Lab Exercises: LAB 2
(pixel value re-scaling/shifting)

General guidance:

1. Download the template code to make menus and demonstrate how to read, write and manipulate images.
2. All the images you use can be downloaded from the course website: http://www.eecs.qmul.ac.uk/~phao/IP/Images/
3. For RAW images, the files have no head data, just the image data as matrices stored. For our RAW images, we do not provide the colour components, and all the data are gray-scale values, a one-byte unsigned integer per pixel, value from 0 to 255.
4. The size of image Cameraman is of 128x128. Other images are of 512x512.

Exercise 1.

Image Pixel Value Re-Scaling: Re-scaling all the pixel values in an image and displaying the image

To re-scale all the pixel values in an image stored in a matrix. The re-scaling factors should be floating-point numbers, which can be from 0 to 2, e.g. 0.5, 0.7, 1.3 and 2.

The pixel values of the images we provided are of one byte per pixel and unsigned integers and from 0 to 255. After rescaling, all the pixel values should be rounded to integers if they are not.

For the results, if a value is less than 0, just set it 0; if a value is greater than 255, just set it 255.

Exercise 2.

Image Pixel Value Shifting: Shifting all the pixel values in an image and displaying the image

To shift all the pixel values in an image stored in a matrix. The shifting value should be an integer, negative or positive.

For the results, if a value is less than 0, just set it 0; if a value is greater than 255, just set it 255.

Exercise 3.

Image Pixel Value Shifting and Re-Scaling: Add a random value to each pixel value, and then shift and re-scale all the pixel values in the image and display the image

Generate a random integer for each pixel and add it to the pixel value, or generate a random integer matrix of the same size and add it to the images stored in a matrix. Then shift and rescale all the pixel values in the image such that all the pixel values are between 0 and 255.

To shift and rescale the pixel values of an image, you have to find the minimum and the maximum pixel values in the new image.

Questions: What happened if image pixel values are rescaled by 2, rounded to integers, then rescaled by 1/2, and finally rounded to integers again? What happened if image pixel values are rescaled by 1/2, rounded to integers, then rescaled by 2, and finally rounded to integers again?