HYBRID JPEG COMPRESSION USING COLOR BASED SEGMENTATION

A.M.Raid[1], W.M.Khedr[2], M. A. El-dosuky[1] and Wesam Ahmed[1]

[1] Mansoura University, Faculty of Computer Science and Information System
[2] Zagazig University, Faculty of Science,Egypt

ABSTRACT

We cannot operate the whole image directly in some applications like image recognition or image compression because it is inefficient method. Therefore, before recognition or compression, many image segmentation algorithms were suggested to segment an image. Image segmentation operation is to rate or cluster an image into many regions depending on the feature of image. A hybrid image compression algorithm is suggested in this paper which segments the image into background and foreground parts and after that compresses the foreground image by using DCT technique. The foreground image is provided more importance than the background region. The color based segmentation method is used to segment image. The observed parameters are compression ratio (CR), mean square error (MSE), and peak signal to noise ratio (PSNR). The goal is to maximize the CR while preserving images' information. The foreground image has a good quality in this the proposed hybrid method.

KEYWORDS

Image Compression, JPEG, DCT , Color Based Segmentation.

1.INTRODUCTION

Image compression used to encode the original image with small number of bits. Reducing the image redundancy and storing or transmitting data in a good format are achieved by the image compression. many techniques can be used to compress the images to lessen their storage sizes and using a smaller space. [1][2]

There are two methods to class compression algorithms .

- Lossy Compression System
  the loss of information when data is compressed is referred to lossy compression .[3]

- Lossless compression system
  the original data can be returned exactly from the compressed data in lossless image compression algorithm. [4][5]
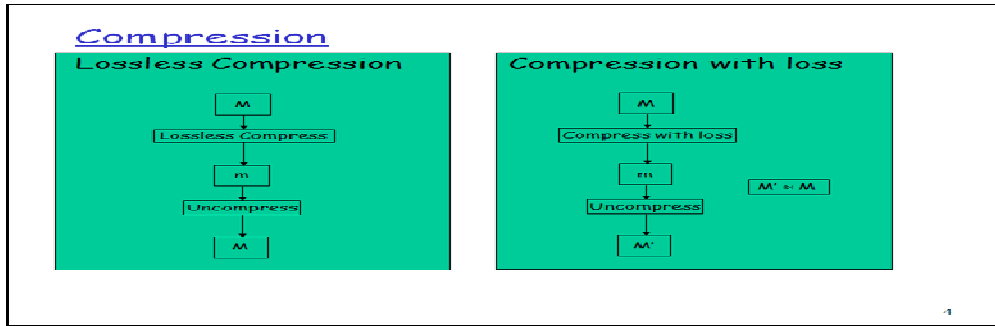
Figure 1: Lossy and Lossless compression

Image segmentation is useful in many applications . The regions of interest in a view are identified in it. There are many segmentation algorithms such as region-based segmentation, color based segmentation, data clustering, and edge-base segmentation. [6][7]

This paper focuses on hybrid image compression system which combines the advantages of color based segmentation and after that using DCT method to enhance the compression technique and achieve better quality reconstructed image with higher compression ratio.

1.1 Performance Criteria in Image Compression

The performance can be evaluated by using the following two major criteria: the Compression ratio (CR) and the quality measurement of the reconstructed image (PSNR). [8]

(a) Compression ratio

$$CR = n1/n2$$

(1)

(b) Distortion measure

$$MSE = \frac{1}{HW} \sum_{i=1}^{H} \sum_{j=1}^{W} [X(i,j) - Y(i,j)]^2$$

(2)

- PSNR is a widely used quality measurement in the image compression field.

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$$PSNR = 10 \log_{10} \frac{255^2}{MSE} (dB)$$

(3)

1.2 JPEG Process Steps for color images

This section presents jpeg compression steps
- – The first step is converted from RGB color space to YCbCr color space conversion
- – Original image is separated into blocks of 8 x 8 image pixels.
- – The DCT labors left to right, top to bottom thereby it is applied to each block.
- – Each block is compressed through quantization.
- – Quantized matrix is entropy encoded.
- – Compressed image is reconstructed through reverse process. the inverse Discrete Cosine Transform (IDCT) is used in this process. [9][10]

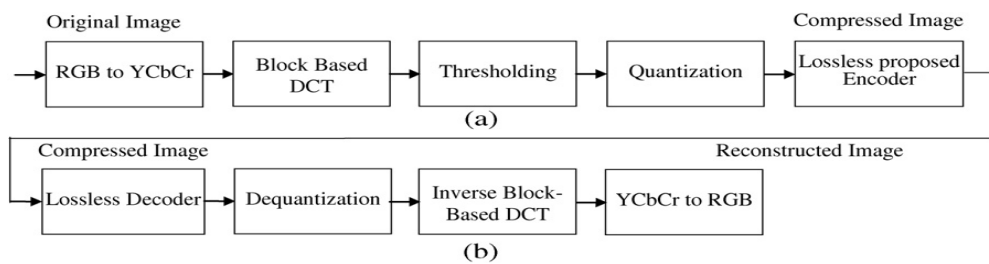Figure 2. demonstrates the diagrams of encoder and decoder in colour images.

Figure 2. Compression algorithm scheme: (a) compression step and (b) decompression step

2.RELATED WORK

A.M.Raid et al, studied color jpeg image compression using DCT method with Huffman encoding . all the steps of color jpeg compression algorithm is covered in this paper . all the components of color jpeg image compression are described . [11]

Charles F. Hall, presented a Hybrid Image Compression Technique depended on many studies that have offered that, the presence of edges plays the role to overall subjective quality of the image .[12]

S. W .Hong and P. Bao, a new hybrid image compression model depended on edge -preserving regularization and subband coding was explained. The idea was the image restoration technique and the lossy image compression schemes are incorporated. [13]

W.Khan, presented many image segmentation methods, reforms them and shows the issues connected to those methods. After the analysis of many image segmentation methods, it is noticed that a hybrid solution for image segmentation composes of two or more methods is being the best way to solve the image segmentation problem.[14]

3.PROPOSED HYBRID IMAGE COMPRESSION METHOD

This hybrid image compression method is suggested in this paper used to segment the image and after that compress the foreground part and this method is unknown. The foreground of the image is given more importance than the background because the fields of computer vision and image

processing where an image's foreground is extracted for further processing (compression , object recognition). There are many objects such as (humans, text , cars) its foreground region is more than its background region. [15][16]

the compression ratio value is increased and a desired high quality compressed image is produced by this Hybrid method . The segmentation process of input image into background and foreground regions consists of many steps: the first step : open an image in the Color Thresholder application. When we first open the app and choose the color space YCBCR to use to represent the color components of the image. We do a primary segmentation process using color selection and then iterate that segmentation process using color component controls. After we finish the segmentation steps, like making a mask image, saving a segmented version of the original image @ matlab 2014 . [17][18][19]

The hybrid algorithm consist of many steps :

1. Input the image to be compressed.
2. the input image is segmented into background and foreground areas .
3. Subdivide the input image into 8x8 blocks.
4. Find the DCT coefficients for each block.
5. the DCT coefficients are Quantized by the quantization table.
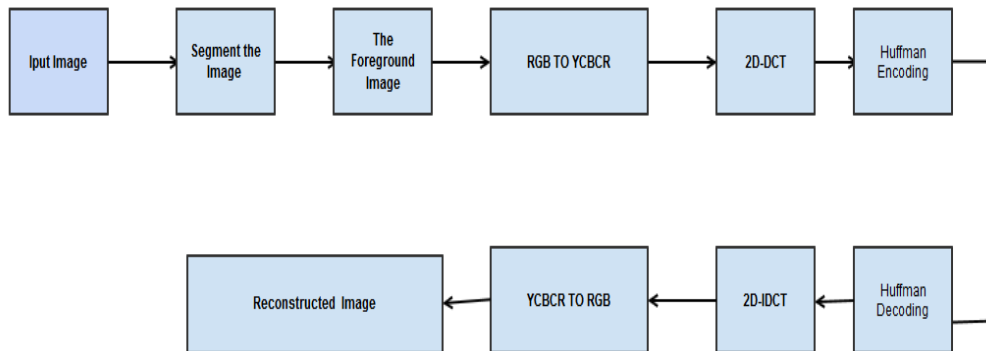6. Compress remaining quantized values by Entropy Encoder.

Figure 3: Hybrid algorithm coding /decoding diagram

4.SIMULATED RESULTS

We stratified the hybrid method on the lena image. The input image file is used in JPEG format. 512*512 pixels is the size of Lena image. The compression ratio and the calculated PSNR and MSE values determined for the image Lena in table 1.

Figure 4. Original image

Figure 5. Reconstructed Image using segmentation +DCT

Figure 6. Reconstructed Image using DCT

Table 1. Performance evaluation of color based segmentation + dct algorithm

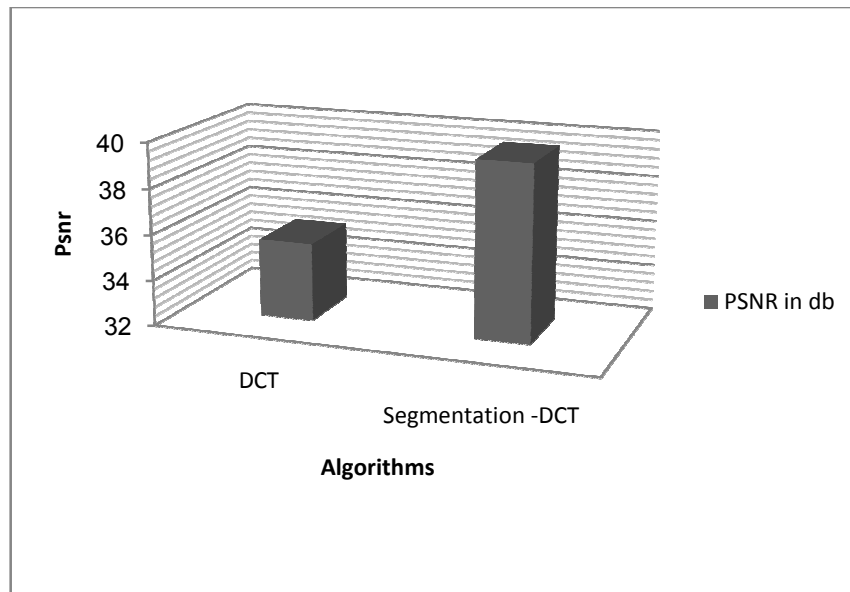| Technique	CR	PSNR(dB)	MSE
Segmentation-DCT	23.1025	39.6553	7.0396
DCT	21.047	35.418	18.675

Figure 7: Graph shows PSNR of the algorithms in Lena image

5. CONCLUSION & FUTURE WORK

The Hybrid method gives a good compression ratio and PSNR values and produces a desired high quality compressed image. The Hybrid method gives a compression ratio value better than DCT method. The quality image of Hybrid method is better than quality image of DCT method.we can use this Hybrid method in the images of larger inconsequential background and certain standard of loss is accepted in the background of the image. This hybrid method will help the images where the background area is not important.

In the future work we will use JPEG 2000 in image compression techniques because the JPEG-2000 standard will contain several modern features.

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