammad, 2014. Literature review on different compression techniques, International Journal of Application of Innovation in Engineering & Management, 3(9): 248-252.
2. Kitty Arora,Lukasz Ryszard Kizewski, 2014. Image Deblocking Using Local Segmentation, School of Computer Science and Software Engineering Monash University. Literature Review.
3. Prantl, Chou. J., M. Crouse, 1998. A simple algorithm for removing blocking artifacts in block-transform coded images, IEEE Signal Processing Letters, 5(2): 33-35.
4. Neha Minami, S., Zakhor, 1995. An optimization approach for removing blocking effects in transform coding, IEEE Transactions on Circuits and Systems for Video Technology, 5: 74-82.
5. Rao, K.R et al., 2014. Video coding standards: AVS China, H.264/MPEG-4 PART 10, Signals and Communication Technology, 37-50. DOI: 10.1007/978-94-007-6742-3_2.
6. Hadenfelt, A., K. Sayood, 1994. Compression of color mapped images, IEEE Trans. Geosci. Remote Sensing. 32: 534-541 doi: 10.1109/36.297972.
7. Mahmud Memon, N., A. Venkateswaran,1999. On ordering color maps for lossless predictive coding, IEEE Transactions on Image Processing, 5(1):1522-1527.

8. Zaccarin, A., B. Liu, 1993. A novel approach for coding color quantized images, IEEE Trans. on Image Processing, 2(4): 442-453.
9. Mahmud Rauschenbach, U., 2000. Compression of palletized images with progressive coding of the color information, SPIE Visual Communications and linage Processing.
10. Mamatha, A. Alain Tremeau, 2008. Color in Image and Video Processing: Most Recent Trends and Future Research Directions, EURASIP Journal on Image and Video Processing, 581371 doi:10.1155/2008/581371
11. Aleksandra Mojsilovic., 2001. Color Quantization and Processing by Fibonacci Lattices, IEEE Transaction on Image Processing, 10(11): 1712-1725.
12. Mohmud Hasan, Kamruddin Md.Nur., 2012. Computational Complexity Reduction of JPEG images, International Journal of Scientific & Technology Research, 1(4): 71-75.
13. Heckbert, P., 1982. Color Image Quantization for Frame Buffer Display, ACM Comput.Graph, 3: 297-307.
14. Weidong Kou., 1995. Digital Image Compression: Algorithms and Standards, Springer US. doi:10.1109/ICICT.2011.5983563.
15. Scheunders, P., 1997. A Comparison of Clustering Algorithms Applied to Color Image Quantization, Pattern Recognition Letters, 18: 1379-84.
16. Sirisathikula, Y et al., 2004. Colour Image Quantization Using Adjacent Colors Line Segment, Pattern Recognition Letters, 25: 1025-43.
17. Cheng, S.C and C.K. Tang, 2011. A Fast and Novel Technique for Color Quantization Using Reduction of Color Space Dimensionality, Pattern Recognition Letters, 22: 845-56.
18. Zihigang Xiang.,1997. Color Image Quantization by Minimizing the Maximum Intercluster Distance, ACM Transactions on Graphics, 16(3): 260-276.
19. Qiu, G.,1998. Coding Colour Quantized Images by Local Colour Quantization. The Sixth Color Imaging Conference. Color Science Systems and Applications, pp: 205-208.
20. Emre Celebi. M., 2011. Improving the Performance of K-Means for Color Quantization, Image and Vision Computing, 29: 260-271,doi:10.1016/j.imavis.2010.10.002.
21. William, K., Pratt., 2007. Digital Image Processing. PIKS.
22. Heena., 2011. Color Image Quantization Based on Euclidean Distance Using Bacteria Foraging Optimization, International Journal of Electronics and Computer Science Engineering, 25(7): 0975-8887.
23. Orchard, M.T., C.A. Bouman, 1991. Color quantization of images, IEEE Transaction on Signal Processing, 39: 2677-2689.
24. Sirisathitkul, Y et al., 2004. Color image quantization using distances between adjacent colors along the color axis with highest color variance, Pattern Recognition Letters, 25: 1025-1043.
25. Hemalatha, M., 2016. A Thorough Survey on Lossy Image Compression Techniques,International Journal of Applied Engineering Research, 11(5): 3326-3329.