

# Machine Vision

Homework#5

Deadline: 2024/05/29 23:59:59

Robot Vision Lab (Room 1421)

TAs: 魏士涵 t112598058@ntut.edu.tw

賴靖嫻 t112598008@ntut.edu.tw

# HW#5

- Image filtering

1. Implement Mean Filter with  $3 \times 3$  and  $7 \times 7$  mask.
2. Implement Median Filter with  $3 \times 3$  and  $7 \times 7$  mask.
3. Implement Gaussian 2D Filter with  $5 \times 5$  mask.
  - Define your  $\sigma$  and describe your Gaussian kernel.

✂ Don't forget the zero padding, check your image size result

# Mean Filter

8	10	21	17	35
2	43	15	72	21
30	94	55	43	74
36	28	69	88	56
45	75	42	47	20

# Mean Filter

0	0	0			
0	8	10	21	17	35
0	2	43	15	72	21
	30	94	55	43	74
	36	28	69	88	56
	45	75	42	47	20

×

1/9	1/9	1/9
1/9	1/9	1/9
1/9	1/9	1/9

=

7				

$$\begin{aligned} &0 \times 1/9 + 0 \times 1/9 + 0 \times 1/9 + \\ &0 \times 1/9 + 8 \times 1/9 + 10 \times 1/9 + \\ &0 \times 1/9 + 2 \times 1/9 + 43 \times 1/9 = 7 \end{aligned}$$

# Median Filter

0	0	0			
0	8	10	21	17	35
0	2	43	15	72	21
	30	94	55	43	74
	36	28	69	88	56
	45	75	42	47	20

Neighborhood values: 0 0 0 0 8 10 0 2 43



0 0 0 0 0 2 8 10 43



0				

# Gaussian 2D Filter

1.  $G(x, y) = \frac{1}{2\pi\sigma^2} e^{-\frac{x^2+y^2}{2\sigma^2}}$

If  $\sigma = 1$ ,

(-1,-1)	(0,-1)	(1,-1)
(-1,0)	(0,0)	(1,0)
(-1,1)	(0,1)	(1,1)

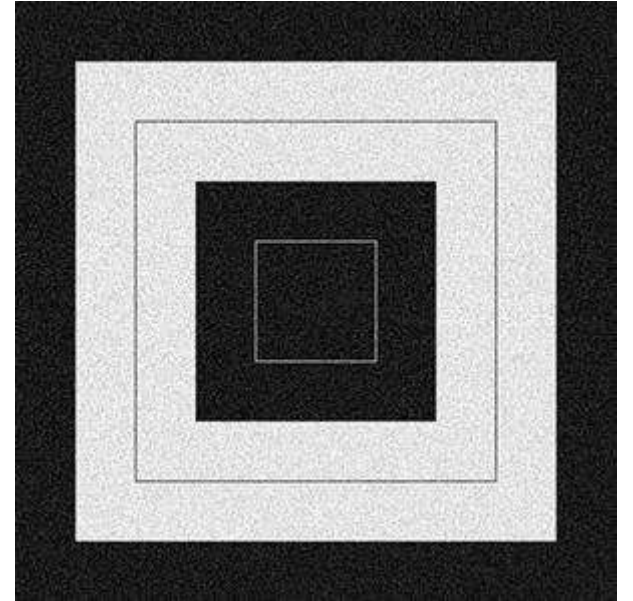


0.0585	0.0965	0.0585
0.0965	0.1591	0.0965
0.0585	0.0965	0.0585

2. Normalization

3. Convolution :  $I * G$

# Images



# HW#5

- Report
  - Student ID
  - Name
  - Describe the main part of your method or explain your code
  - 15 result images
  - Compare the result images that were generated by three different filters and describe what you observe



# HW#5

- 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: filter2D, medianBlur, GaussianBlur, blur

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

# HW#5

- 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#5

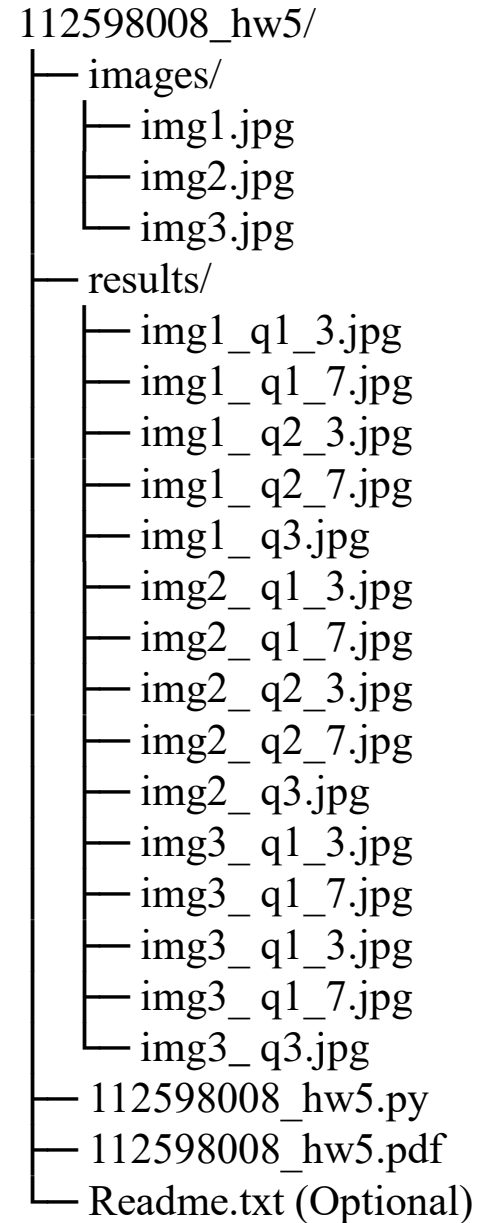
- Grade
  - Program(80%)
    - Mean Filter (25%)
    - Median Filter(25%)
    - Gaussian 2D Filter(30%)
  - Report(20%)

# HW#5

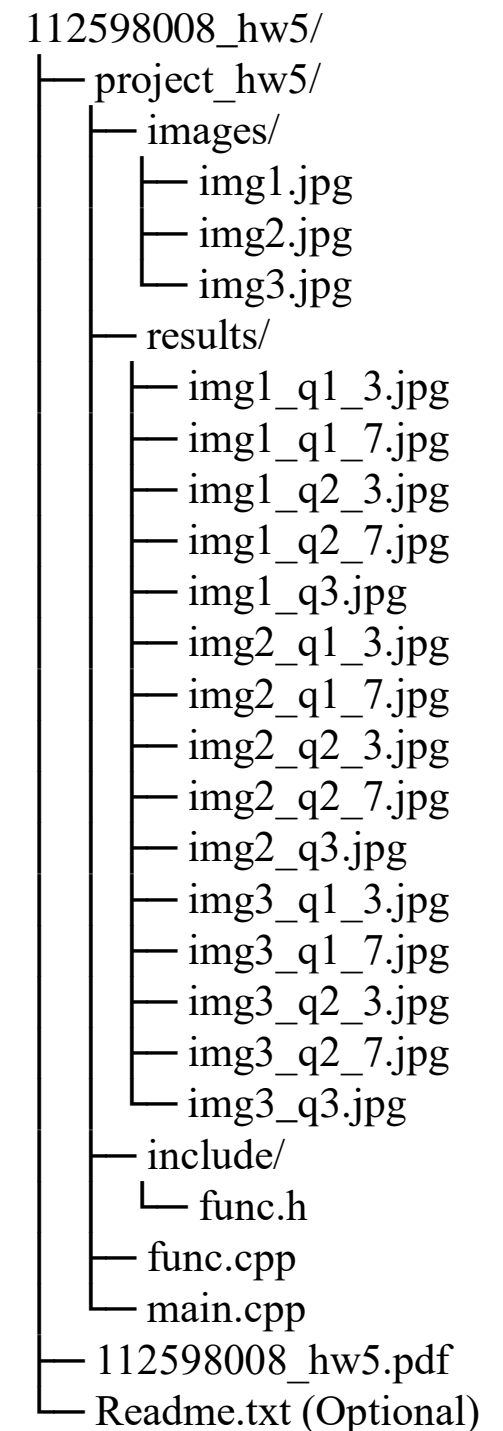
- Folder Structure

- There are 15 images in the results folder.
- Write homework on the one program.

Python



C/C++



# HW#5

- Please compress your files.
  - Example: 112598008\_hw5.zip
- Deadline: 2024/05/29 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.