

Watermark Insertion Using DWT Transformation

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Problem Statement

To Insert a watermark on a digital image using dwt transformation and to check the quality (depth) of watermark which was inserted on the host image.

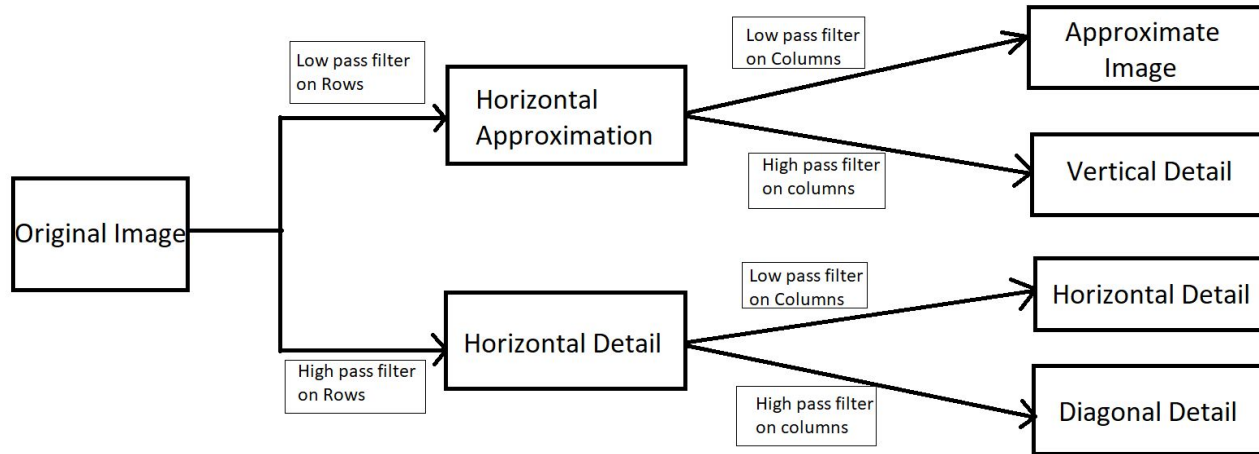
What is DWT ?

Dwt stands for Discrete Wavelet Transform. In this transform wavelets are discretely sampled.

Sampling the wavelets can be done in many ways. The one on which we are working upon is the discrete Haar wavelet transform.

One way to work on this transform is to pair up the inputs and finding their sum and differences and storing the difference and passing the sum in a recursive way until finally we obtain the sum and simultaneous differences of all the numbers.

This algorithm is raw and does not require heavy computation, saving us from complex hardware.



2-D DWT

Understanding The Algorithm

[1,1,1,1,1,1,1,1]

Doing this recursively for $n/2$
terms lead to:

[8,0,0,0,0,0,0,0]

[2,2,2,2,0,0,0,0]

How to use DWT for watermark insertion ?

[8,0,0,0,0,0,0,0]

The second half of the dwt transformed data consists of the LL values (Approximate Image).

The LL values of the host image is added to the LL values of the watermarked image.

$(\text{LL value of final image}) = (\text{LL value of host image}) - n(\text{LL value of watermark image})$

n = visibility factor of watermark image

Finally, an inverse DWT operation is done on the combined image and we obtain a watermarked image.

Matlab code.... And Image Quality

As we are working on pixel values. So we first have to convert the image in a txt file (binary or hexadecimal) so as to work on the data values of those files.

For this purpose matlab is used.

We first convert the image into grayscale as it is easy to work upon and then after the operations are done on the data, the matlab code is again used to convert back the data into an image file.

The Image quality depends on several factors, like the efficiency of algorithm, visibility factor, noise in the image produced.

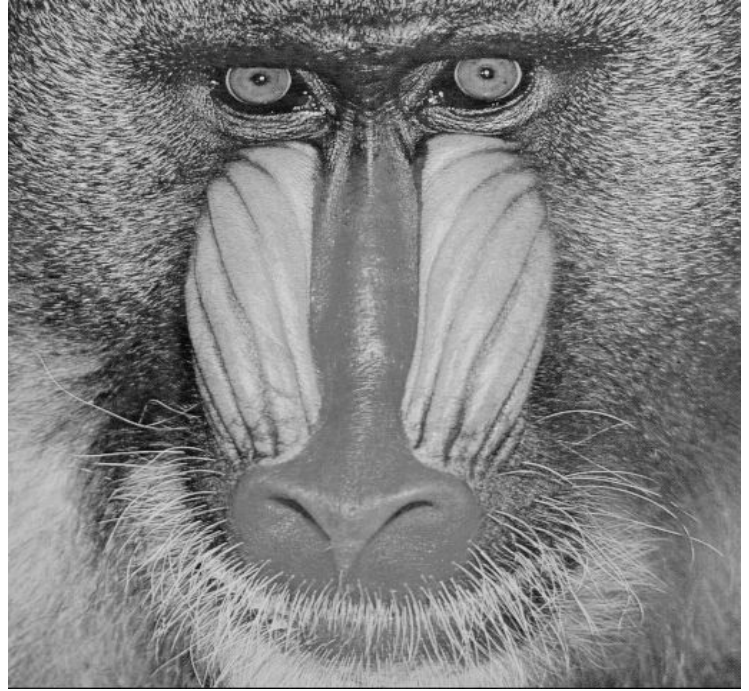
Images Used



HOST IMAGE

DS PROJECT

TEXT WATERMARK



WATERMARK IMAGE

Result Obtained



Visibility Factor = 1.0



Visibility Factor = 0.7



Visibility Factor = 0.5



CONCLUSION

- As we note that the text watermark is more efficient for insertion in digital image than an image watermark according to our DWT algorithm.
- The edges of text are more pronounced than the image watermark.
- Also, we see that the efficiency of watermark produced depends highly upon the value of visibility factor used.
- In our watermark insertion process, the most suitable value for $n=0.7$.

Thank You

