Assignment 1
2017113547 이정근

소스코드 : rotation_bw.py

```
import cv2
import numpy as np

def transform(img, angle):   # forward transformation
    height, width = img.shape
    result = np.zeros((height, width), np.uint8)   # result image

    affine = np.array([[np.cos(np.radians(angle)), -np.sin(np.radians(angle)), 0],
                       [np.sin(np.radians(angle)), np.cos(np.radians(angle)), 0],
                       [0, 0, 1]])   # Affine transformation matrix

    for x in range(width):
        for y in range(height):
            p = affine.dot(np.array([x, y, 1]))

            xp = int(p[0])
            yp = int(p[1])

            if 0 <= yp < height and 0 <= xp < width:
                result[yp, xp] = img[y, x]
    return result

def backward_map(in_image, out_image, angle):
    height, width = out_image.shape
    result = np.zeros((height, width), np.uint8)

    affine = np.array([[np.cos(np.radians(angle)), -np.sin(np.radians(angle)), 0],
                       [np.sin(np.radians(angle)), np.cos(np.radians(angle)), 0],
                       [0, 0, 1]])   # Affine transformation matrix

    inverse_affine = np.linalg.inv(affine)

    for x in range(width):
        for y in range(height):
```

```
                if out_image[y][x] == 0:
                    p = inverse_affine.dot(np.array([x,y,1]))

                    xp = int(p[0])
                    yp = int(p[1])

                    if 0 <= yp < height and 0 <= xp < width:
                        result[y, x] = in_image[yp][xp]
                else:
                    result[y][x] = out_image[y][x]
    return result

in_image = cv2.imread('dgu_gray.png', 0)  # img2numpy

out_image = transform(in_image, 20)

backward_mapped_image = backward_map(in_image, out_image, 20)

cv2.imshow('Input Image', in_image)
cv2.imshow('Result Image', out_image)
cv2.imshow('Backward Mapped Image', backward_mapped_image)

cv2.imwrite('dgu_gray_rotate.png', out_image)  # save result img

cv2.imwrite('dgu_gray_backward_mapped.png', backward_mapped_image)

cv2.waitKey()
```

결과 사진

dgu_gray_backward_mapped.png

dgu_gray.png

dgu_gray_rotate.png