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 $\boldsymbol{G}$ and the slope $\boldsymbol{\theta}$ of the gradient are calculated

Sobel

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

Gx

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

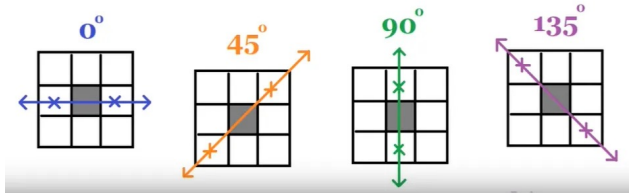
Gy

$$G = \sqrt{G_x^2 + G_y^2}$$

$$\theta = arctan\left(\frac{G_y}{G_x}\right)$$

3. Non-maximum suppression.

- Consider in 4 directions and compare with neighbor pixels



4. Double threshold

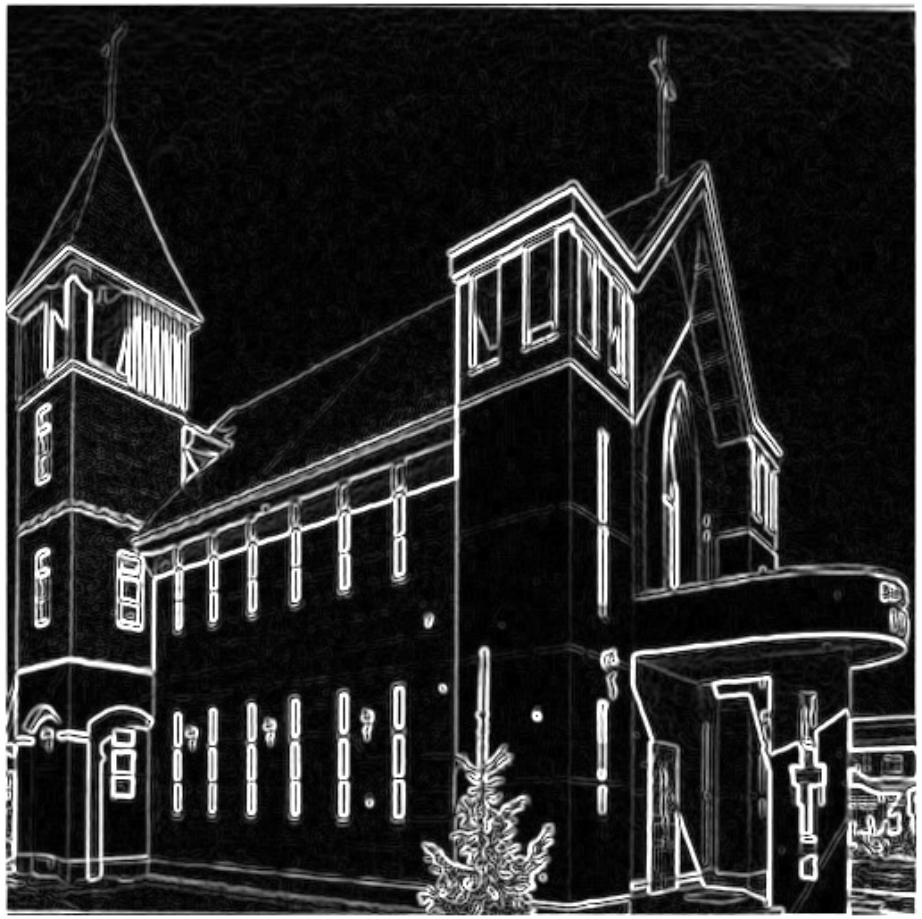
- Used to determine strong edge and weak edge
- > high threshold : strong edge
- > high threshold && < low threshold : weak edge

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.