Computer-vision-Homework 10

Zero Crossing Edge Detection

Due date：21 Dec 2021

Programming language: python 3.9.9

Import lib:

- Opencv: to read and write the image file

Original image: lena.bmp

[512(width),512(height),1channel(cv2.IMREAD_GRAYSCALE)]

Code explanation:

First we need to calculate the Laplace operator with different mask. And extend again with the results of the operator, and detect the neighbors of each pixel to form the final result.

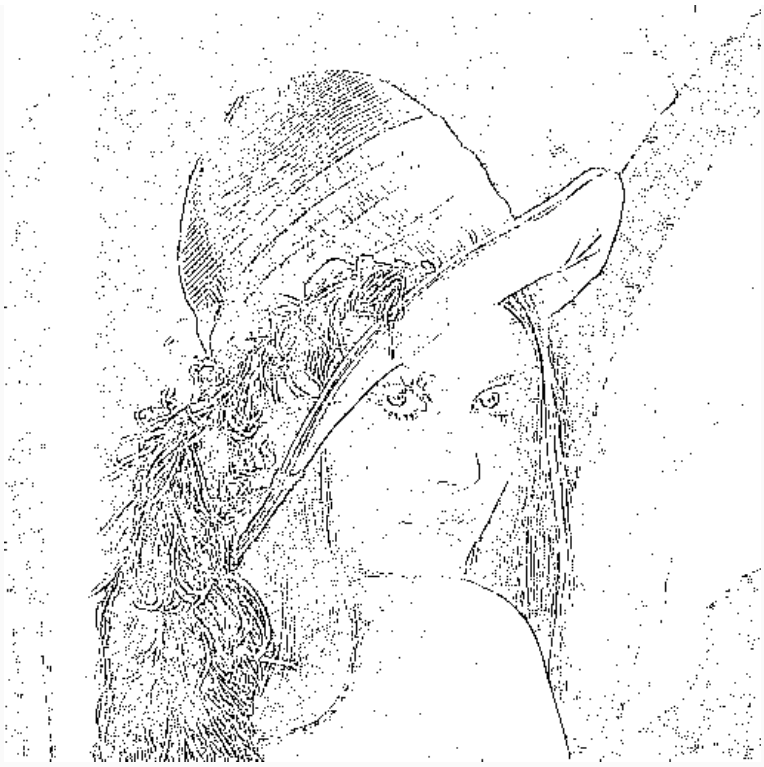
So the only different between each images are the mask and the threshold.

```
def Laplcian(image, mask, threshold):
    imageBoarded = cv2.copyMakeBorder(image, int(len(mask) / 2), int(len(mask) / 2), int(len(mask[0]) / 2), int(len(mask[0]) / 2), cv2.BORDER_REFLECT)  # Extend image borders
    MaskPixel = image.copy()
    for i in range(len(image)):
        for j in range(len(image[i])):
            sum = 0
            for m in range(len(mask)):
                for n in range(len(mask[m])):
                    sum += mask[m][n] * int(imageBoarded[i + m][j + n])
                    if sum >= threshold:
                        MaskPixel[i][j] = 2
                    elif sum <= -threshold:
```

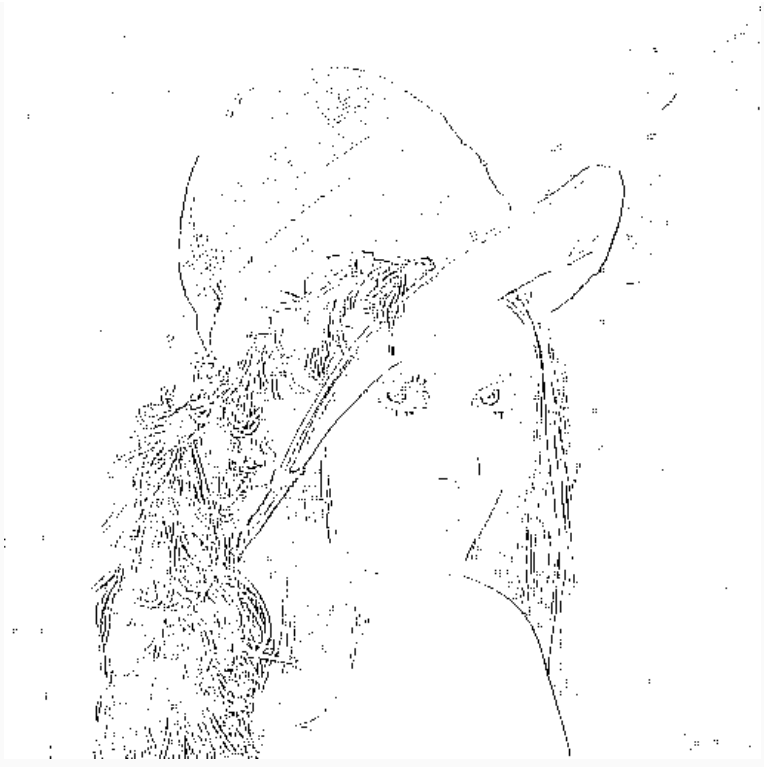
```
                MaskPixel[i][j] = 0
            else:
                MaskPixel[i][j] = 1
    BorderExtendMaskPixel = cv2.copyMakeBorder(MaskPixel, 1,
1, 1, 1, cv2.BORDER_REFLECT)  # Extend image borders
    ImageReturn = image.copy()
    crossmask = [[0, 1], [0, -1], [1, 0], [-1, 0], [1, 1],
[1, -1], [-1, 1], [-1, -1]]
    for i in range(len(image)):
        for j in range(len(image[i])):
            ImageReturn[i][j] = 255
            if BorderExtendMaskPixel[i + 1][j + 1] != 2:
                continue
            for position in crossmask:
                a, b = position
                if BorderExtendMaskPixel[i + 1 + a][j + 1 + b]
== 0:
                    ImageReturn[i][j] = 0
                    break
    return ImageReturn
```

(a) Laplace Mask1 (0, 1, 0, 1, -4, 1, 0, 1, 0): 15

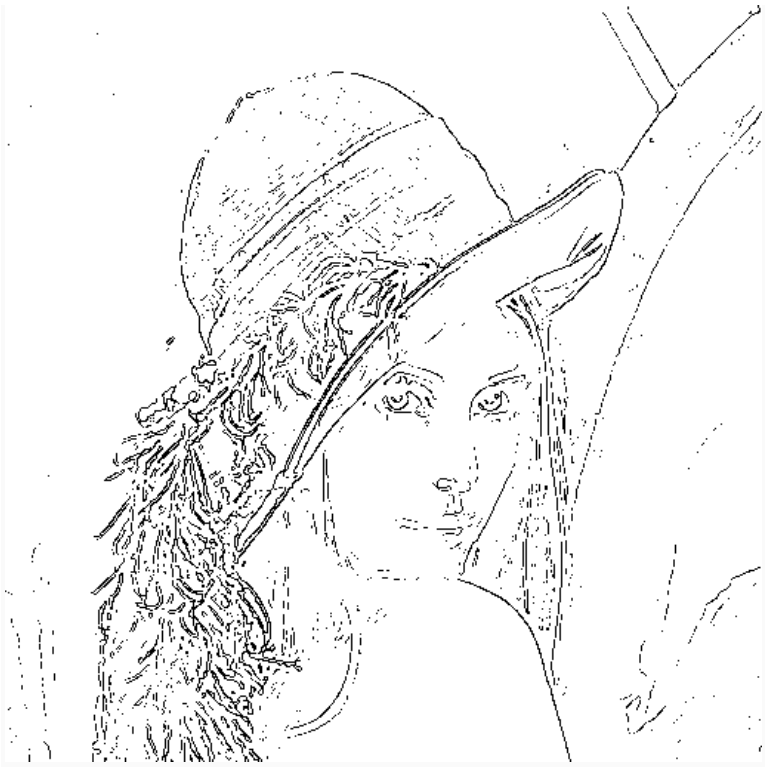
- (b) Laplace Mask2 (1, 1, 1, 1, -8, 1, 1, 1, 1): 15



- (c) Minimum variance Laplacian: 20



- (d) Laplace of Gaussian: 3000



- (e) Difference of Gaussian: 1