a. 採用將上下 rows 對調的作法

```
# upside-down
im_a = im.copy()
for i, rows in enumerate(im):
    im_a[511-i] = rows
imageio.imwrite("lena_a.bmp",im_a)
```

b. 將 columns 對調

```
# right-side-left
im_b = im.copy()
for i in range(512):
    for j in range(512):
        im_b[i][j] = im[i][511-j]
imageio.imwrite("lena_b.bmp",im_b)
```

c. 將圖片的 row, column 互換 e.g.將 newimg[5][2]=img[2][5]

```
# diagonally flip
im_c = im.copy()
for i in range(512):
    for j in range(512):
        im_c[i][j] = im[j][i]
imageio.imwrite("lena_c.bmp",im_c)
```

d.利用 PIL 的 rotate

```
# rotate clockwise for 45 degree
rotated = im.rotate(-45)
rotated.save("lena_d.bmp")
```

e.利用 PIL 的 resize

```
# shrink lena.bmp in half
size = int(im.size[0]/2)
shrinked = im.resize((size, size))
shrinked.save("lena_e.bmp")
```

f.利用 PIL 的 convert 並設立 threshold

```
# binarize lena.bmp at 128 to get a binary image
thresh = 128
fn = lambda x : 255 if x >= thresh else 0
binary = im.convert('L').point(fn, mode='1')
binary.save("lena_f.bmp")
```