電腦視覺（一）Homework3

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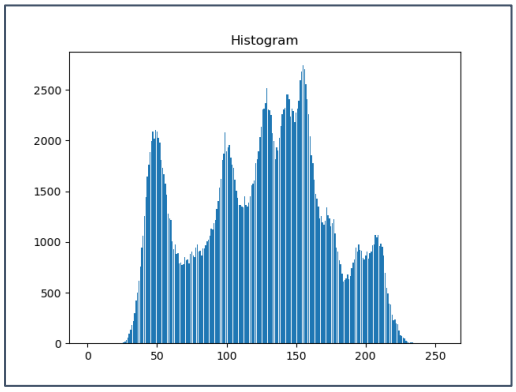
1. Histogram image



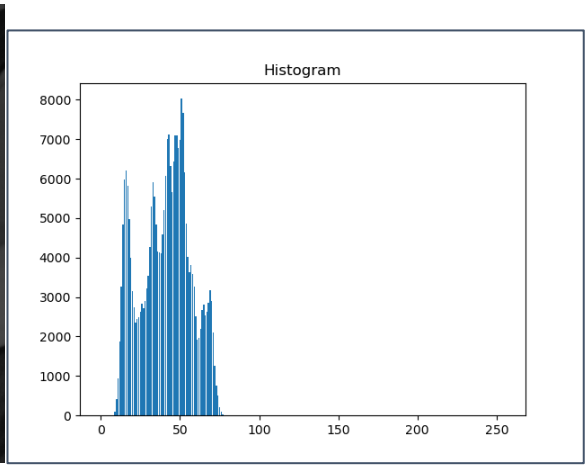
原圖用與前次作業相同的程式碼求出直方圖

```
def histogram(img):
    arr = np.zeros(256, np.int64)
    for i in range(img.shape[0]):
        for j in range(img.shape[1]):
            arr[img[i][j]] += 1 #arr存各intensity各數

    Intensity = np.arange(0, 256, 1)
    plt.bar(Intensity, arr)
    plt.title("Histogram")
    plt.show()
```

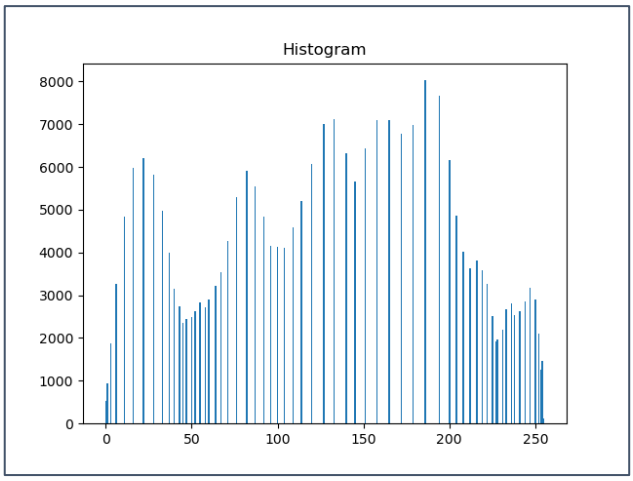
用一個 arr 陣列在相對應的格子中記數。

2. Histogram image(Intensity divide by 3)



將每個 pixel 的灰階值都除以 3 求整數，呼叫前面寫好的函式再次輸出灰階圖。

3. Histogram Equalization



```python
def histogram_equalize(img):
    arr = np.zeros(256, np.int64)
    #arr2 = np.zeros(256, np.int64)
    arr_CDF = np.zeros(256, np.float16)
    Area =img.shape[0]*img.shape[1]
    #histogram first
    for i in range(img.shape[0]):
        for j in range(img.shape[1]):
            arr[img[i][j]] += 1

    for i in range (1,255):
        arr[i]+=arr[i-1]
        arr_CDF[i]=arr[i]/Area

    for i in range(img.shape[0]):
        for j in range(img.shape[1]):
            img[i][j]=arr_CDF[img[i][j]]*255
    # #he-cdf
    # for i in range(img.shape[0]):
    #     for j in range(img.shape[1]):
    #         arr2[img[i][j]] += 1

    # for i in range (1,255):
    #     arr2[i]+=arr2[i-1]
    #     arr_CDF[i]=arr2[i]/Area

    #drawing
    Intensity = np.arange(0, 256, 1)
    plt.bar(Intensity, arr_CDF)
    plt.title("Histogram3")#CDF of original hist
    plt.show()
    histogram(img)
    cv2.imwrite('histogram_eq.png',img)
```

加入一個 arr_CDF 去紀錄隨灰階值增加所累積的 pixel 各數，並且除以總像素數得到其加權值。最後依照公式乘上 255，以完成 histogram equalize。

中間註解掉的部分為撿球求出等化後的 CDF 直方圖，為直角三角形。