HW1:Fundamentals

林义涵（学号：13331158 计应1班）

1 Exercises

1.1 Storage

1. There are **256** bit planes for this image.
2. The panel **256** is the most visually significant one.
3. 2048 * 2048 * 256 / 8 = 1.342 * 10^8
   So **1.342 * 10^8** bytes are required for storing the image.

1.2 Adjacency

1. For the shortest 4- path between p and q, there is no such a particular path, since the pixels around q are 0, 4, 4.
2. For the shortest 8- path between p and q, the length is **4**.
3. For the shortest m- path between p and q, the length is **5**.

1.3 Logical Operations

1. $$Solution = A \bigcap B \bigcap C$$
2. $$Solution = (A \bigcap B) \bigcup (B \bigcap C) \bigcup (C \bigcap A)$$
3. $$Solution = (B - A) + (A \bigcap C) - (B \bigcap C)$$

2 Programming Tasks

2.1 Pre-requirement

Input My student ID is "13331158", so my picture is "**58.png**".
Language The language I choose is **Python**, and the library I choose is **PIL**.

2.2 Scaling

1. The **192*128** result is: 

   The **96*64** result is: 

   The **48*32** result is: 

   The **24*16** result is: 

   The **12*8** result is: 

2. The **300*200** result is: 
3. The **450*300** result is: 
4. The **500*200** result is:

5. First, get the width and the height from the "input_img" and the "output_img" and calculate the "scale_width" and the "scale_height".The width and the height of the "output_img" are called "target_width" and "target_height".
   Second, get the data from the "imput_img" and put into a list. New a image called "result" to store the output data. Third, choose some data from original image to fill the "result".

```
for i in range(target_height):
   for j in range(target_width):
    result.append(resource[int(i * scale_height) * original_width + int(j * scale_width)])
```

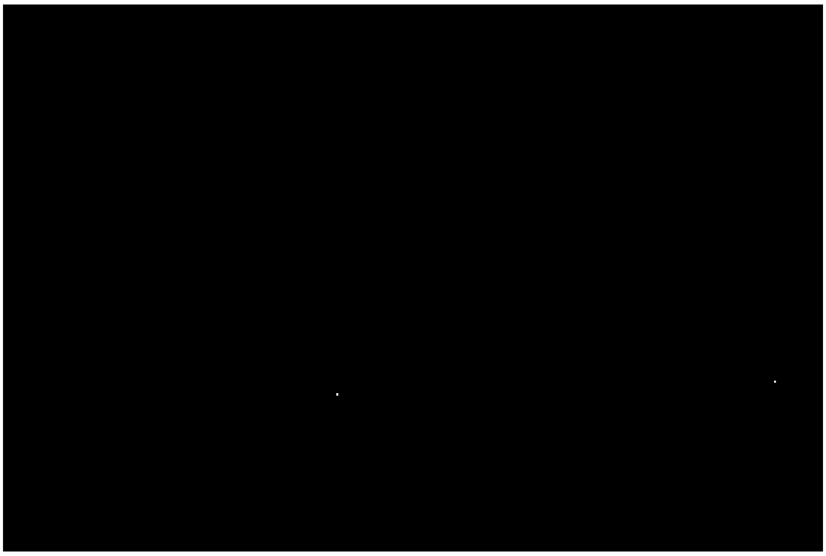
2.3 Quantization

1. The **128** gray level result is: 

The **32** gray level result is: 

The **8** gray level result is: 

The **4** gray level result is:

The **2** gray level result is: 

2. First, new a "result" image with the same width and height like "input_img". Create a variable called "level_height", for example, divide [0, 255] into 4 levels, the "level_height" means the level unit "85". Second, use the "level_height" to reduce the gray level resolution of all the pixels and put into the "result" image.

```
for i in range(original_height):
    for j in range(original_width):
        result.append(int(resource[i * original_width + j] / level_height) * level_height)
```