

# Machine Vision

Homework#6

Deadline: 2024/06/19 23:59:59

Robot Vision Lab (Room 1421)

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# HW#6

- **Canny Edge Detection**
  1. Noise Reduction
  2. Find the intensity gradient of the image
    - Sobel operator
  3. Non-maximum suppression
  4. Double threshold
  5. Edge Tracking by Hysteresis

## 1. Noise Reduction

- Use the Gaussian filter to remove the noise
- Chose the kernel size yourself

## 2. Finding Intensity Gradient of the Image

- Use operator to get image gradient in  $x$  and  $y$  directions.
- Then, the magnitude  $G$  and the slope  $\theta$  of the gradient are calculated

### Sobel

-1	0	1
-2	0	2
-1	0	1

G<sub>x</sub>

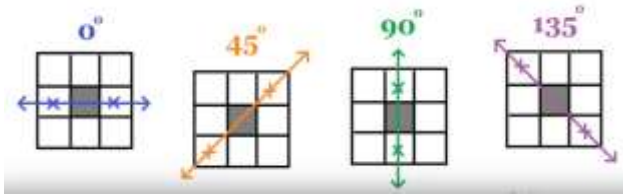
-1	-2	-1
0	0	0
1	2	1

G<sub>y</sub>

$$G = \sqrt{G_x^2 + G_y^2}$$
$$\theta = \arctan\left(\frac{G_y}{G_x}\right)$$

### 3. Non-maximum suppression.

- Consider in 4 directions and compare with neighbor pixels



### 4. Double threshold

- Used to determine strong edge and weak edge
- $>$  high threshold : strong edge
- $>$  high threshold &&  $<$  low threshold : weak edge

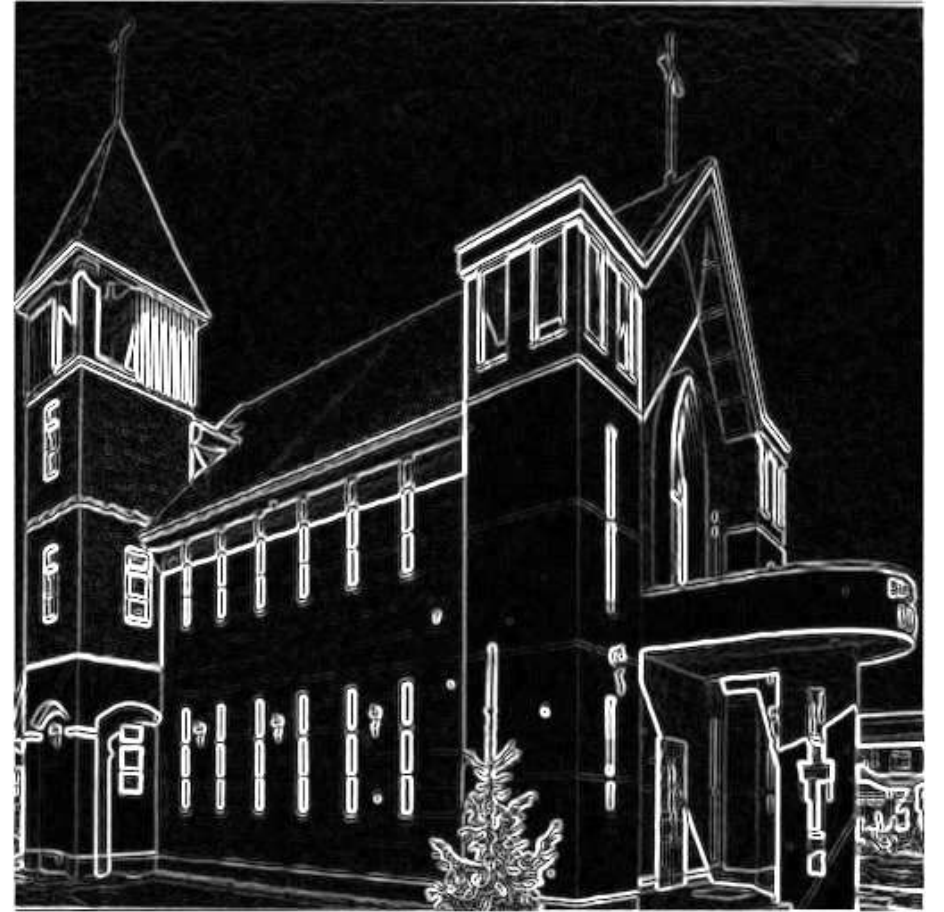
### 5. Edge Tracking by Hysteresis

- Connect all weak edges in the extension direction of the strong edges

# IMAGES



# EXAMPLE



# HW#6

- Report
  - Student ID
  - Name
  - Describe the main part of your method or explain your code
  - 3 result images
  - Describe the result images what you observe

# HW#6

- Rules in using C/C++ OpenCV Lib

- Use [OpenCV-2.x](#) version

- **Allow use:**

1. Read, save, show image (cvLoadImage, cvShowImage, ...)
2. Define image (Mat)
3. Get image size (cvSize, cvGetSize)

- **Not Allow use:**

1. Cannot use the function of Lib to do the main part of homework.

Example: Canny, threshold

**Other libs also not allow use to do the main part of homework**



# HW#6

- Rules in using Python OpenCV Lib

- Allow use:

1. Read, save, show image (cv2.imread, cv2.imshow, ...)
2. Define image
3. Get image size

- Not Allow use:

1. Cannot use the function of Lib to do the main part of homework.

Example: cv.filter2D, cv.medianBlur, cv.GaussianBlur, cv.blur

Other libs also not allow use to do the main part of homework

# HW#6

- Grade
  - Program(80%)
    - Find the intensity gradient of the image (20%)
    - Non-maximum suppression (20%)
    - Double threshold (20%)
    - Edge Tracking by Hysteresis (20%)
  - Report(20%)

# HW#6

- Folder Structure

- There are 3 images in the results folder.
- Write homework on the one program.

## Python

```
112598008_hw6/  
├── images/  
│   ├── img1.jpg  
│   ├── img2.jpg  
│   └── img3.jpg  
├── results/  
│   ├── img1_sobel.jpg  
│   ├── img2_sobel.jpg  
│   └── img3_sobel.jpg  
├── 112598008_hw6.py  
├── 112598008_hw6.pdf  
└── Readme.txt (Optional)
```

## C/C++

```
112598008_hw6/  
├── project_hw6/  
│   ├── images/  
│   │   ├── img1.jpg  
│   │   ├── img2.jpg  
│   │   └── img3.jpg  
│   ├── results/  
│   │   ├── img1_soble.jpg  
│   │   ├── img2_soble.jpg  
│   │   └── img3_soble.jpg  
│   ├── include/  
│   │   └── func.h  
│   ├── func.cpp  
│   └── main.cpp  
├── 112598008_hw6.pdf  
└── Readme.txt (Optional)
```

# HW#6

- Please compress your files.
  - Example: 112598008\_hw6.zip
- Deadline: 2024/06/19 23:59:59
  - For each hour late, 10% of the total score will be deducted.
- Don't share your code and your report with other students.  
Do it by yourself.