

## EE435 Spring 2012 PS04 (Problem Set 04)

**Due: Fri 2/24/2012**

1. Download the file *CoolGuy.bmp* from the course website. This is a blurry picture. Using MATLAB, sharpen the picture, write it out as a png file called *SharpCoolGuy.png*, and send it to me by email. Also, turn in a labeled 1x2 subplot of the original and sharpened image. Turn in your code.
2. Download the file *IranianPresident\_sick.png* from the course website. Using MATLAB, and without using a low pass filter, do your best to get rid of the noise. Write it out as a tiff file called *NowNotSoSick.tiff*, and send it to me by email. Also, print out and turn in a labeled 1x2 subplot of the original and fixed image. Turn in your code.
3. Download the *feb3201214.jpg* from the course website. This image has dimensions 750x600x3, and the planes of data are red (plane 1), green (plane 2) and blue (plane 3). Strip off and reorder the planes of data into green (plane 1), blue (plane 2), and red (plane 3) image. Write out this new image as *SwappedPlanes.jpg* and email it to me. Turn in your code.

Explain why the dude's shirt is now the color it is.

4. The default quality when writing out an image as a JPEG in MATLAB is 75 (on a scale of 0-100). Read in the *feb3201214.jpg* image. Now, write it out under different names as jpeg images with quality 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 and fill in the following table based on the size of the file (in bytes) that Windows says it is. Caution: each time you use the *imwrite* command, the array that is written out MUST be the original array (do NOT use one of the 0-100 quality images). Then, compute how many of these JPEG images would fit on a 250 MB SD card. For your computations, use the file size given by Windows when in the Details view mode of the folder containing the files. Assume that 1 MB =  $10^6$  bytes, and 1 kByte =  $10^3$  bytes. Note: you cannot have a fraction of an image, and "Raw Data" refers to how much storage the raw uint8 data would occupy.

JPEG Quality	File Size (kBytes)	# Images on a 250 MB SD card
0		
10		
20		
30		
40		
50		
60		
70		
80		
90		
100		
Raw Data		

Create a 1x2 subplot with the quality = 0 and the quality = 100 images displayed and labeled. Print this out and turn it in. What is the primary advantage of reducing the quality of the JPEG image you write out? The primary disadvantage?

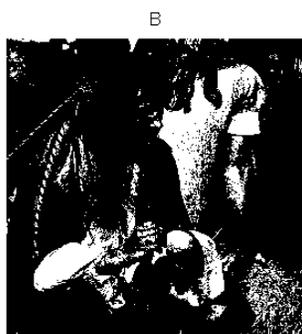
5. An original grayscale image is shown to the right. The three images below (labeled A, B and C) show this image thresholded, or thresholded and eroded, or thresholded and dilated. Identify which of the black and white images below are which, and why you think that.



Thresholded:

Thresholded and eroded:

Thresholded and dilated:



6. Below is seen an original binary image and three binary images that were derived from the original using morphology. Determine which the original is and which operation below corresponds to the other three images. State how you determined this.

Erosion w/a  $2 \times 10$  rectangular structuring element that has been rotated  $45^\circ$ .

Dilation w/a  $2 \times 10$  horizontal rectangular structuring element.

Erosion w/a  $2 \times 10$  horizontal rectangular structuring element.

