Assignment 5

This assignment is due by 11:59 p.m. on Sunday, March 11. All reports should be submitted as PDFs.

Part 1: Detecting JPEG Compression Using DCT Coefficient Quantization Fingerprints

In class, we discussed how JPEG compression leaves behind fingerprints in an image's DCT coefficients. These fingerprints are visible when examining the histogram of a single subband of an image's DCT coefficients. To calculate a DCT coefficient histogram, first, an image is first divided into 8×8 pixel blocks. The DCT of each block is computed and the appropriate coefficient is then added to a vector of containg the same DCT coefficient for each block in the image. The histogram (with a bin size of 1) of this vector is then computed.

- Write a Matlab function that calculates and displays a histogram of a single subband of an image's DCT coefficients. This function should accept as inputs both the image to be examined along with two variables (valued between 1 and 8) specifying the row and column index of the DCT subband to be examined. Please fully comment your code and append it to your report.

  Note: It may be helpful to create this function by modifying the code you wrote to simulate JPEG compression in Assignment 2.

- Use the function you wrote to examine the images **DCTfprints1.tif**, **DCTfprints2.tif**, and **DCTfprints3.tif** for DCT coefficient compression artifacts. Examine the (2,2) subband of DCT coefficients for each image and include a plot of the corresponding histogram for each image in your report.

- Which of these images have been JPEG compressed at least once? For images that have been JPEG compressed at least once, determine the quantization interval used when quantizing the (2,2) subband of DCT coefficients by visually inspecting the DCT coefficient histogram. If the image has been JPEG compressed twice, determine the quantization interval used during the last compression.

- Which of these images have been JPEG compressed twice? For images that have been compressed twice, determine whether the quantization interval used during the second compression was larger or smaller than the quantization interval used during the first compression.