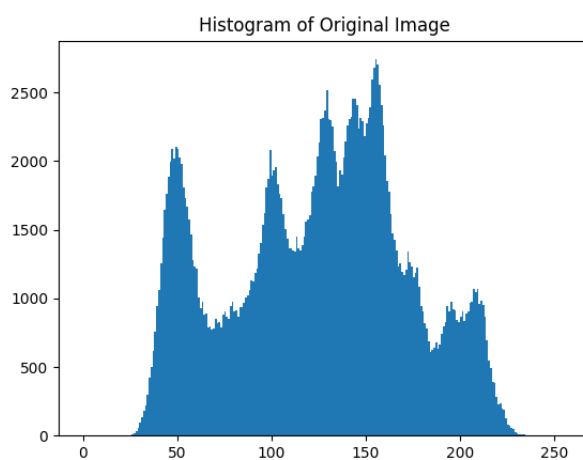# Computer Vision 2019 Fall

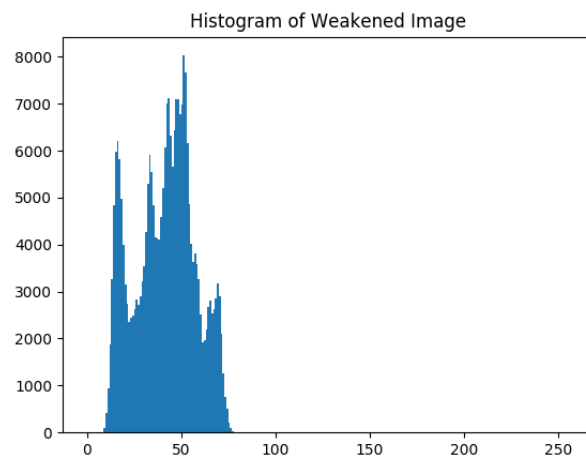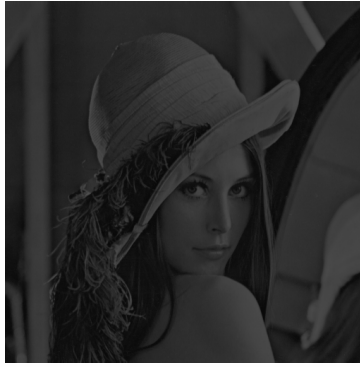## Homework #3

B06902059 資工三 謝宜儒

Description

This homework focuses on some pixel-wise manipulations on an image and plotting the histograms of the resulting images.

Results

(a) original image and its histogram
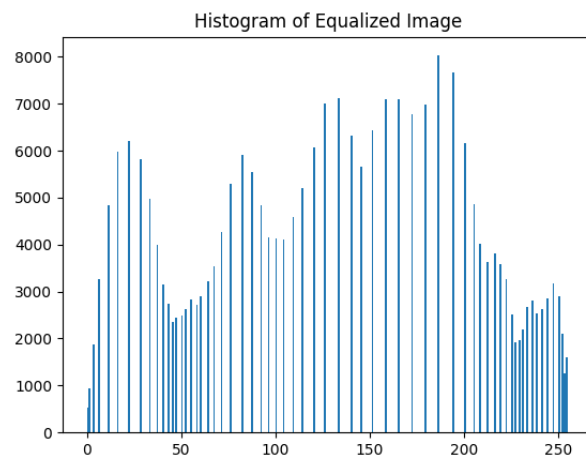

(b) image with intensity divided by 3 and its histogram

Histogram of Weakened Image

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

Histogram of Equalized Image

Source Code (fragment)

```python
# Plot the histogram of an image
def plot_hist(img, title, filename):
  plt.hist(img.flatten(), bins = range(0, 257))
  plt.title(title)
  plt.savefig(filename)
  plt.show()

# (a) original image and its histogram
def generate_original(img):
  cv2.imwrite('01_original.bmp', img)
  cv2.imshow('Original Image', img)
  cv2.waitKey(0)
  cv2.destroyAllWindows()
  plot_hist(img, 'Histogram of Original Image', '01_original_hist')

# (b) image with intensity divided by 3 and its histogram
def generate_weakened(img):
  weakened_img = img // 3
  cv2.imwrite('02_weakened.bmp', weakened_img)
  cv2.imshow('Weakened Image', weakened_img)
  cv2.waitKey(0)
  cv2.destroyAllWindows()
  plot_hist(weakened_img, 'Histogram of Weakened Image', '02_weakened_hist')

# (c) image after applying histogram equalization to (b) and its histogram
def generate_equalized(img):
  n = length * width
  weakened_img = img // 3
  equalized_img_flatten = np.copy(weakened_img.flatten())
  pixels_hist = np.zeros(256)
  for i in range(length):
    for j in range(width):
      pixels_hist[weakened_img[i][j]] += 1
  pre_sum = np.cumsum(pixels_hist)
  for i in range(0, 256):
    equalized_img_flatten[np.argwhere(weakened_img.flatten() == i)] = \
pre_sum[i] * 255 // n
  equalized_img = equalized_img_flatten.reshape(length, width)

  cv2.imwrite('03_equalized.bmp', equalized_img)
  cv2.imshow('Equalized Image', equalized_img)
  cv2.waitKey(0)
  cv2.destroyAllWindows()
  plot_hist(equalized_img, 'Histogram of Equalized Image',
'03_equalized_hist')
```

To run the source code, type the following line in a terminal:

```
python3 hw3.py [input image] [problem number]
```

where in this homework, the input image is **lena.bmp** and the problem numbers are **1 ~ 3** .