Computer Vision Homework 1

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Description: I used Anaconda jupyter to complete this homework.
Using Numpy and PIL to store and address every pixel.
Part 1: just exchange the order of corresponding pixel.
Part 2: call functions in PIL.

1. (a) upside-down lena.bmp

Code:

```
from PIL import Image
import numpy as np
```

```
# upside-down
img = np.array(Image.open(r"C:\Users\Joey_\
img = img[::-1] #
out_img = Image.fromarray(img)
out_img.show()
```

(b) right-side-left lena.bmp

Code:

```
In [3]: # right-side-left
        img = np.array(Image.open(r"C:\Users\Joey_\Google
        for i in range(0, 512):
            img[i] = img[i][::-1]
        out_img = Image.fromarray(img)
        out_img.show()
```

(c) diagonally flip lena.bmp

Code:

```
In [4]: # diagonally flip upper left to bottom right
        img = np.array(Image.open(r"C:\Users\Joey_\Google 雲端硬碟\
        for i in range(0, 512):
            for j in range(i,512):
                img[i][j], img[j][i] = img[j][i], img[i][j]
        out_img = Image.fromarray(img)
        out_img.show()
```

2. (d) rotate lena.bmp 45 degrees clockwise

Code:

```
In [5]: # rotate lena.bmp 45 degrees clockwise
        img = Image.open(r"C:\Users\Joey_\Google 雲端硬
        img = img.rotate(-45)
        img.show()
```

(e) shrink lena.bmp in half

```
In [6]: # shrink lena.bmp in half
        img = Image.open(r"C:\Users\Joey_\Google 雲
        img.thumbnail((256,256),Image.ANTIALIAS)
        img.show()
```

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

Code:

```
In [8]: # binarize lena.bmp at 128 to get a b
        img = np.array(Image.open(r"C:\Users\
        for i in range(0, 512):
            for j in range(0, 512):
                if (img[i][j] >= 128):
                    img[i][j] = 255
                else:
                    img[i][j] =0
        out_img = Image.fromarray(img)
        out_img.show()
```