

CMPEN/EE455: Digital Image Processing I
Fall 2019
Project #4

assigned: Monday 28 October 2019
due: Thursday 7 November 2018

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 function 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.
 - i. Give the mathematical transformation $s = T(r)$ represented by the method above.
 - ii. Give the modified image and its new histogram and cdf.
4. Histogram Equalization (HE) — Equalize the original image using HE, as discussed in L19. You must write your own HE function.
 - i. Plot $s = T(r)$ for this situation, where $0 \leq r \leq 255$ and $0 \leq s \leq 255$.
 - ii. Give the equalized image along with 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?