

Lab 3: Simple Steganography

Brian Hosler & Sarah Peachey

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1 Detecting JPEG Compression Using DCT Coefficients Quantization Fingerprints

JPEG compression leaves behind fingerprints in the image's DCT coefficients. These fingerprints become clearly visible in the histogram of the DCT coefficients. This is due to the blocking effects and quantization that takes place during the JPEG compression process. The DCT coefficients histogram of a JPEG compressed image will not be smooth, it will contain gaps and the width of the gaps corresponds to the quantization level used during the JPEG process. If an image was doubly JPEG compressed the bins in the histogram will be grouped by a different width, so there new bins will either be zero or dramatically increase in height.

```
%Assignment 5
%Brian Hosler and Sarah Peachey
f1=imread('Assignment 5 - Part 1 Files/DCTfprints1.tif');
f2=imread('Assignment 5 - Part 1 Files/DCTfprints2.tif');
f3=imread('Assignment 5 - Part 1 Files/DCTfprints3.tif');
f4=imread('Assignment 5 - Part 1 Files/DCTfprints4.tif');
f5=imread('Assignment 5 - Part 1 Files/DCTfprints5.tif');

figure
subBandHist(f1,2,2)
%no JPEG

figure
subBandHist(f2,2,2)
%step size 10

figure
subBandHist(f3,2,2)
%step size 6

figure
subBandHist(f4,2,2)
%no JPEG

figure
subBandHist(f5,2,2)
%step size 10
```

As seen in Figure 1 DCT1fprints1.tif is clearly not JPEG compressed as there are no fingerprints in the histogram. Whereas Figure 2 shows the image was compressed with quantization levels of 10, and Figure 3 shows that image was compressed with quantization levels of 6. Figure 4 again appears to have no fingerprints of JPEG compression visible in the histogram. Finally figure 5 seems to show that the image was JPEG compressed with quantization levels of 10, but it also has magnitudes much greater than all the other images, especially at zero. So one could assume that at first a bin size of 5 or 2 was used to compress the image and the image was then double compressed with a quantization level of 10. I think it would be 5 or 2 first because those numbers both evenly divide 10 so multiple of the first quantization bins would evenly fit into the second quantization bins. Which would result in the drastic spikes that are seen in Figure 5.

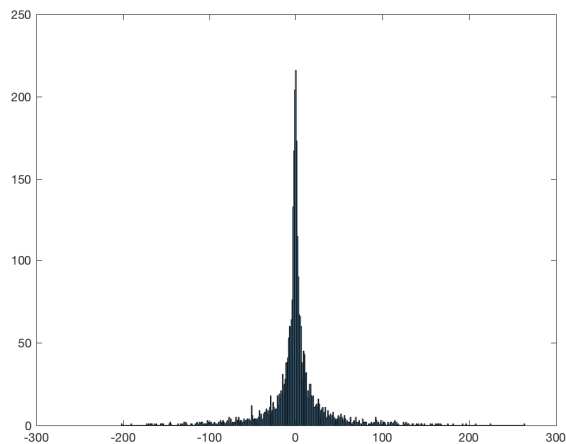


Figure 1: The histogram of the DCT coeff's of DCTfprints1.tif

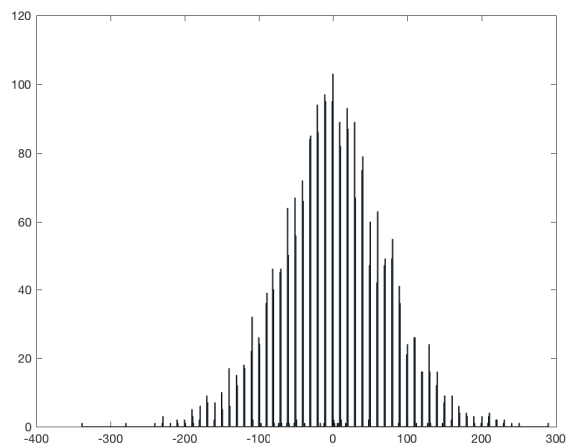


Figure 2: The histogram of the DCT coeff's of DCTfprints2.tif

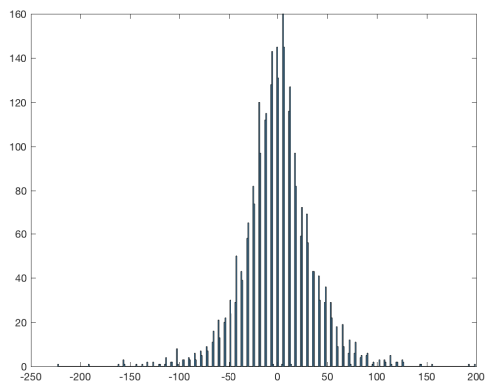


Figure 3: The histogram of the DCT coeff's of DCTfprints3.tif

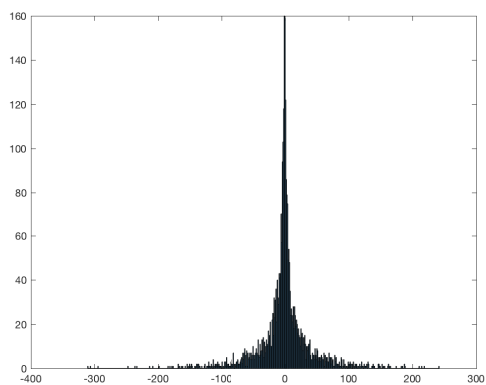


Figure 4: The histogram of the DCT coeff's of DCTfprints4.tif

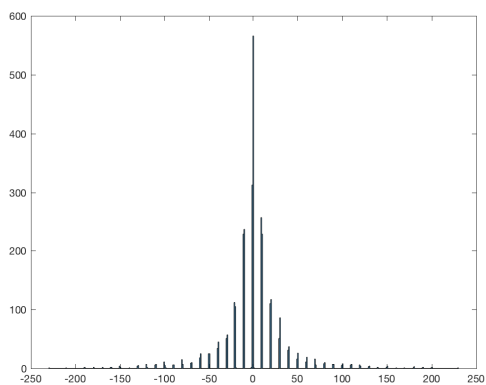


Figure 5: The histogram of the DCT coeff's of DCTfprints5.tif