Problem Set 1
CMSC 426
Due February 9, 2010

Programming Assignment

The goal of this assignment is to give you some hands-on experience with histograms, and to get us started programming with images in Java. You are given some skeleton code that reads, displays, and saves images. If you run this code, it will ask you for the name of a couple of images, and of an output file. Note that the program will not work properly until you edit it so that it accesses one of your directories for these files. The program will display these images on the screen, and save this display in a designated file. If you enter "uniform" for the second file, only the first image will be read, and if you enter "exit" for the final file name, the images will not be saved.

Your solutions should be in a zip file and include a document containing the results of your program and all code you have written. Email this in a single zip file to Arijit Biswas.

1. **20 Points:** Implement the function *histogram* to determine the histogram of an image. Uncomment the lines of code that create a panel for the histogram and that add this panel to the mainpanel. Your program now should be able to read in an image and display its histogram. Demonstrate your results using the Walker Evans photograph. Save the results to an image file and include this with your write-up.

2&3 Implement *uniformHistogram* to generate a vector that represents a uniform histogram. Implement *specifyHistogram.* This function will take an image and a histogram as input and change the intensities of the input image so that the new image has a histogram that matches the input histogram.

2. **20 Points** Demonstrate that your program can perform histogram equalization using the Walker Evans images. Submit an image that shows the results of giving this image a *uniform* histogram. In addition, show the results of histogram equalization on an image of your choice that you feel demonstrates the potential usefulness of histogram equalization.

3. **20 Points** Demonstrate that your program can perform histogram specification. Manipulate the Walker Evans image so that it has the same histogram as the Ansel Adams image. In addition, show the results of histogram specification on an image of your choice that you feel demonstrates the potential usefulness of histogram specification.

4. **Challenge Problem, 10 Points:** Add some additional functionality to the program to allow the user to manipulate a histogram with a little more control. For example, you might allow the user to increase or decrease the contrast of an image. Allow the user to do this interactively, until they are satisfied with the results. Or provide a mechanism that allows the user to manipulate different parts of the image in different ways. You can invent any manipulation that you think is useful. Explain briefly what manipulation you have allowed, and show examples of the results using images of your choice.