Review of Compression Method for Multimedia Database Using DCT

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Abstract: **The concepts of image compression are explained using the mathematical equations of DCT. The analysis of JPEG standard is based on discrete cosine transforms (DCT). In the JPEG standard, DCT played the important role of separating information by using different frequencies. The Compression was achieved through quantization and coding. Image compression is a technique by which the amount of data required to represent a digital image is reduces and hence this can minimize such type of problems. JPEG image format is based on Discrete Cosine Transformation (DCT), quantization and encoding process. Enhancing the efficiency of JPEG is hardly to develop the algorithm of quantization and coding. Finally, the JPEG compression encoder established, and the performance of compressed image presented.**

Keywords: **DCT, JPEG, Compression, Encoder.**

I.   INTRODUCTION

Image compression is technique that can minimize the size of a graphics file in bytes without compromising the quality of the image. The reduced file size allows more images can be stored in a specified amount of disk or memory space. With the rapid growth of computer applications, needs large storing space and hence we explore such an efficient ways of storing large amounts of data. For example, any web page or online record that uses dozens of images will more to be expected to use some form of image compression to store those images in an efficient way [1]. This is for the reason that the amount of space required holding massive collection of images can be prohibitively large in terms of cost [1]. Fortunately, there are several methods of image compression available now. These falls into two general categories: lossless and lossy image compression. The JPEG process is a broadly used form of   lossy image compression that center around the Discrete Cosine Transform .The DCT works on whole image as by separating images into parts of differing frequencies by using a step called quantization, where fraction of compression essentially occurs, the less essential frequencies are discarded, hence the use of the term "lossy." Then, only the most important frequencies that remain are used retrieve the image in the decompression process. As a result, reconstructed of images contain some distortion; but as will see soon that these levels of distortion can be adjusted during the various compression stages. The JPEG method is used for both color and black-and-white images, but the focus will be on compression.

II.   BRIEF LITERATURE SURVEY

DCT was firstly proposed in 1974, and the first time that DCT was applied in image compression was in 1984.Because of its superior decorrelation and energy compaction properties, the joint ISO committee adopts the DCT in the JPEG international compression standard, which is also the first compression standard for continuous tone still images. There are three purposes in image coding, known as image compression: in which firstly, compress the image for limitation of storage; secondly, reduce the amount of information for transmission; at last, remove redundant information for preparation of pattern recognition [2]. In JPEG standard, two compression techniques are defined as lossy compression

and lossless compression. The process, which is based on DCT, is lossy compression. High compression could be achieved by lossy compression. Furthermore the vision effect of the reconstruction image from the process of decoder is similar with that of original image Meanwhile, there are extending processing coding methods based the basic DCT sequence processing.. The basic JPEG encoder method was defined in JPEG standard is composed with three procedures: image transform, quantitative and coding. The procedures of decoder including inverse transform quantitative and decoding, are inverse processing compared with that of encoder.

III.   PROBLEM FORMULATION

1. The DCT Equation:

The DCT transforms the data from the spatial domain to the frequency domain. The spatial domain that shows the amplitude of the color as move through the space. The frequency domain shows that the amplitude of the color is changing from one pixel to the next in an image file.

$$D\ (i,j) = \frac{1}{4} C(i)C(j) \sum_{x=0}^{7} \Sigma_{y=0}^{7}\ P(x,y)\ Cos\left[\frac{(2x+1)ix}{16}\right] Cos\left[\frac{(2y+1)jx}{16}\right]$$

$$C(u) = \begin{cases} \frac{1}{\sqrt{2}} & if\ u = 0 \\ 1 & if\ u > 0 \end{cases}$$

$$D\ (i,j) = \frac{1}{\sqrt{2N}} C(i)C(j) \sum_{x=0}^{N-1} \Sigma_{y=0}^{N-1}\ P(x,y)\ Cos\left[\frac{(2x+1)i\pi}{2N}\right] Cos\left[\frac{(2y+1)j\pi}{2N}\right]$$

2. Quantization:

Quantization process involves dividing each coefficient by an integer value between 1 to 255 and round off. The quantization table is chosen to reduce the precision of each coefficient to not more than necessary. The quantization table is carry along with the compressed file.

3. Zigzag:

In this process the coefficients are arrange in order of increasing frequency. The high frequency coefficients are more expected to be 0 after quantization process. This improves the compression of run-length encoding. Now both run-length encoding and Huffman coding can be used.

4. Run-length Coding:

Repeated occurrence of the same character is called a run. Number of repetition is called the length of the run. It is an technique that used for encoding.
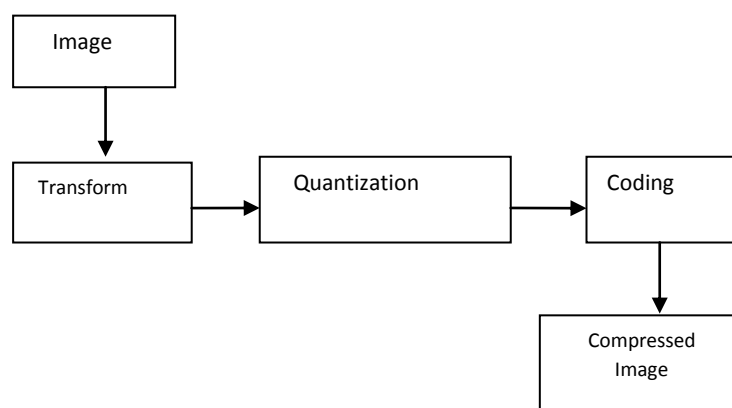

Figure1. JPEG Image Compression

IV.   OBJECTIVE

The most of the compression techniques are used to compress image for storage and transmission of the image. Some of the efficient techniques are used for the better performances which are based on DCT image compression .JPEG compression algorithm uses the Discrete Cosine Transform (DCT). Many image data are usually archived and transmitted in the compressed form, for example, JPEG traditionally, firstly fully decompress the manipulating JPEG image. Because the traditional method is not efficient it cannot satisfy the requirements of real-time system. So there is need of studying the technology of image processing based on DCT compressed domain.

V.   PROPOSED METHOD

The following is a general overview of the JPEG image compression process using dct [6]. Later, describe the JPEG's method in detailed, the more broad understanding of the process may be acquired:

1. The image is broken into 8x8 blocks of pixels.
2. It Works from left most corners to right most; top to bottom, the DCT can be applied to each block of image.
3. Each block is compressed by performing quantization process.
4. The collection of compressed blocks that represent the image is stored in a hugely reduced amount of space.

After the above process, finally the image is reconstructed through decompression, for that Inverse Discrete Cosine Transform (IDCT) process used.

VI.   EXPECTED OUTCOMES OF PROPOSED WORK

The jpeg compression based on DCT is complimentary approach for reducing the overall time complexity. The jpeg compressed data is in greatly reduced form as compared to the original data, so it is useful for improving the efficiency of the system [3]. A few of compression algorithm, to a certain extent, meets the demand of the analysis and processing of the jpeg image data [3]. The compressed data is widely used for the better storage and efficient transmission of the multimedia data. Therefore, image processing technology based on compression technique will be applied in more areas. This technique of compression will provide the better results and performance.

VII.   CONCLUSION

The JPEG is one of the broadly used image compression standard, this paper analysed the main procedures of encoding based on JPEG standard procedure [5]. DCT have a property that it can decompose the image into different frequencies components so that the concept of compression could be achieved. Then the redundant information with high frequency in an image could be removed by quantization or encoding procedure. It means that DCT is work as the foundation of compression in JPEG format of lossy compression technique [5]. With the increases of compression ratio could caused the losses of more information, Therefore fast DCT algorithms contribute to high Encoding efficiency although coding procedure and quantization are hardly to preserve the resources of processors[5].

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