

CEN 501 - Fall 2014

Part I Signal Processing and Analysis

Semester Project

Image Compression

Due Date: 10-15-14 (Day of Exam 2)

You will be working with the 512X512 8-bit-per-pixel, raster-scanned "lena.raw" image posted on Blackboard.

Discrete Cosine Transform (DCT) Image Compression

Create an image compression system using the 2-D DCT via the following steps:

- (1) Segment the image into non-overlapping 8 X 8 pixel blocks.
- (2) Apply the 2-D DCT independently to each block.
- (3) Set one-quarter, one-half, and three-quarters of the coefficients in each block to zero. For the remaining coefficients, quantize each using a 10-bit uniform scalar quantizer. For each case, compute the total number of bits used to code the image, and compute the average number of bits per pixel. Display and comment on the quality of the reconstructed image for each case, and compute the peak signal-to-noise ratio (PSNR). Note that the coefficients set to zero should correspond to the highest frequencies in each case.
- (4) For each case, including the original image, plot the 2-D DFT magnitude spectrum of each reconstructed image and comment.

Submit a report in Microsoft Word format with four chapters: An introduction chapter that describes the overall experiments and provides a detailed discussion of the 2-D DCT theory; a chapter that discusses your implementation details with MATLAB code and comments; a chapter that discusses and shows the results for all cases; and a final chapter that draws appropriate conclusions.

Submit one MATLAB programs (.m file) that I can run to verify your findings. The DCT system is to be written discretely from scratch without using any predefined MATLAB functions or libraries whatsoever!!! Each program should be completely automatic and display the appropriate figures simultaneously. That is, the MATLAB program should display eight figures: three reconstructed images plus their DFTs, along with the original image and it's DFT. Securely attach a CD-ROM with your program to the inside of the front cover of your report. All programs must run on MATLAB 2012b.