電腦視覺 HW3 report

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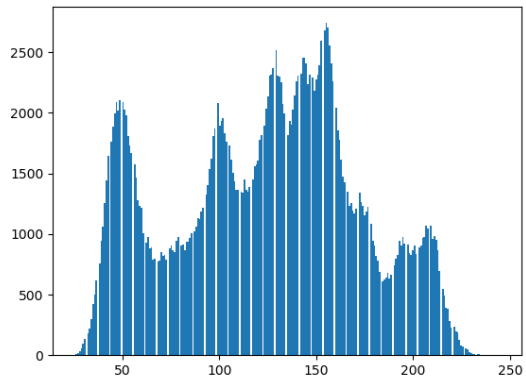
Write a program to generate images and histograms:

(a) original image and its histogram:

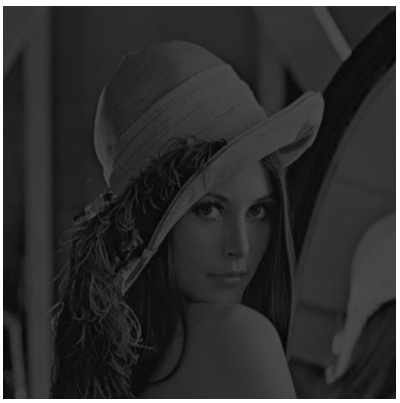
解釋: 與作業二相同, 略。直接展示成果:

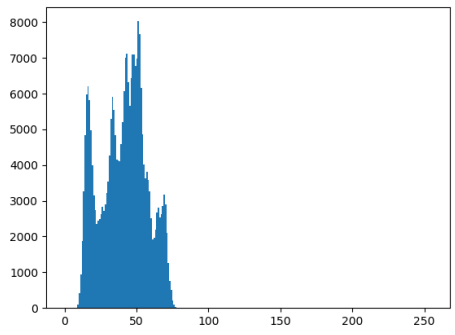


(b) image with intensity divided by 3 and its histogram:

解釋: 對每個 pixel 的亮度除以 3(題目說四捨五入或無條件捨去皆可, 故此處採無條件捨去(藉由令元素必須為 int), 並用題目(a)類似技法輸出即可。

```
np_img_b = copy.deepcopy(np_img)
np_img_b.astype(int)
for i in range(row):
    for j in range(col):
        np_img_b[i][j] = np_img_b[i][j] / 3
        if(np_img_b[i][j] not in hist_dict_b):
            hist_dict_b[np_img_b[i][j]] = 1
        else:
            hist_dict_b[np_img_b[i][j]] = hist_dict_b[np_img_b[i][j]] + 1
        hist_list_b.append(np_img_b[i][j])
```





(c) image after applying histogram equalization to (b) and its histogram:

解釋: 此題先使用問題(b)的結果繼續往下做。接著，用 list 統計每個 pixel 的亮度，透過 prefix sum 更新成累加版本的 list，透過書中描述的 cdf 與 最大亮度(即 255) 相乘進而得到答案(下面是精簡後的關鍵程式碼)。

```
np_img_c = copy.deepcopy(np_img_b) # applying histogram equalization to (b)
np_img_c.astype(int)
for i in range(row):
    for j in range(col):
        record_list_c[np_img_c[i][j]] = record_list_c[np_img_c[i][j]] + 1

for i in range(record_list_c.shape[0]):
    prob_list_c[i] = record_list_c[i]/(total_pixel)

# get cdf of the img
prefix_sum = 0
cdf_list_c = np.zeros(256, dtype=float)
for i in range(prob_list_c.shape[0]):
    prefix_sum += prob_list_c[i]
    cdf_list_c[i] = prefix_sum

for i in range(row):
    for j in range(col):
        np_img_c[i][j] = cdf_list_c[np_img_c[i][j]] * max_luminance
```