

DIP (E4830)

Assignment 1

Due: 2/18/07

Note: For questions or problems contact Prof. Ebadollahi (shahram@ee.columbia.edu) or the TA (wl2223@columbia.edu)

Note: Please provide a well-documented copy of your code (MATLAB or any other language of your choice) for the questions that ask you to perform operations on images.

Question 1) [Sampling/Reconstruction – 30 pts.]

- 1-1) Down-sample image “lenna.jpg” of size 256x256 to represent it with only 64x64 samples.
- 1-2) Reconstruct the image at original size of 256x256 by interpolation from the 64x64 samples using the following schemes. In both cases make sure you include the resulting images in your response.
 - (a) Use the Nearest-Neighbor (Zero-order) interpolation function
 - (b) Use the bilinear interpolation functionCompute the average error for both cases, compare them, and comment on your results.

Note: You are required and will be graded for your own implementation of the interpolation. However, you can use MATLAB’s built in functions to check your results.

Question 2) [Quantization/Dithering – 30 pts.]

Again take image “lenna.jpg” of size 256x256, which is originally quantized with 8 bits per pixel.

- 2-1) Quantize the range of gray-level values of the pixels in this image with only B=4 bits. Use the linear quantizer (uniform optimal quantizer) to perform the quantization. Include the resulting image quantized with B=4 bits in your response.
 - 2-2) This time apply random dither and then uniformly quantize with B=4 bits. Include the resulting image in your response. Comment on your choice of the level of noise added to the image.
- Compute the average error between the result images. Comment on the subjective quality of the images in both cases.

Question 3) [Half-toning – 20 pts.]

Take the B=4 bits quantized image in (2-1). Half-tone the image for bi-level display. Include the resulting image in your response. Also show the matrices for approximating the required gray-level values.

Question 4) [Color – 10 pts.]

Answer question 6.5 on page 457 of your text book.

Question 5) [Color – 10 pts.]

Answer question 6.15 on page 458 of your text book.
