ECE 618 Project 1
Due 9/16/2004

1 FORMAT FOR SUBMITTING PROJECT REPORTS

Page 1. Cover Page. printed neatly. The cover page should contain:

1. Project title
2. Project number
3. Course number
4. Student's name
5. Date due
6. Date handed in
7. Abstract (not to exceed 1/2 page)

Page 2. Technical discussion. One to two pages (max). This section should include the techniques used and the principal equations (if any) implemented.

Page 3 (or 4). Discussion of results. One to two pages (max). A discussion of results should include major findings in terms of the project objectives, and make clear reference to any images generated.

Results. Includes all the images generated in the project. Number images individually so they can be referenced in the preceding discussions.

Appendix. Program listings. Includes listings of all programs written by the student. Standard routines and other material obtained from other sources should be acknowledged by name, but their listings should not be included.

Layout. The entire report must be in standard sheet size format (8.5 x 11 inches in the U.S.) All sheets should be stapled in three locations to form a binding booklet-like support on the left margin.

2 Project 1

The purpose of this project is to study image mapping and Histogram operations

2.1 Reducing the number of gray levels in an Image

Write a computer program that would reduce the number of gray levels in a PGM image form 256 to \( L \) levels, where \( L \) is a parameter in our program. Your report should include the original image and 3 different outputs (using three different levels: e.g. 128, 64, and 2).
2.2 Image Enhancement Using Intensity Transformations

1. Using Three different PGM images perform the following
   (a) Image Negative.
   (b) Log Transformation (Plot the transfer function).
   (c) $\gamma$ Correction with $\gamma = 0.25$ and $\gamma = 2.5$. Plot Transfer Functions.

2.3 Histogram Equalization

   (a) Write a computer program for computing the histogram of an image.
   (b) Calculate the mean gray level and variance.
   (c) Implement the histogram equalization technique.
   (d) Use three different PGM images and perform histogram equalization on them.

As a minimum, your report should include the original image, a plot of its histogram, a plot of the histogram equalization transformation function, the enhanced image, and a plot of its histogram. Use this information to explain why the resulting image was enhanced as it was.

2.4 For Graduate Students

   (a) Generate a 256x256 8-bit image that has gray levels varying randomly (using a gaussian distribution) in the range [200,220]. Insert a 100x100 square in the middle of the image. The gray level of the square should vary in the range [80:100]. The image represents an object in a light gray background. Using the histogram information, devise an algorithm to remove the background (i.e set the background pixels to white). Describe your algorithm and plot the original image, its histogram, the output image and its histogram.

2.5 Extra Credit (All)

Write a Java applet to perform image enhancements as described in section 2.2 of this project.