ES-203 Digital Systems Project REPORT

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Watermark Insertion using DWT algorithm

Our project for ES-203 was insertion of watermark in an image. There are several algorithms to accomplish this task and we decided to go along with the Discrete Wavelet Transform(DWT) algorithm.

A Discrete Wavelet Transform (DWT) is a transform for which the wavelets are discretely sampled and is useful for processing of non-stationary signals. The DWT splits the signal into high and low-frequency parts. The high-frequency part contains information about the edge components and the low-frequency part is split again into high and low-frequency parts. We usually use high-frequency components for watermarking as the human eye is less sensitive to changes in the edges.

We can perform DWT at various levels, for our project we have performed a 2-level DWT transform. We have first converted the image to a hex file and applied DWT on that to split it into smaller sub-bands. We did the same for the watermark image. Then we operated the two images to integrate them and then applied Inverse DWT to obtain the watermarked image.
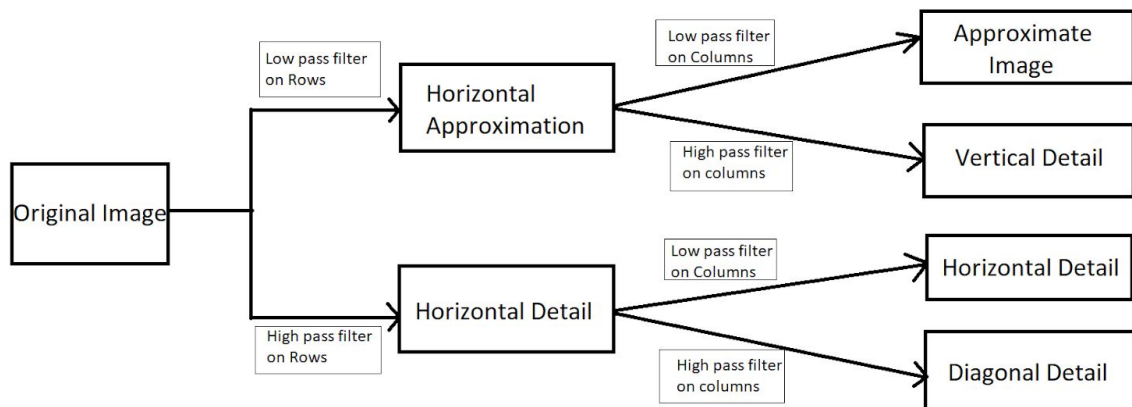
2-D DWT

Results:-

Host Image   **Watermark Image**

DS PROJECT

Watermarked Images:-

Visibility Factor=0.5   **Visibility Factor=0.7**   **Visibility Factor=1**

References:

- **https://en.wikipedia.org/wiki/Discrete_wavelet_transform**
- **https://www.researchgate.net/publication/330118608_FPGA_Implementation_of_Digital_Images_Watermarking_System_Based_on_Discrete_Haar_Wavelet_Transform/link/5c2ec4f5458515a4c70a71b0/download**
- **https://www.fpga4student.com/2016/11/image-processing-on-fpga-verilog.html**
- **https://in.mathworks.com/matlabcentral/answers/128347-image-to-text-conversion**
- **https://onlinehextools.com/convert-hex-to-image**
- **https://www.ece.rice.edu/~wakin/images/lena512.bmp**