CV HW3

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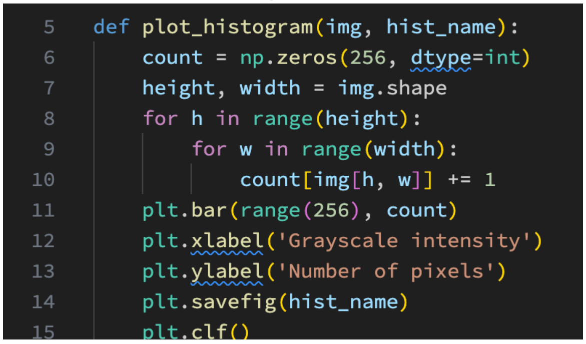
(a) original image and its histogram

Brief description, algorithm: iterate through 每個 pixels，並將各個 pixel 的值記錄在 256 維的 list 中，例如(1, 1)值爲 136，則 count[136]加一，最後畫出 count list。

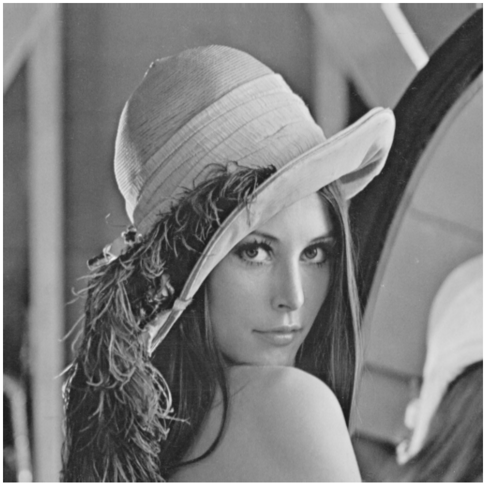
Parameters: None

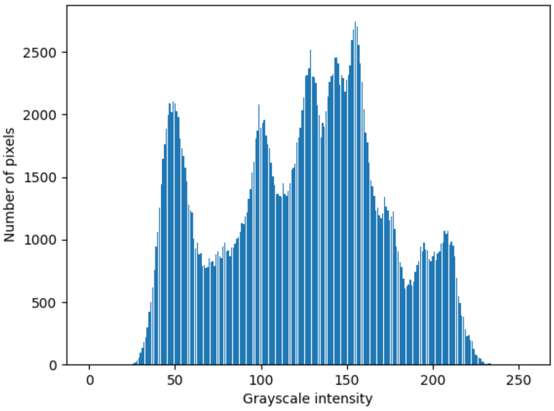
Principal code fragment:



```python
def plot_histogram(img, hist_name):
    count = np.zeros(256, dtype=int)
    height, width = img.shape
    for h in range(height):
        for w in range(width):
            count[img[h, w]] += 1
    plt.bar(range(256), count)
    plt.xlabel('Grayscale intensity')
    plt.ylabel('Number of pixels')
    plt.savefig(hist_name)
    plt.clf()
```

Resulting image:



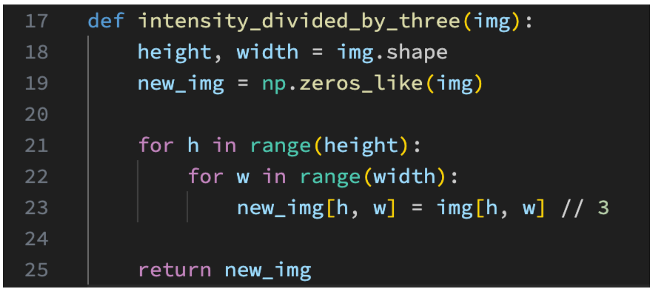


(b) image with intensity divided by 3 and its histogram

Brief description, algorithm: iterate through 每個 pixels、將每個 pixel 的值都除三並無條件捨去，得到 new_img，最後用(a)小題的程式畫出 histogram。

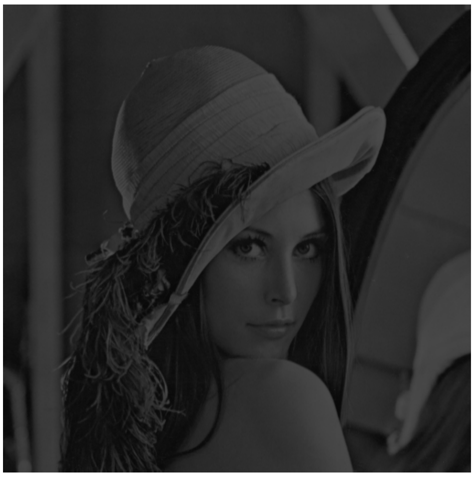
Parameters: None

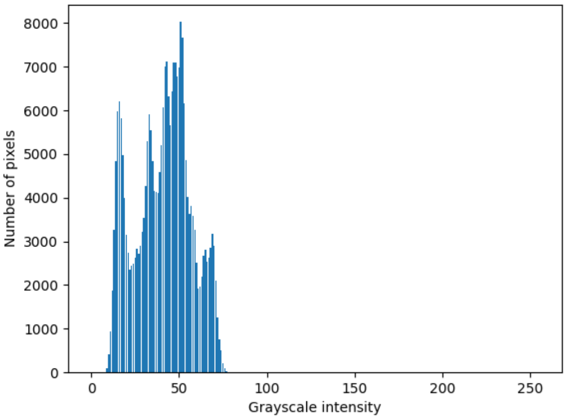
Principal code fragment:



```
def intensity_divided_by_three(img):
    height, width = img.shape
    new_img = np.zeros_like(img)

    for h in range(height):
        for w in range(width):
            new_img[h, w] = img[h, w] // 3

    return new_img
```

Resulting image:



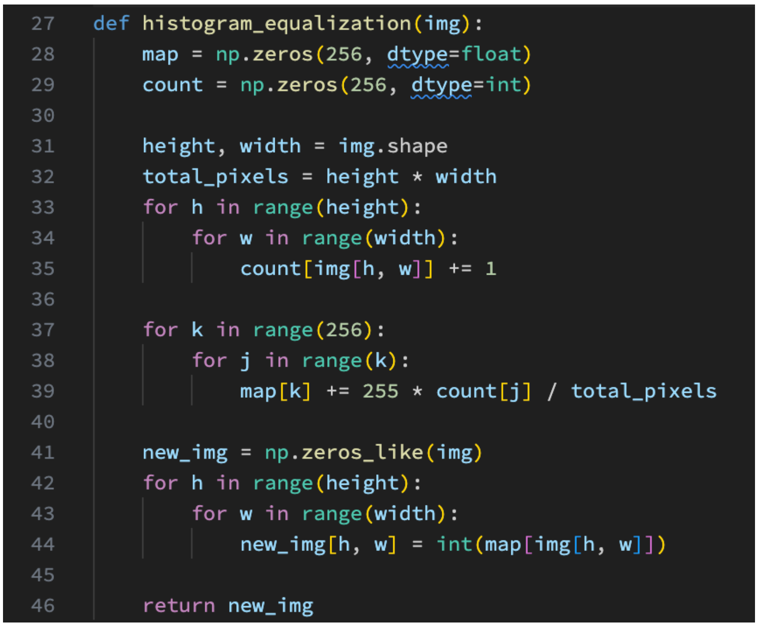


(c) image after applying histogram equalization to (b) and its histogram

Brief description, algorithm: 先 iterate 記錄各個 grayscale intensity pixels 的數量，記錄在 count 裡。用 CH3 講義 page 105 算出 intensity 轉換的 map，並將 img 轉換爲 new_img，最後一樣用(a)小題的程式畫成 histogram。

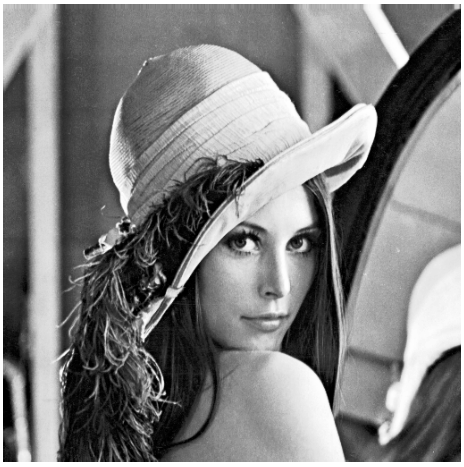
Parameters: None

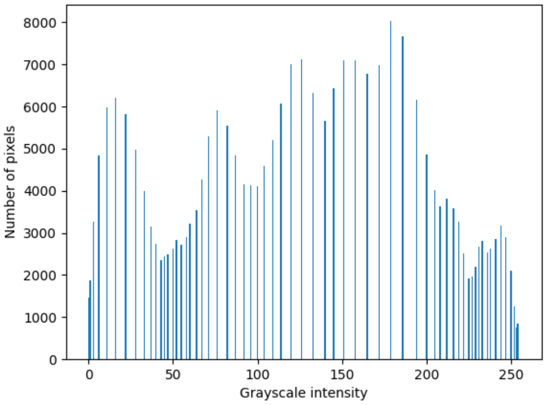
Principal code fragment:



```python
def histogram_equalization(img):
    map = np.zeros(256, dtype=float)
    count = np.zeros(256, dtype=int)

    height, width = img.shape
    total_pixels = height * width
    for h in range(height):
        for w in range(width):
            count[img[h, w]] += 1

    for k in range(256):
        for j in range(k):
            map[k] += 255 * count[j] / total_pixels

    new_img = np.zeros_like(img)
    for h in range(height):
        for w in range(width):
            new_img[h, w] = int(map[img[h, w]])

    return new_img
```

Resulting image:




Number of pixels
Grayscale intensity