

CMPEN/EE455: Digital Image Processing I
Fall 2017
Project #4

assigned: Friday 20 October 2017
due: Wednesday 1 November 2017

reading assignment: G&W Ch. 3.1 — 3.3

Image Enhancement: Histogram Modification

Consider the “truck” image. This image exhibits relatively low contrast. For the “truck” image, do the following:

1. Give the original image. Compute and plot the image’s histogram $\hat{p}_r(r)$ and cdf $c_r(r)$. Do this by writing your own program to compute the image histogram and cdf. Make labeled plots of these quantities using suitable MATLAB plotting functions.
2. Apply gamma correction, as given by eq. (3-5) of G&W, to the original image; in particular, give the images and associated histograms and cdf’s for $\gamma = 5.0$ and $\gamma = 0.20$. (Write your own function!)
3. Contrast Stretching (see L18) — Apply the following histogram-modification procedure to the original image:
 - (a) Set all pixels with gray levels below 10% in the cdf to black.
 - (b) Set all pixels with gray levels above 90% in the cdf to white.
 - (c) Linearly stretch the range between the 10% and 90% gray levels to cover the range 0 to 255.

In your report, give the mathematical transformation $s = T(r)$ represented by the method above. Also, give the modified image and its new histogram and cdf.

4. Histogram Equalization (see L19) — Equalize the original image using optimal contrast stretching; of course, you must write your own function. Give the equalized image and its histogram and cdf.
5. Give observations on all of your results. How do the histogram modifications affect the output images and their associated gray-level distributions?