**Computer Vision HW1 Report** R06922030 傅敏桓

**Environment**: Python 3.6 with OpenCV

**Benchmark**: lena.bmp

**Part 1: Write a program to manipulate lena.bmp**

**Usage:** $> python3 hw1.py

**Description**:

(a) Upside-down: assign pixel (ImgHeight-1-i, j) to pixel (i, j) in the new image

(b) Right-side-left: assign pixel (i, ImgWidth-1-j) to pixel (i, j) in the new image

(c) Diagonally mirroring: assign pixel (ImgHeight-1-i, ImgWidth-1-j) to pixel (i, j) in the new image

**Principal code fragment:**

```
# Upside-down
for i in range(img.shape[0]):
    for j in range(img.shape[1]):
        new_img[i, j] = img[img.shape[0] - 1 - i, j]

# Right-side-left
for i in range(img.shape[0]):
    for j in range(img.shape[1]):
        new_img[i, j] = img[i, img.shape[1] - 1 - j]

# Diagonally mirroring
for i in range(img.shape[0]):
    for j in range(img.shape[1]):
        new_img[i, j] = img[img.shape[0] - 1 - i, img.shape[1] - 1 - j]
```

**Resulting images:**

(a) Upside-down

(b) Right-side-left

(c) Diagonally mirrored

**Part2: Use Photoshop to manipulate lena.bmp**

**Image processing software:** Microsoft PowerPoint 2016

**Task Description:**

(a) Rotate lena.im 45 degrees clockwise

(b) Shrink lena.im in half

(c) Binarize lena.im at 128 to get a binary image

**Method Description:**

The above tasks can be carried out with Microsoft PowerPoint basic functionalities. First import lena.bmp.

(a) Rotation: 右鍵 → 設定圖片格式 → 大小與屬性 → 旋轉 → 輸入 45°

(b) Shrink: 右鍵 → 設定圖片格式 → 大小與屬性 → 調整高度 → 輸入 50% (鎖定長寬比)

(c) Binarization: 右鍵 → 設定圖片格式 → 圖片 → 重新著色 → 黑白 50%

After manipulation, save image by right-clicking and click 另存為圖片.

**Resulting images:**

(a) 45 degrees clockwise rotation

(c) Binarized

Original lena.bmp

(b) Shrinked lena.bmp (in half)