

# Computer Vision 2019 Fall

## Homework #1

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### Description

This homework focuses on some basic operations on an image, which is done by simple programming or software operations.

### Results

#### Part 1

(a) upside-down lena.bmp



(b) right-side-left lena.bmp



(c) diagonally-mirrored lena.bmp



## Part 2

(d) rotate lena.bmp 45 degrees clockwise



(e) shrink lena.bmp in half



(f) binarize lena.bmp at 128 to get a binary image



## Source Code

For part 1, the resulting images were generated by the following code:

```
!!!!
```

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```
import sys
import numpy as np
import cv2

# Upside-down image
def plot1(img):
    upside_down_img = img.copy()
    for i in range(length):
        for j in range(width):
            upside_down_img[i][j] = img[length - 1 - i][j]

    cv2.imwrite('01_upside_down.bmp', upside_down_img)
    cv2.imshow('Upside-down Lena', upside_down_img)
    cv2.waitKey(0)
    cv2.destroyAllWindows()

# Right-side-left image
def plot2(img):
    right_side_left_img = img.copy()
    for i in range(length):
        for j in range(width):
            right_side_left_img[i][j] = img[i][width - 1 - j]

    cv2.imwrite('02_right_side_left.bmp', right_side_left_img)
    cv2.imshow('Right-side-left Lena', right_side_left_img)
    cv2.waitKey(0)
    cv2.destroyAllWindows()

# Diagonally mirrored image
def plot3(img):
    diagonally_mirrored_img = img.copy()
    for i in range(length):
        for j in range(width):
            diagonally_mirrored_img[i][j] = img[j][i]

    cv2.imwrite('03_diagonally_mirrored.bmp', diagonally_mirrored_img)
    cv2.imshow('Diagonally mirrored Lena', diagonally_mirrored_img)
    cv2.waitKey(0)
    cv2.destroyAllWindows()

if __name__ == '__main__':
    # Read the original image
    img = cv2.imread('lena.bmp')
    length = img.shape[0]
    width = img.shape[1]

    if sys.argv[1] == '1':
```

```
    plot1(img)
elif sys.argv[1] == '2':
    plot2(img)
elif sys.argv[1] == '3':
    plot3(img)
else:
    print("Invalid argument.\nUsage: python3 hw1.py [problem number]")
```

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

```
python3 hw1.py [problem number]
```

## Software

For part 2, the resulting images are generated using Photoshop.

## Reference

<https://blog.gtwang.org/programming/opencv-basic-image-read-and-write-tutorial/>