CBIC: A Novel Image compression Algorithm

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Abstract: At present lot of image compression standards have been developed by companies and researchers. In this paper, we discuss some image compression standards for still images that are popular in the recent years. The methods are JPEG, JPEG-LS, JBIG2, GIF, LZ77, PNG, HD Photo, TIFF and FIC. All the above methods have its own advantages and disadvantages. We introduce the new compression method 'CBIC to overcome the above disadvantages and ultimately consume very less memory. A new algorithm is developed and implemented.

Key words: JPEG2000, JPEG-LS, JBIC2, GIF, LZ77, PNG, HD, TIFF and FIC.

I. INTRODUCTION

In the early 1990s, a number of new image compression algorithms such as CREW (Compression with Reversible Embedded Wavelets) and EZW (Embedded Zero free Wavelets) emerged to provide not only compression performance, but also a new set of factors unseen before. In march 1997 a call for technical contributions was issued, the first evaluation, is performed in November 1997 in Sydney, Australia, where 24 algorithms were submitted and evaluated. Based on evaluation, it was decided to create a JPEG 2000 "Verification Model" (VM) which could lead to a reference implementation for the following standard process. The first VM (VM0) is based on the Wavelet/Trellis coded Quantization (WTCQ) algorithm submitted by SAIC and the University of Arizona. At the November 1998 meeting, the algorithm EBCOT (Embedded Block Coding with Optimized Truncation) was adopted into VM 3, and the entire VM software was re-implemented in an object oriented manner. The document describing the basic JPEG 2000 decoder (Part I) reached "Committed Draft" (CD) status in December 1999, JPEG 2000 finally became in "International Standard" (IS) in December 2000.

Issues with JPEG. The JPEG standard is still the most popular standard for storing images an web servers and the resolution at which images are compressed using the standard is acceptable for application such as web browsing. These are the issues with JPEG image compression standard. No lossless compression option, Decoupling of images, Block effects , Edge effects and Global transformations. There are some other features and enhancements of the JPEG image compression standard. Better compression, Progressive Signal transmission, Tilling, Regions of interest, Larger image size and Multiple channels. The JPEG image compression standard consists of four basic steps in the algorithm are i) Preprocess ii)Transformation iii)Quantization iv)Encoding.

We first presented overview of the development of JPEG in section 1. In section 2, we give the overview of the existing methods. In section 3, we discuss the novel image compression algorithm "CBIC" how the algorithm is generated and implemented. Section 4 the results are verified. Conclusion and future enhancements are discussed in section 5.

II. REVIEW OF LITERATURE

A. GIF

The Graphics Interchange Format (GIF) is a bitmap image format it was introduced by CompuServe in 1987 and has since come into widespread usage on the world wide web due to its wide support and portability. This format supports up to 8 bits per pixel for each image, allowing a single image to reference its own palette of up to 256 different colors chosen from the 24-bit RGB color space, it also supports animation and allows a separate palette or up to 256 colors for each frame. These palette limitations make the GIF format less suitable for reproducing color photographic and their images with continuous color, but it is well suited for simpler images such as graphics or loss

631

with solid areas of color. Gif's are suitable for sharp-edged line are with a limited number of colors. Gif's may be used to store low-color sprite data for images. Gif's can be used for small animations and low-resolution film clips. Gif's are commonly used as a medium for humorous effect.

GIF is an image file format commonly used for images on the web and sprites in software programs. Unlike the JPEG image format, GIF'S uses lossless compression that does not degrade the quality of the image. However, GIFs store image data using indexed color, meaning each image can include a maximum of 256 colors. GIF is still a popular image format on the interest because image size is relatively small compared to other image compression types.

Pros:

Can support transparency, can do small animation, "Lossless" quality- they contain the same amount of quality as the original, except it only now has 256 colors. Greater for images with limited colors, or with flat regions

of color.

Cons:

Only supports 256 colors. It is the oldest format in the web, having existed since 1989. It has not been updated since and sometimes, the file size is larger than PNG.

B. BMP

BMP (Bitmap) is a bitmapped graphics format used internally by the Microsoft windows graphics subsystem(GDI), and used commonly as as simple graphics file format on that platform. It is an uncompressed format. Bitmaps are defined as a regular rectangular mesh of cells called pixels, each pixel containing a color value. They are characterized by only two parameters, the number of pixels and the information content per pixel. There are other attributes that are applied to bitmaps but they are derivatives of there are two fundamental properties. These files are large and uncompressed, but the images are rich in color, high in quality, simple and compatible in all windows OS and programs.

Pros:

Works well with most windows programs and OS, you can use it as windows wallpaper.

Cons:

Does not scale or compress well. Again, very huge image files making it not web friendly.

No real advantage over other image formats.

C. TIFF

TIFF (Tagged Image File Format) is a file format for mainly storing images, including photographs and line art. It is one of the most popular and flexible of the current public domain raster file formats. Originally created by the company Aldus jointly with Microsoft, for use with PostScript Printing, TIFF is a popular format for high color depth images, along with JPEG and PNG. TIFF format is widely supported by image-manipulation applications, and by scanning, faxing, word processing, optical character recognition and other applications. It is a graphics file format created in the 1980s to be the standard image format across multiple computer platforms. The TIFF format can handle color depths ranging from 1 bit to 24 bit. Since the original TIFF standard was introduced, people have been making many small improvements to the format, so there are now around 50 variations of the TIFF format. So much for a universal format. TIFF is a popular among common users but has gained recognition in the graphic design publishing and photography industry.

Pros:

Very flexible format, it supports several types of compression like JPEG, LZW, ZIP

High quality image format, all color and data information are stored.

TIFF format can now be saved with layers.

Cons:

Very large file size transfer time, huge disk space consumption, and slow loading time.

D. PNG

PNG (Portable Network Graphics) is a file format for image compression that in time, is expected to replace the graphics interchange format(GIF) that is widely used on today's internet. Owned by Unisys, he GIF format and its usage in image-handling software involves licensing or other legal considerations. The PNG format , on the other hand, was developed by an internet committee expressly to be paten-free. It provides a number of improvements over the GIF format. Like a GIF, a PNG file is compressed in lossless fashion. A |PNG file is note intended to replace the JPEG format, which is "lossy" but lets the create make a trade-ff between file size and image quality when the image is compressed. Typically, an image in a PNG file can be 10 to 30% more compressed than in a GIF format.

Pros:

Lossless, so it does not lose quality and detail after image compression.

In a lot ways better than GIF, To start, PNG often created smaller files sizes than Gif

Cons:

Not good for large images, because they tend to generate a very large file, sometimes creating large files than JPEG.

Unlike GIF however, it cannot be animated.

Not all web browsers can support PNG.

III. PROPOSED CBIC ALGORITHM

CBIC stands for Cell Based Image Compression method. Our proposed method consume less memory compare to all the above five compression methods. The compression process of CBIC may broadly divided into four parts.

1. Input the image
2. Preprocess
3. Compression
4. Output the image

The first step of our CBIC's compression algorithm is used for getting the image. Step 2 we start to the resize the image as 256 X 256, then stored as a BMP file. The entire image is divided into 2 X 2 Cells. In Step 3 we find the mean of the above cell, finally the average cell values are stored in the respective cells. In Step 4 we get the compressed image.

The Decompression process of CBIC may broadly divided into four parts.

1. Input the compressed image
2. Decompress
3. Post process
4. Output the image

In step 1 we input the compressed image, in step 2 take the 1st pixel, then enlarge the image to 2 X 2 pixel. In Post process, the resize of the entire image into 256 X 256 and finally we are getting the Decompressed image is our output.

Algorithm for CBIC

Compression Algorithm

Step 1: Input the image
Step 2: Preprocess
    Step 2.1: Resize the image as
        256x 256.
    Step 2.2: Restored as BMP
    Step 2.3: The image is converted
        as 2 X 2 cells
Step 3: Compression (for all 2x2 cells)

    Step 3.1: Read the 2 x 2 Cell.
    Step3.2: Find the mean of the
        cell
    Step3.3: The mean value is stored instead
        of the cell.
Step 4: Output the Compressed image
Step 5: End

Decompression Algorithm

Step 1: Input the Compressed image.
Step 2. Decompression (for all pixels)
    Step 6.1: Read the pixel
    Step 6.2: Create a Cell (2x2) with content
        as mean Value in the pixel.
Step 3: Post Process
    Step 3.1 Resize to 256 X 256
Step 4: Output the Decompressed image.
Step 5: End

IV. RESULTS AND DISCUSSION

The CBIC method was implemented in Matlab, version 2013.

The following five images are taken as input and the size of the images after compression is tabulated below.
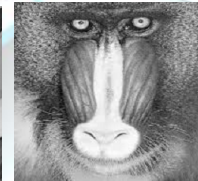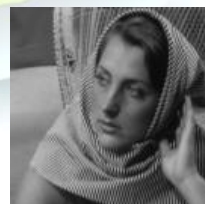

Fig.1

Fig.2

Fig.3

Fig. 4

633

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Fig. 5

NAME	BMP	GIF	JPEG	PNG	TIFF	CBIC
Fig. 1	65.0	66.4	22.8	49.7	75.9	17.0
Fig. 2	65.0	72.3	29.5	53.8	76.7	17.0
Fig. 3	65.0	72.7	25.7	54.9	76.4	17.0
Fig. 4	65.0	50.7	19.6	41.8	75.7	17.0
Fig. 5	65.0	69.2	27.0	51.6	75.8	17.0

V. CONCLUSION

From the above results and discussions it is evident that the proposed cell based image compression method out performs the existing methods. The size of the image is reduced nearly one fifth than that of the original image. We conclude that the proposed CBIC method is very promising for image compression.

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