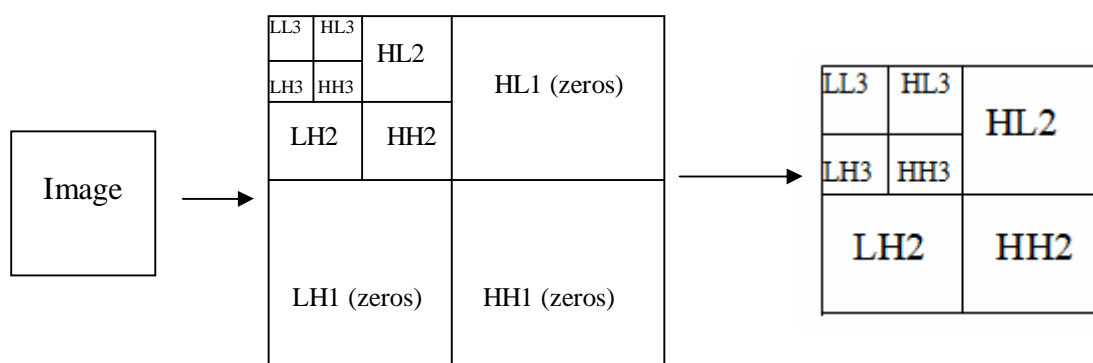


Hybrid Color Image Compression Technique by using Discrete Wavelet Transform and Discrete Cosine Transform

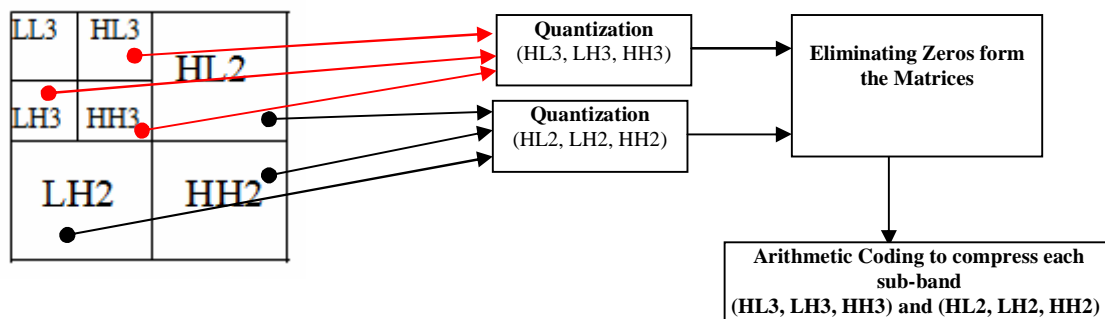
Color Image Compression 2011

This technique is using for color image compression, this new technique Hybrid between Discrete Wavelet Transform and Discrete Cosine Transform.

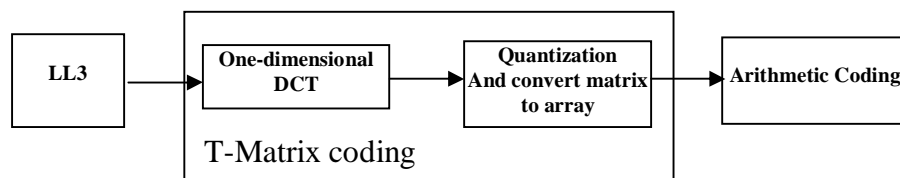
The following Figure-(a, b, c) illustrates CIC2011 technique



(a) First step; Transform image by using three level Discrete Wavelet Transform



(b) Second step; quantization and eliminate zeros form each sub-band, and then compress each sub-band by Arithmetic Coding



(c) Third step; compress LL3 sub-band by using T-Matrix Coding.

Figure - (a, b, c), complete steps for CIC2011 image compression technique

Implementation in MATLAB

1 - Compress color images

Before writing your program, you must download the following functions from the *MathWork* website:

- "Arith_Code.m"
- "TransformDCT.m"

The above two functions are used in CIC2011 approach, you can download it from:

MathWork --> Author --> Mohammed Siddeq

Then copy "Arith_Code.m" and "TransformDCT.m" in the same folder "CIC2011", finally you can write your program to compress color images, in MATLAB language:

```
Im = imread('C:\images\image2.bmp');
Quantize=[0.05, 0.2, 0.2];
Data=Code_Color_Image_DWT_DCT(Im,Quantize,'c:\comp.CIC','db5');
```

"Im" :- represents color image RGB from the path 'C:\images\image2.bmp'

"Quantize":- quantization values in range [0.01 - 0.5], for each layer (R. G. B.). In the quantization step always using values between [0.01 - 0.05], for first layer, while for the second and third layers, can use more than 0.05. These factors are used for decreasing maximum values at each layer if the quantization values increased the image will be degraded or damaged. For this reasons we always are using small values. For obtains good image qualities, and good compression. See the following proposed quantization:-

Quantize=[0.01, 0.1, 0.1] (Very good image quality) , (Good compression)

Quantize=[0.05, 0.1, 0.1] (Good image quality) , (Good compression)

Quantize=[0.05, 0.2, 0.2] (Good image quality) , (Good compression)

Quantize=[0.1, 0.2, 0.3] (bad image quality) , (Good compression)

Quantize=[0.1, 0.3, 0.4] (bad image quality) , (Very Good compression)

"Code_Color_Image_DWT_DCT(Im,Quantize,'c:\comp.CIC','db5');"

This function is used for compress the color image "Im", and store the compressed image in the file "comp.CIC", and in same time the output of this function is stored in value "Data", this value contains details information about compressed image file. The researcher/programmer can use it later in another operation like Encryption or Hiding data ... etc.

The user can change the wavelet name "db5", to any type of wavelet method.

See the file "test_Compress_Color.m" to run your program

Good Luck

2 - Decompress color images

After compressing your color image, now you need for decompression technique, the following program is used for decompression color images:

```
DeIM=Decode_Color_Image_DWT_DCT('c:\comp.CIC');
imshow(uint8(DeIM));
imwrite(uint8(DeIM),'c:\test.bmp');
```

Before writing your program, you must download the following functions from the *MathWork* website:

- "Arith_Decode.m"
- "InverseDCT.m"

The above two functions are used in CIC2011 approach, you can download it from:

MathWork --> Author --> Mohammed Siddeq

Then copy "Arith_Deode.m" and "InverseDCT.m" in the same folder that contains all function for CIC2011, finally you can write your program for decompress image

"**Decode_Color_Image_DWT_DCT('c:\comp.CIC')**" :- this function is using for read compressed data from the file "**comp.CIC**" for decompress RGB color image, and stored the decompressed image in "**DeIM**", the researcher/programmer can show and save the RGB image in a disk by using "**imshow**" and "**imwrite**", these two functions are built-in at MATLAB language.

See the file "**test_Decompress_Color.m**" to run your program

Good Luck

4- Gray level image Compression / Decompression

Maybe researchers / programmers are working on gray level image compression; CIC2011 is also working on the gray level images. Because the base of the color images is gray level layers, the following functions show for you how CIC2011 working on gray level images:

```
"H=Image_code_DWT_DCT(Im,Factor,Save_Path,Wave_Name)"
```

For more details see inside the above function. The following example in MATLAB show for you how gray level image compression working:

Example -1-

```
Im = imread('C:\images\Gray1.bmp');  
Header=Image_code_DWT_DCT(Im,0.05,'C:\images\code1.CIC','db3');
```

-Note The output from the above function is "**Header**", and save the compressed data in a file. The header is containing more details information about compressed file, may be the researchers/programmers can use it in different applications (Encryption, Hiding data, ...etc).

Example -2-

```
Im = imread('C:\images\Gray1.bmp');  
Header=Image_code_DWT_DCT(Im,0.05,'','db3');
```

For decompression program see the following example in MATLAB:

```
P=Deode_Image_DWT_DCT('C:\images\code1.CIC',0,'Load');  
Imshow(uint8(P));
```

-Note The option "**Load**" its meaning read the compressed file and put the decompressed image into matrix "P". If you have just compressed data without file (i.e. Header) and you need to check it without save it on a file using same function with option "**Read**":

```
P=Deode_Image_DWT_DCT('',Header,'Read');  
Imshow(uint8(P));
```

Good Luck



Mohammed Mustafa Siddeq

He is working on Software Engineering Dept. – Technical College – Kirkuk – IRAQ. He is appointed as a researcher and lecturer in the same college. He working on digital image processing by using MATLAB and Visual C++.NET, also he is publish his works in Journal of Information and Computing Science – Liverpool- UK, and he has many researches in different journals at UK and USA.
