Machine Vision

Homework#1

Deadline: 2024/03/20 23:59:59

Robot Vision Lab (Room 1421)

TAs: 魏士涵 t112598058@ntut.edu.tw

賴靖嫻 t112598008@ntut.edu.tw

HW#1

1. Image Quantization(binary, gray, index-color)

   1-1. Convert the color image to the grayscale image

   - Formula: $(0.3 \times R) + (0.59 \times G) + (0.11 \times B)$.

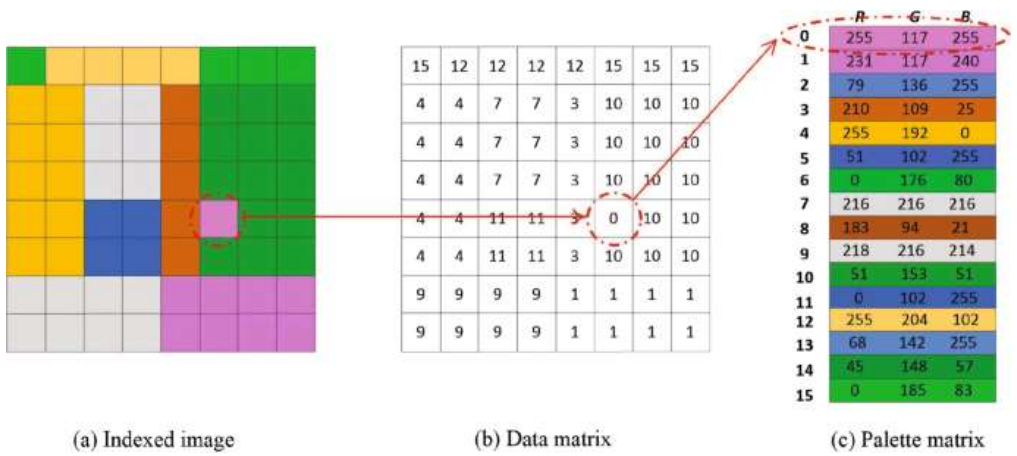
   1-2. Convert the grayscale image to the binary image

   - Choose a appropriate threshold by yourself.

   1-3. Convert the color image to the index-color image

   - Define your own colormap of 16 type colors.

HW#1



15	12	12	12	12	15	15	15
4	4	7	7	3	10	10	10
4	4	7	7	3	10	10	10
4	4	7	7	3	10	10	10
4	4	11	11	3	0	10	10
4	4	11	11	3	10	10	10
9	9	9	9	1	1	1	1
9	9	9	9	1	1	1	1

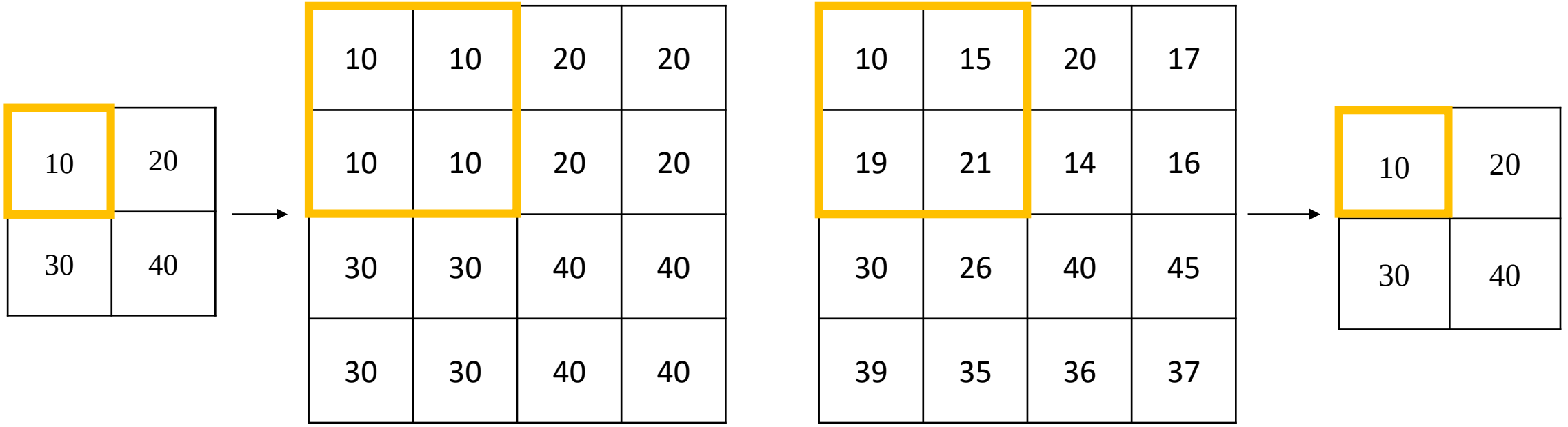
	R	G	B
0	255	117	255
1	231	117	240
2	79	136	255
3	210	109	25
4	255	192	0
5	51	102	255
6	0	176	80
7	216	216	216
8	183	94	21
9	218	216	214
10	51	153	51
11	0	102	255
12	255	204	102
13	68	142	255
14	45	148	57
15	0	185	83

(a) Indexed image (b) Data matrix (c) Palette matrix

HW#1

2. Resizing Image

2-1. Resizing image to $\frac{1}{2}$ and 2 times without interpolation

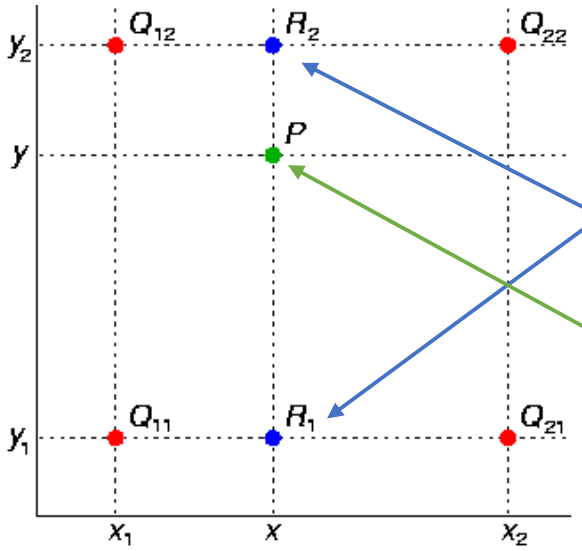


HW#1

2. Resizing Image

2-2. Resizing image to $\frac{1}{2}$ and 2 times with interpolation

- You can use bilinear or bicubic interpolation.



$$f(x, y_1) \approx \frac{x_2 - x}{x_2 - x_1} f(Q_{11}) + \frac{x - x_1}{x_2 - x_1} f(Q_{21}),$$

$$f(x, y_2) \approx \frac{x_2 - x}{x_2 - x_1} f(Q_{12}) + \frac{x - x_1}{x_2 - x_1} f(Q_{22}).$$

$$f(x, y) \approx \frac{y_2 - y}{y_2 - y_1} f(x, y_1) + \frac{y - y_1}{y_2 - y_1} f(x, y_2)$$

HW#1

- Report
  - Student ID
  - Name
  - Describe the main part of your method
  - Result images and colormaps
  - Explain the results you get

HW#1

- 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: cvtColor(image, gray, CV_RGB2GRAY); // convert RGB to Gray

HW#1

- 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: cv2.cvtColor(image, cv2.COLOR_BGR2GRAY) // convert RGB to Gray

HW#1

- Grade
  - Program(80%)
    - Q1-1(10%)
    - Q1-2(10%)
    - Q1-3(20%)
    - Q2-1(15%)
    - Q2-2(25%)
  - Report(20%)

HW#1

- Folder Structure
  - ➢There are 21 images in the results folder.
  - ➢Write all questions in one program

Python

```
112598058_hw1/
├── images/
│   ├── img1.jpg
│   ├── img2.jpg
│   └── img3.jpg
├── results/
│   ├── img1_q1-1.jpg
│   ├── img1_q1-2.jpg
│   ├── img1_q1-3.jpg
│   ├── img1_q2-1-half.jpg
│   ├── img1_q2-1-double.jpg
│   ├── img1_q2-2-half.jpg
│   ├── img1_q2-2-double.jpg
│   ├── …
│   └── img3_q2-2-double.jpg
├── 112598058_hw1.py
├── 112598058_hw1.pdf
└── Readme.txt (Optional)
```

C/C++

```
112598058_hw1/
├── project_hw1/
│   ├── images/
│   │   ├── img1.jpg
│   │   ├── img2.jpg
│   │   └── img3.jpg
│   ├── results/
│   │   ├── img1_q1-1.jpg
│   │   ├── img1_q1-2.jpg
│   │   ├── img1_q1-3.jpg
│   │   ├── img1_q2-1-half.jpg
│   │   ├── img1_q2-1-double.jpg
│   │   ├── img1_q2-2-half.jpg
│   │   ├── img1_q2-2-double.jpg
│   │   ├── …
│   │   └── img3_q2-2-double.jpg
│   ├── include/
│   │   └── func.h
│   ├── func.cpp
│   └── main.cpp
├── 112598058_hw1.pdf
└── Readme.txt (Optional)
```

HW#1

- Please compress your files.
  - Example: 112598058_hw1.zip
- Deadline: 2024/3/20 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.