

Lab 2: Intensity transformation

Course: IMT3017 – Computer Vision, NTNU, Autumn Semester 2020

Objectives

- Intensity transformation
- Histogram equalization

In an image processing context, the histogram of an image normally refers to a histogram of the pixel intensity values. This histogram is a plot showing the distribution of pixels in an image at each different intensity value found in that image.

For an 8-bit grayscale image there are 256 different possible intensities, and so the histogram will graphically display 256 numbers showing the distribution of pixels amongst those grayscale values. For this lab, read **Lena** image as gray image using skimage.io library.

Gamma correction, or often simply gamma, is a nonlinear operation used to encode and decode luminance (I) or tristimulus information in video or still image systems. Gamma correction is, in the simplest cases, defined by the following power-law expression:

$$I_o = I_i^\gamma$$

where I_i and I_o are the input and output images respectively. If γ is less than 1, the mapping is weighted toward higher (brighter) output values. If γ is greater than 1, the mapping is weighted toward lower (darker) output values.

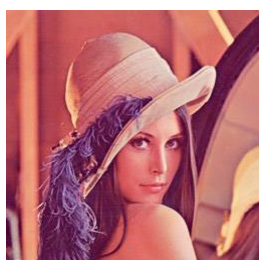


Figure 1: Lena Image

Tasks (Do not use built in functions from any library except for reading, plotting and saving your results):

- Apply gamma correction to darken the Lena image, see Fig. (2)
- Compute the histogram of the dark Lena image and compare the original histogram as shown in Fig. (2)
- Apply histogram equalization to dark Lena image, plot the cumulative distributed function (the transformation function) as shown in Fig. (3)

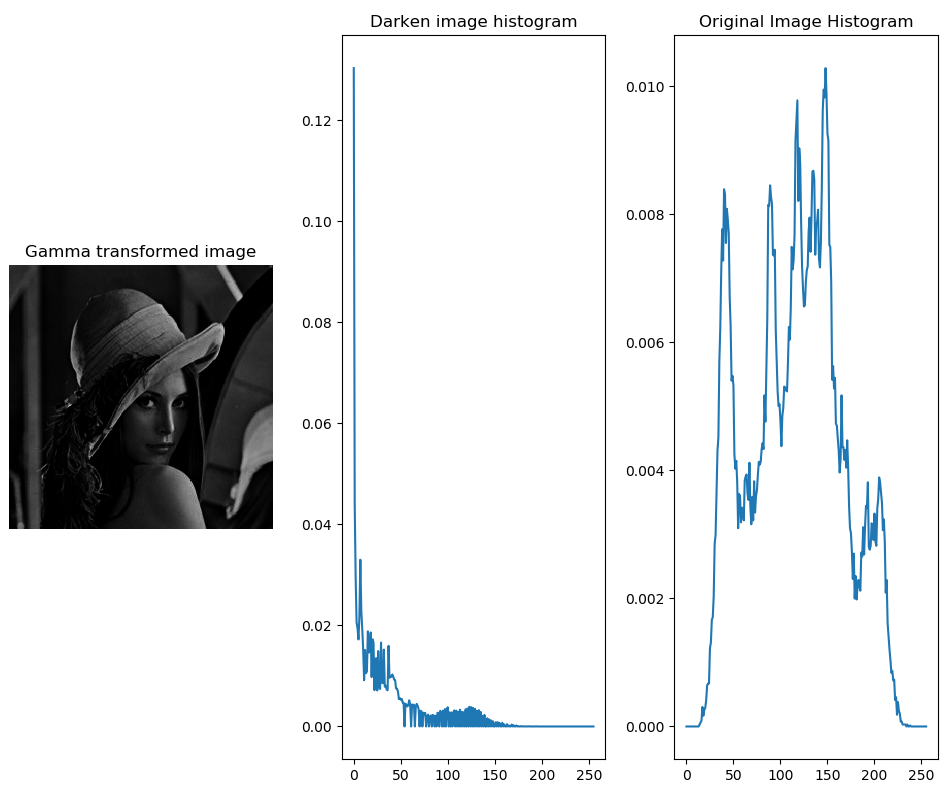


Figure 2: Histogram after gamma transformation

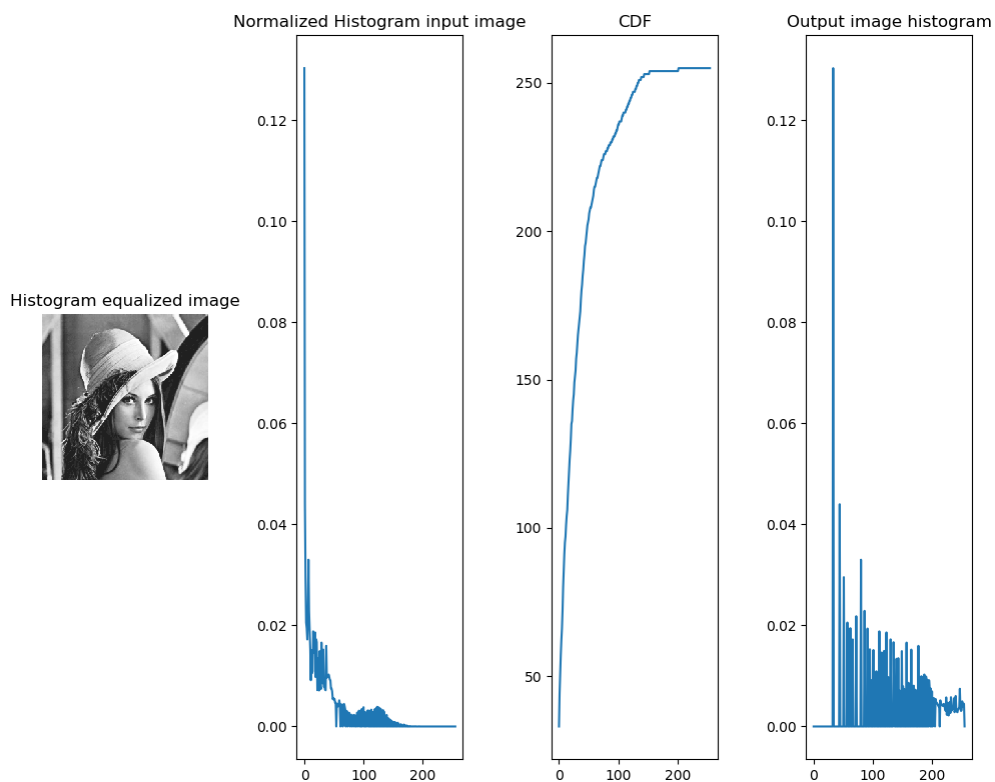


Figure 3: Histogram Equalization