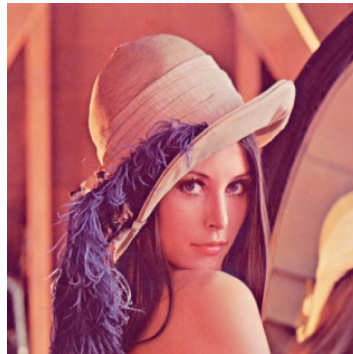# Programming Assignment #2
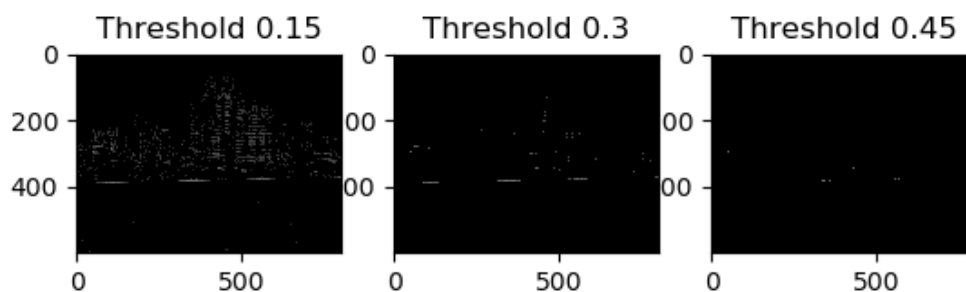
Task #1
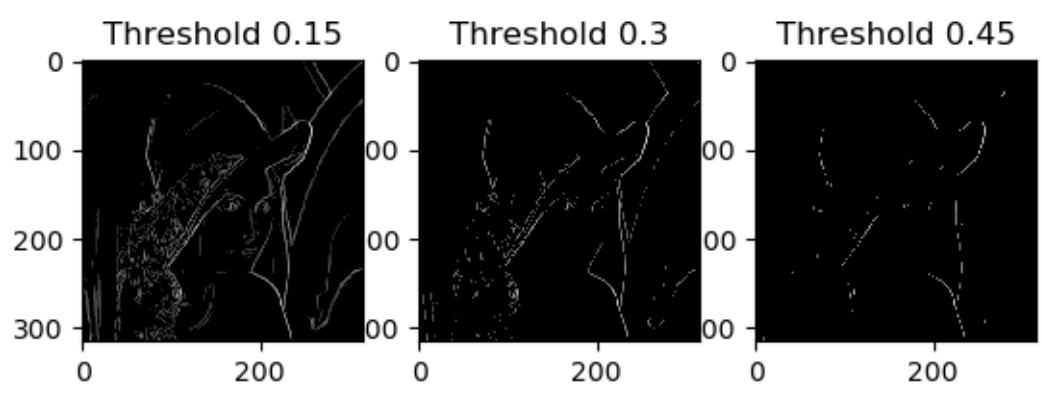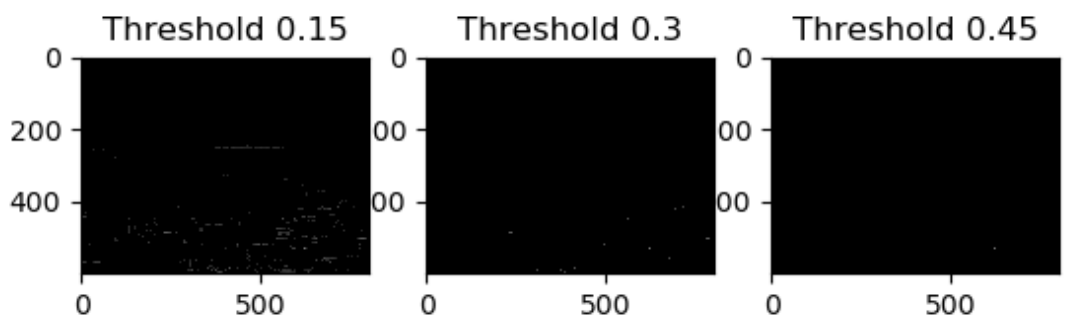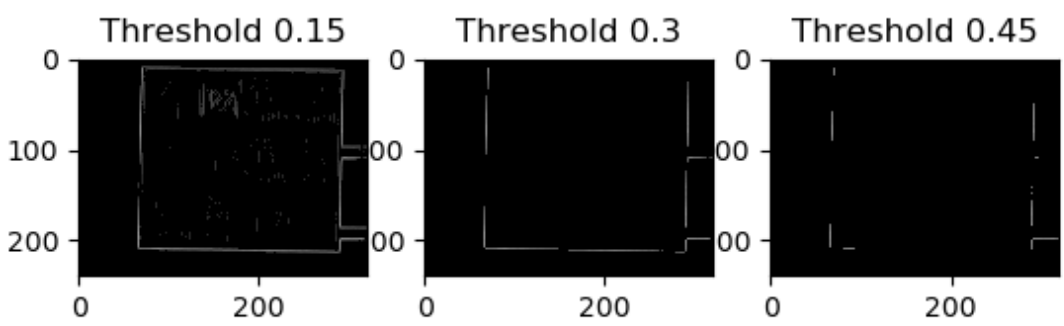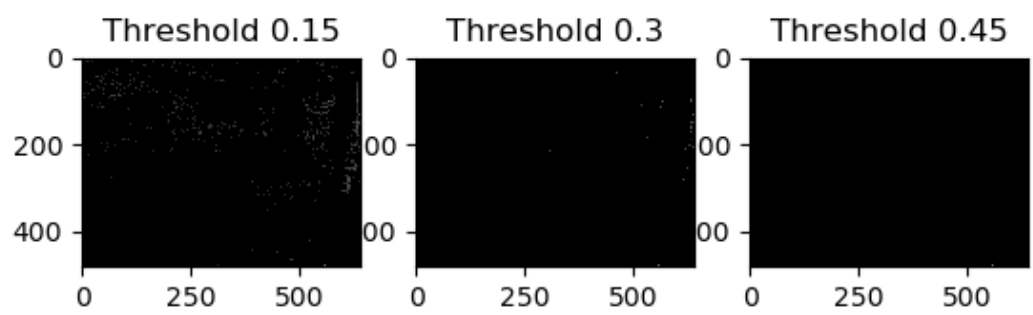
1. origin image (the order is 123)
45

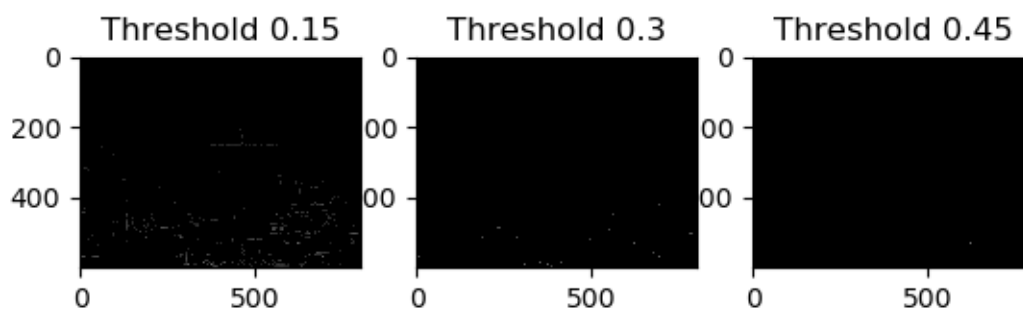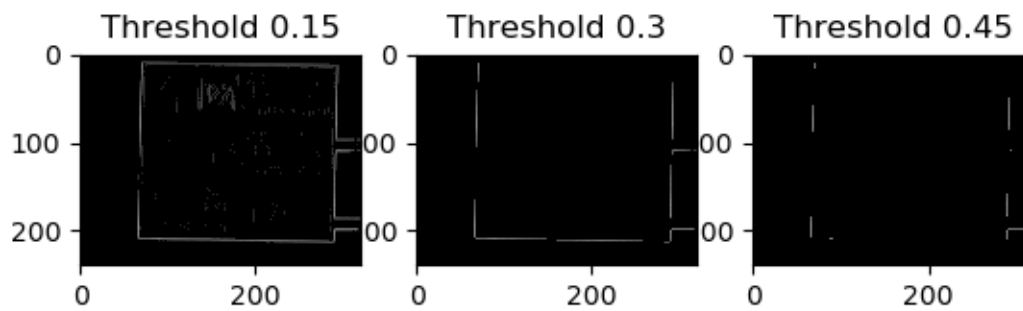**2. I use the two gradient filters: Prewitt and Sobel. The threshold sets 0.15,0.3,0.45**

- Prewitt

Threshold 0.15   Threshold 0.3   Threshold 0.45
Threshold 0.15   Threshold 0.3   Threshold 0.45
Threshold 0.15   Threshold 0.3   Threshold 0.45
Threshold 0.15   Threshold 0.3   Threshold 0.45
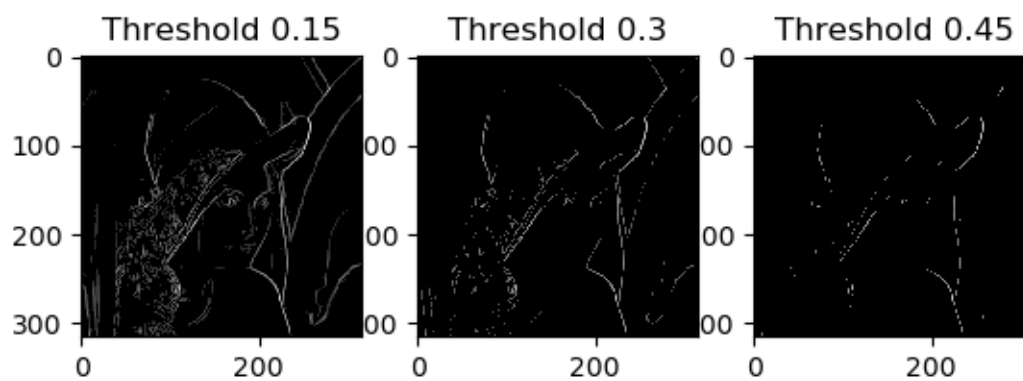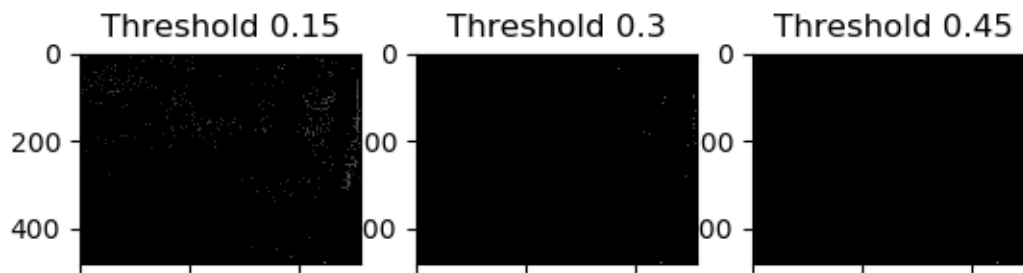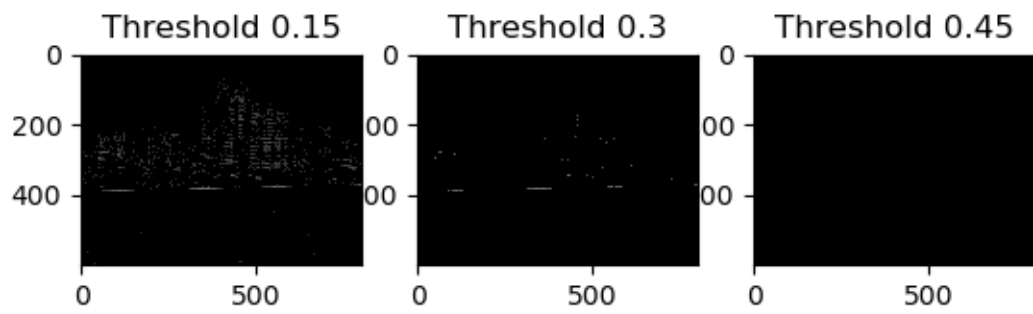
- Sobel

3. LoG
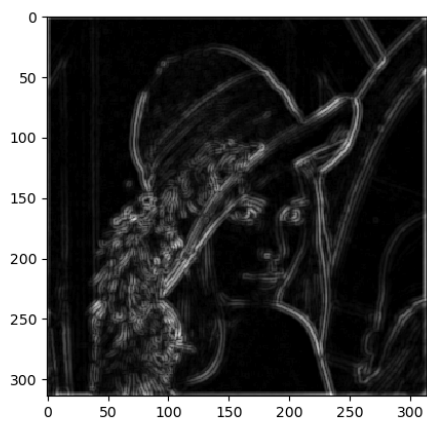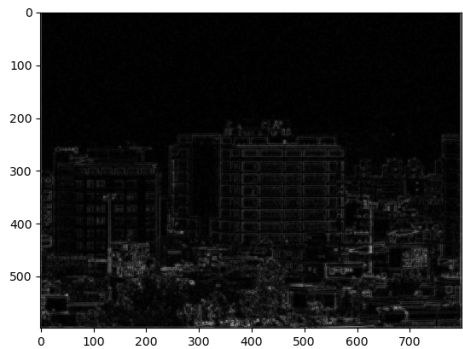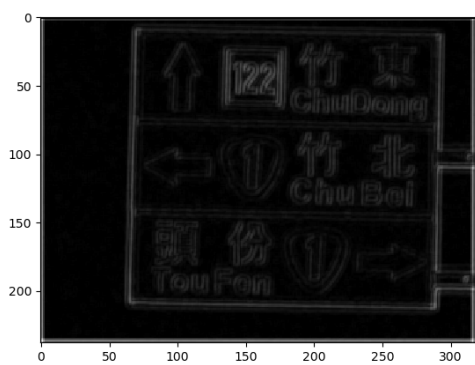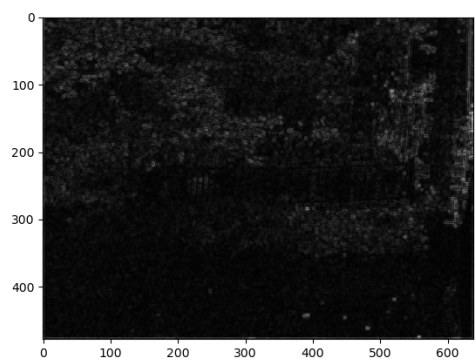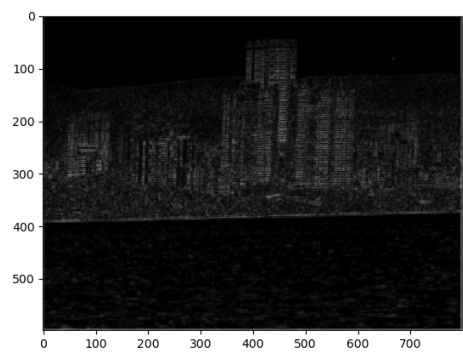
4. with preprocessing vs without preprocessing (the left image is preprocessing image and the right is not)

  - Gaussian blur

  -

contrast stretch

5. observation

- Prewitt operator is similar to the Sobel operator and is used for detecting vertical and horizontal edges in images. However, unlike the Sobel, this operator does not place any emphasis on the pixels that are closer to the center of the mask
- The threshold decides whether edges are present or not at an image point. If the threshold is lower, the more edges will be detected, 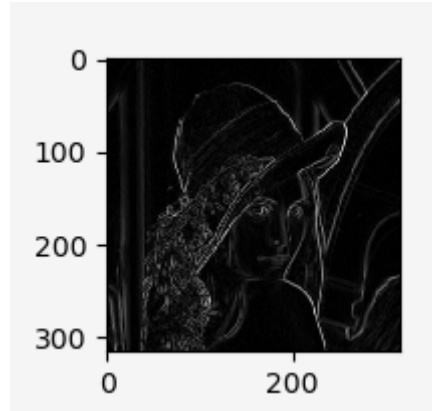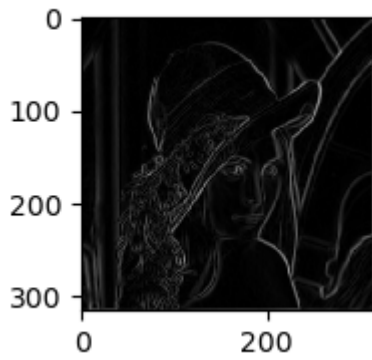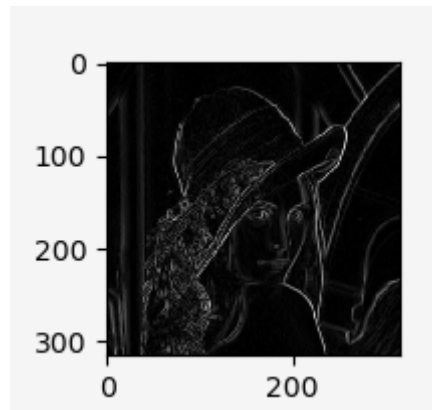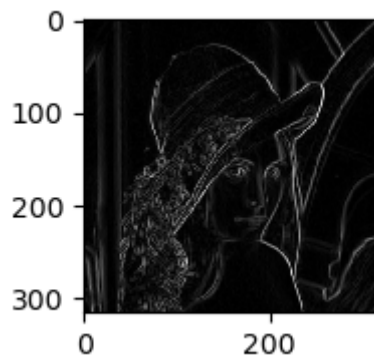but the image may include more irrelevant features. If the threshold is higher, the subtle edge will be missed or result in fragmented edges
- Using a Gaussian Blur filter before edge detection can reduce the noise in the image, which improves the result of edge-detection. This approach is commonly referred to as LoG
- Edge detection requires identifying the boundaries between object and the background of an image, whereas contrast adjustment ensures the object and the background to be distinguished. This relation leads to a decision that, the more accurate will be the contrast of an image
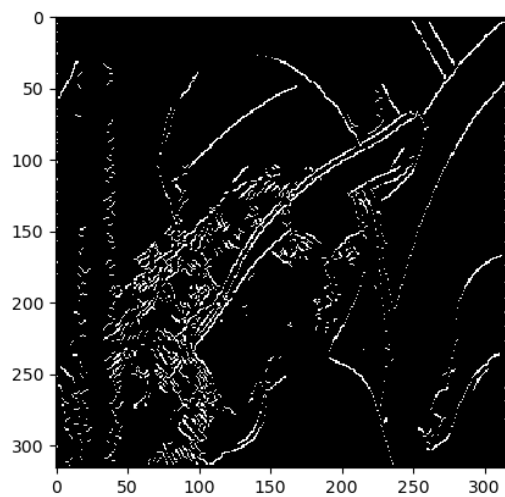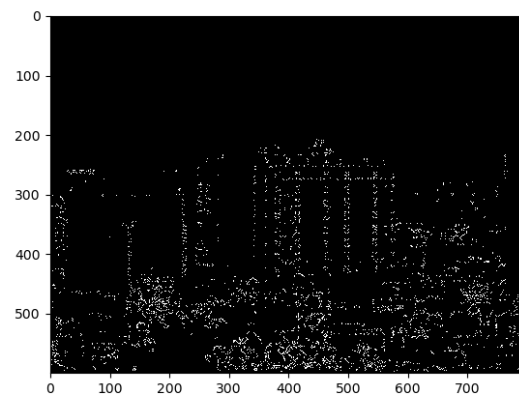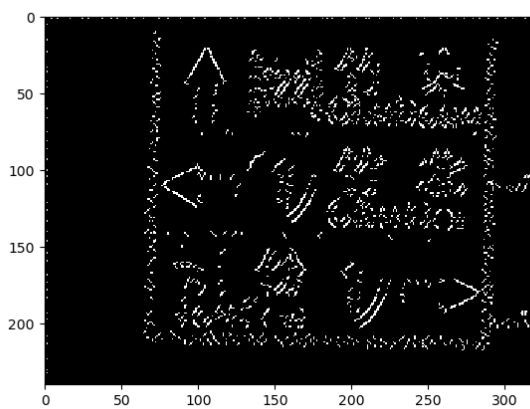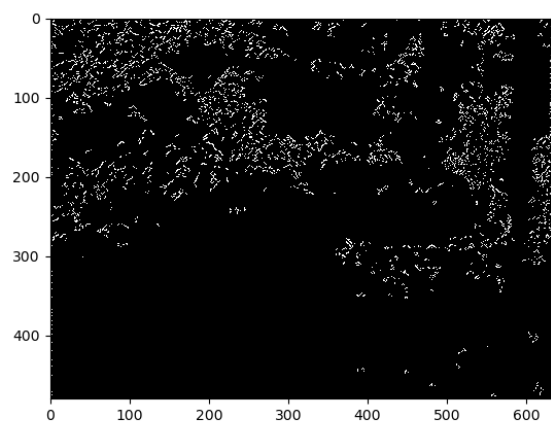
Task #2

I set the high/low threshold by ratio.
high_threshold=max_pixel_value * high_threshold_ratio
low_threshold=high_threshold * low_threshold_ratio

1.Compare the results of those of task #1
high_threshold_ratio=0.3, low_threshold_ratio=0.2
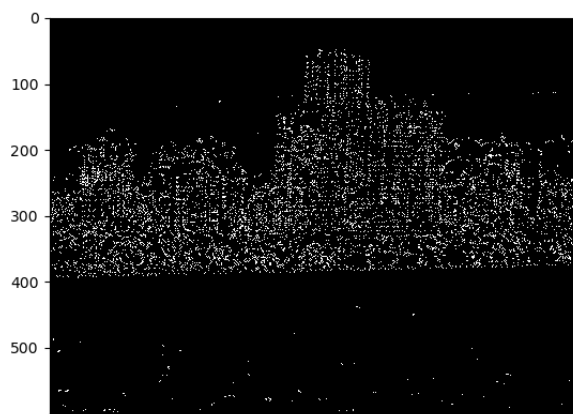
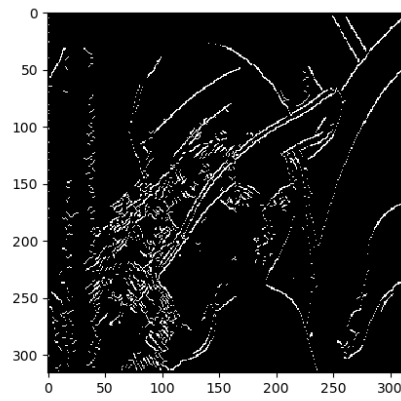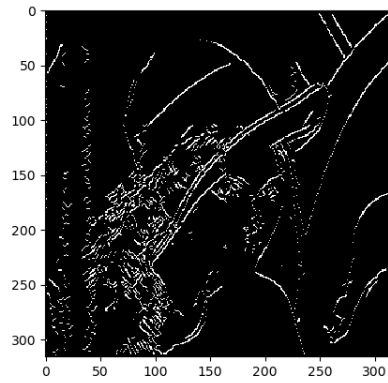## 2. study the effect of the two thresholds

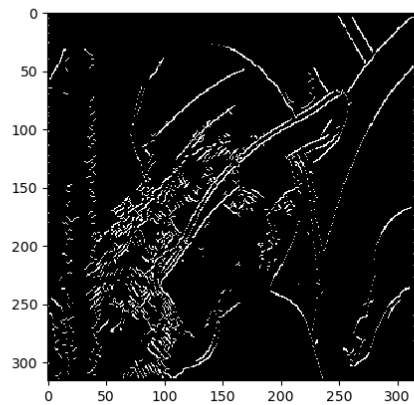high_threshold_ratio=0.2   vs   high_threshold_ratio=0.2
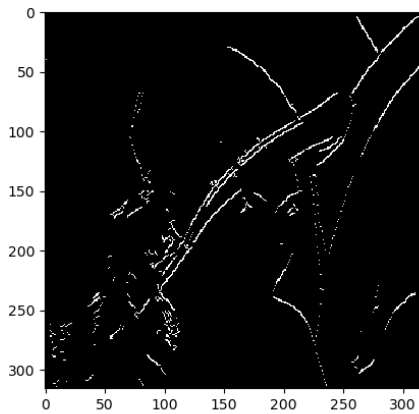low_threshold_ratio=0.3   low_threshold_ratio=0.15

high_threshold_ratio=0.4   vs   high_threshold_ratio=0.2
low_threshold_ratio=0.15   low_threshold_ratio=0.15

3.observation

- Study the effect of two thresholds: If the threshold is too high, it will miss some important message. Some edges may not connect. If the threshold set too low, it will take the details too important.
- Compare the results of those of task #1: the edges of canny detector are thinner , clear and fewer false edges than task #1 because canny do the non-max suppression and hysteresis process to remove the weak edge point and false edges.

Code List

- main.py