CS4495 Computer Vision – Fall 2013

Problem Set 0 – Images as Functions (really arrays or matrices of numbers)

Due August 29th, 2013 a minute before midnight

This problem set is really just to make sure you can load an image, manipulate the values, produce some output.

What do you hand in: A Zip file that has

(1) Images (either as JPG or PNG or some other easy to recognize format) clearly labeled using he convention PS<number>-<question number>-<question sub>-counter.jpg   For example, for this PS, the second image used as input would be listed as ps0-1-a-2.jpg since question 1(a) asks to get two images as input for the rest of the PS.
(2) Code you used for each question. It should be clear how to run your code to generate the results. Code should be in different folders for each main part with names like PS0-1-code. For some parts – especially if using Matlab – the entire code might be just a few lines.
(3) Finally a PDF file that shows all the results you need for the problem set. This will include the images appropriately labeled so it is clear which section they are for and the small number of written responses necessary to answer some of the questions.   Also, før each main section, if it is not obvious how to run your code please provide brief but clear instructions.

1   Input images
   a. Find two interesting images to use. They should be color. You might find some classic vision examples in http://sipi.usc.edu/database/database.php?volume=misc   Or take your own. Make sure they are not larger than 512x512.
       Output: both images

2   Color planes
   a. Swap the red and blue pixels of image 1
       Output: new image
   b. Create a monochrome image (M1g) by selecting the green channel of image 1
       Output: new image
   c. Create a monochrome image (M1r) by selecting the red channel of image 1
       Output: new image
   d. Which looks more like what you'd expect a monochrome image to look like? Would you expect a computer vision algorithm to work on one better than the other?
       Output: response

3   Replacement of pixels
   a. Take the inner square of 100x100 pixels of monochrome version of image 1 and insert them into the monochrome version of image 2
      Output: new image
4   Arithmetic and Geometric operation
   a. What is the min and max of the pixel values of M1g? What is the mean? What is the standard deviation? And how did you compute these?
      Output: response
   b. Subtract the mean from all the pixels, then divide by the standard deviation, then multiply by 10 (if your image is zero to 255) or by 0.05 (if your image ranges from 0.0 to 1.0). Now add the mean back in.
      Ouptut: new image
   c. Shift M1g to the left by 2 pixels.
      Output: new image
   d. Subtract the shifted version of M1g from the original and make sure that the values are legal (what do negative numbers for pixels mean anyway?).
5   Noise
   a. Take the original colored image and start adding Gaussian noise to the pixels in the green channel. Increase sigma until the noise is somewhat visible.
      Output: new image. Response: what is sigma?
   b. Now, instead add that amount of noise to the blue channel.
      Output: new image
   c. Which looks better? Why?
      Output: response