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# Homework 3

Write a program to generate images and histograms:
(a) original image and its histogram
(b) image with intensity divided by 3 and its histogram
(c) image after applying histogram equalization to (b) and its histogram

The requirements above are accomplished by Python. All the histograms are created by matplotlib package, and all the processed images are exported by cv2 package. After the intensity of lena image divided by 3 by multiple for loops changing intensity pixel by pixel, the image becomes dark as Fig 1. shown. In third part, I applied the histogram equalization to the result from (b) as the homework requiring. The image becomes brighter after processing as the rightest image in Fig1. For histogram equalization linearization, the formula $s_k = 255\Sigma_{j=0}^{k-1}\frac{n_j}{n}$ ($k$ is the grey level intensity, and $n_j$ is the number of pixels with intensity $j$) is used where $s_k$ represents every pixel in new processed image with grey level intensity $k$. To achieve the requirement, I build a table to record the number of pixels for each grey level intensity, and use a function to calculate the new image based on the table.

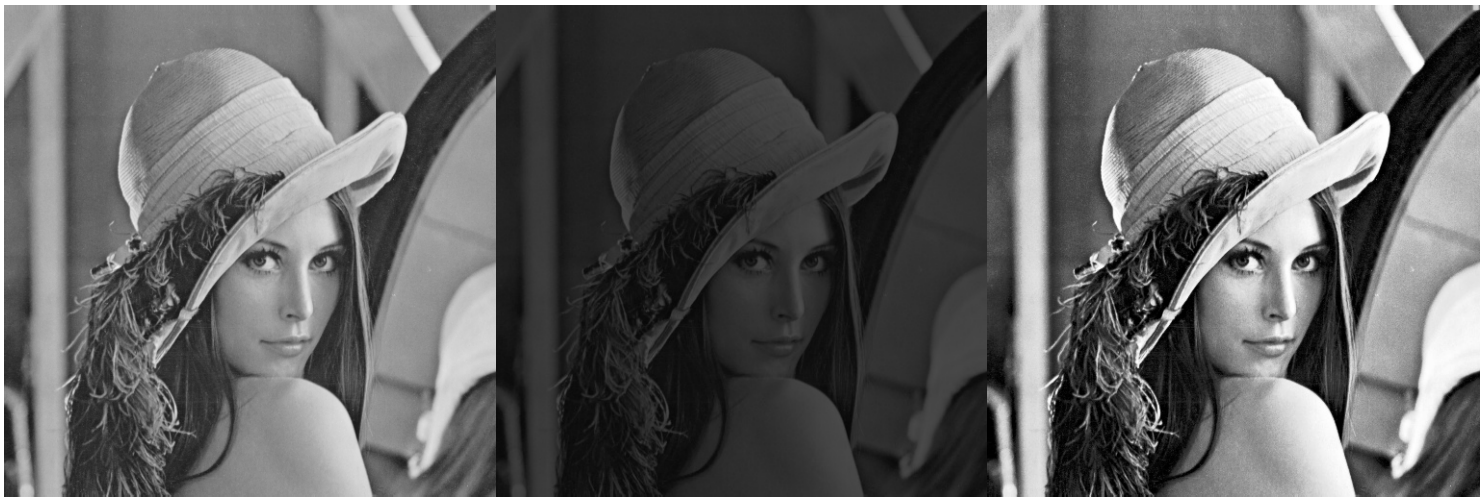

Figure 1. The left one is the image of original lena.bmp, and the middle one is the image with intensity divided by 3. The right one is the image after applying histogram equalization to the image with intensity divided by 3.

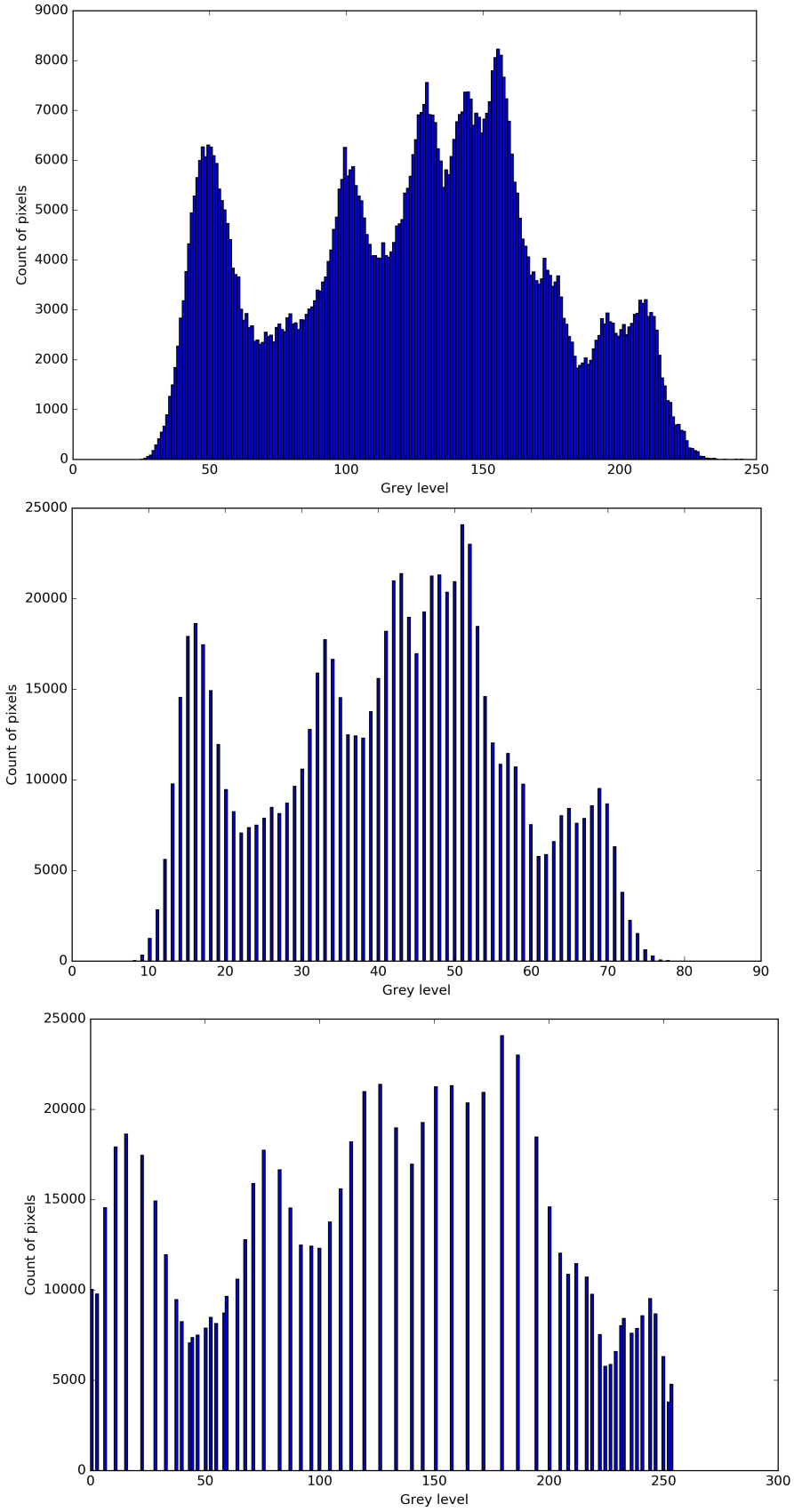


Figure 2. The histograms. The top one is the histogram of original image. The middle one is the histogram of the image with intensity divided by 3. The bottom one is the histogram of image after applying histogram equalization to the image with intensity divided by 3.