

CS/ECE 545 Digital Image Processing, Spring 2014 Homework 1, Due before class February 12, 2014

Problem 1 (15 points): Gray level modification: Create an ImageJ plugin **GrayLevel_Modification** that modifies the values of an 8-bit grayscale input image according to the function $s = 16 \sqrt{r}$, where r is the input intensity and s is the processed intensity. The factor of 16 guarantees that the result will be in the range 0 to 255. Use this plugin to modify any currently open 8-bit grayscale image.

Problem 2 (15 points): (Thresholding): Create a plugin called **Median_Threshold** that sets the threshold value to the median of the histogram. Use this plugin to threshold an input image 8-bit grayscale image. Recall that the median m is the value that satisfies $P(x < m) = P(x > m)$, in other words, half of the intensity values are less and half of the values are greater than m .

Problem 3 (15 points): Power Transform: Create an ImageJ plugin **Power_Transform** which performs a power law transformation on an image. This function should take an 8-bit grayscale image and the gamma value (as a variable you can modify in your program) to transform the image. Remember that power law transformations are achieved using the simple formula:

$$s = c * r^\gamma$$

where s is the processed pixel value, r is the original pixel value, γ is the parameter controlling the power law transformation and c is a constant usually set to 1. Try this new function out on the following images (spine.jpg and runway.jpg), experimenting with different values for γ . In the comments of your plugin, state what values of γ worked best for each spine.jpg and for runway.jpg

Problem 4 (25 points): Burger and Burge problem number 4.3 (page 51). For this problem, you should create a plugin called **NonLinear_Binning** that solves the problem described. Create a table of 10 arbitrary ranges and pick appropriate intervals. It should be possible for the ranges you choose in your program to be changed and the program recompiled

Problem 5 (30 points): Burger and Burge problem number 5.1 (page 83). For this problem, you should create a plugin called **AutoContrast_quantiles**.

Submitting Your Work

Submit all ImageJ plugins (GrayLevel_Modification.java, MedianThreshold.java, Power_Transform.java, NonLinear_Binning.java and AutoContrast_quantiles.java) put into **ONE** zip file named *yourfirstname_yourlastname_hw1.zip* using turnin. **DON'T EMAIL ME YOUR HOMEWORK.** Also, **TEST YOUR CODE IN THE ZOOLAB BEFORE SUBMITTING**