Final Project: Watermark

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Introduction:

Background and literature review: In this assignement,

Motivation: Watermarks are identifying images or patterns that are embedded in images. They are often used on postage stamps, currency, and other documents to discourage counterfeiting. In the case of image copyrights, watermarks are often trademarks or logos that artists

Objective: Our group chose 3 objectives that build upon eachother to explore watermarks in images. 1) To both include a conspicuous and inconspicuos watermark in an image. 2) To use the Discrete Fourier Transform (DFT), computed using the Fast Fourier Transform (FFT), to hide an extractable watermark in an image. 3) To use the concept of bitplanes discussed in Lab 10 to hide an extractable watermark in an image.

Proposed approach:

Outline talk about the reason you choose this approach over other methods (any advantages/disadvantages, etc). We proposed to hide an extractable watermark (logo.png) in our image (lena.png) using two relevant methods to our course.

In the first method we applied binary thresholding followed by run length encoding to the watermark. by computing the discrete Fourier transform (DFT) of the image using a fast Fourier transform (FFT) algorithm. We then hid our watermark by first applying binary thresholding followed by run length encoding to the watermark. In our image, we replaced the magnitude of the DFT in the mid-range frequencies with our encoded watermark.

From ECE 418 Lab 2: Two-Dimensional Fourier Transform, we learned that much of the image's appearance is changed by altering the phase, and thus we didn't change any phase values. We also learned that low-frequencies contain much of the information content in the Fourier domain, and high-frequencies contribute to an image's sharpness. Therefore, we proposed to store our encoded image in the mid-range frequencies in a ring region centered around the zero frequency of the DFT magnitude image similar to Source 1.

The second method we replaced the least significant bit of our image with the binary thresholded watermark image.

Advantages/Disadvantages

Experimental design and results:

Experimental settings

The training/test dataset used

Evaluation criteria

Experimental results

watermark.m - our primary script Our core script contains three functions: a main function, a Dijkstra function, and a FindConnection function.

Main function:

Dijkstra function:

FindConnection function:

Execution:

Model Validation

Performance Summary

Discussion and future work:

Discussion and analysis on the approach and experiments.

Are the results just as you expected Are there any explanations on why the proposed approach perform well/badly? Are there any improvements that can be made in the future work?

Sources:

1: Sarkar, Sudeep. (2009) "Physical Problem for Fast Fourier Transform Computer Engineering." Chapter 11.00D. http://nm.mathforcollege.com/mws/com/11fft/mws_com_fft_phy_problem.pdf

Figure 1: logo.png.

Figure 2: lena.png.

Figure 3: lena_basicwatermark.png.

Figure 4: output_LSB_1.png.

Figure 5: output_LSB_3.png.