Computer Vision Homework 6 B07902078 資工三 沈韋辰

Language: Python3.8.3

Modules: OpenCV(cv2), numPy

Step.1 Binarize the image and downsample it

Algorithm:
Traverse the topmost-left pixel as the downsampled data (use double for-loop to find the target pixel, and more double for-loop to downsampling its 8x8 neighbor according to the threshold)

Step.2 Count the Yokoi connectivity number using 4-connected

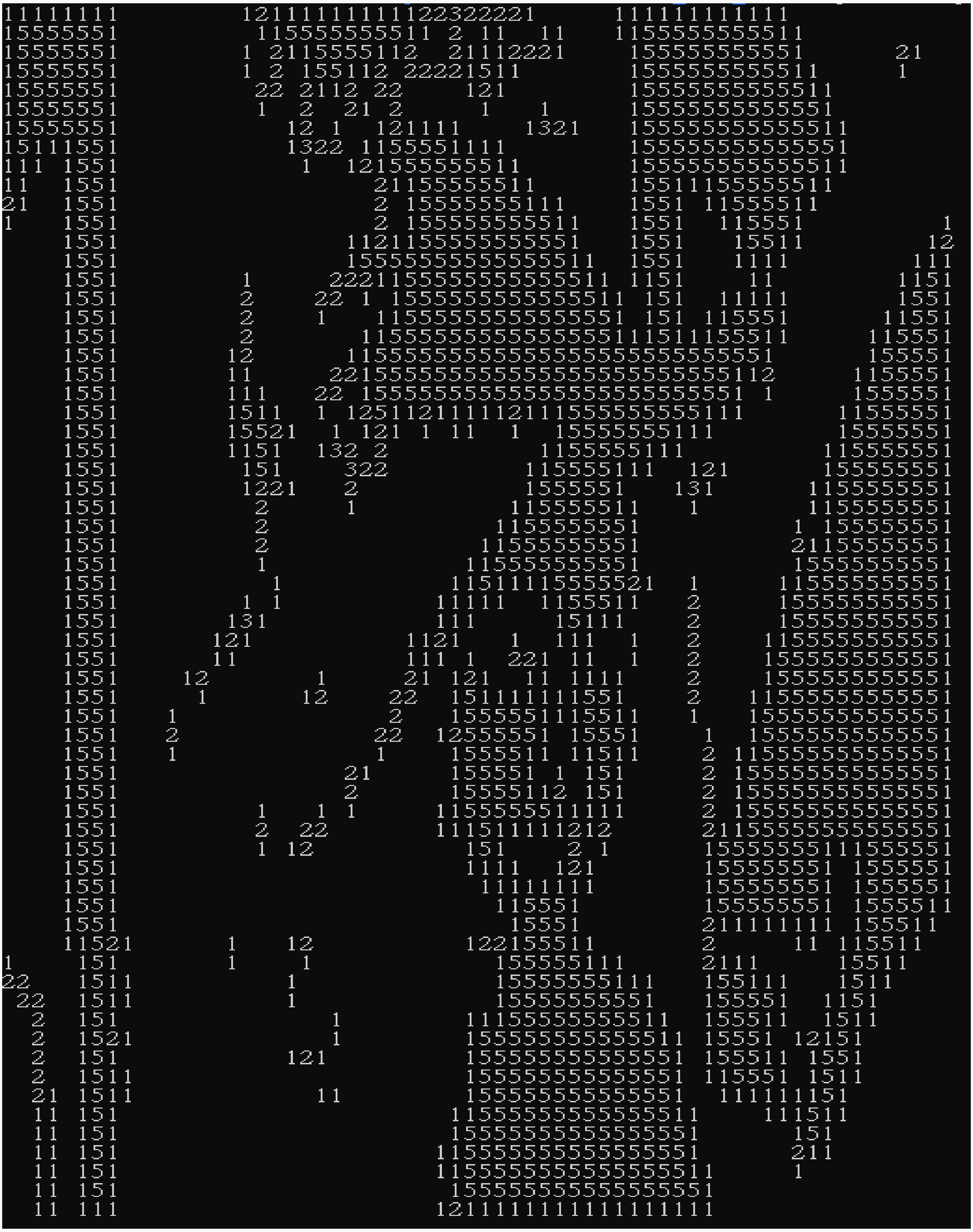
Algorithm:
Make a copy (**lena2**) of the original downsampling image**(lena1)**, **lena1** is simply binary for input, and **lena2** is for labeling. For each pixel in **lena1**, define its x0~x8, if some orientation is out of range, let it be 0. Compute the 4 values determined from the h-function, which are actually h(x0,x1,x6,x2), h(x0,x2,x7,x3), h(x0,x3,x8,x4), h(x0,x4,x5,x1) respectively. (counter-clockwise circle according the order x1, x2, x3, x4).

- h-function definition:

If the first two parameters are not equal, return s.
Otherwise, if any of the third and fourth parameters are not equal to the first two, return q
Otherwise, they are all equal, return r.

After gaining the 4 h-function values, we follow this rule to determine the kind of label and put it on **lena2**: If they are all ‘r’, the label is 5, otherwise, the label is the number of ‘q’. The meaning of the label is: in the 3 by 3 box of the target, how many components we will get if we remove the target. (in 4-connected, and the exception is the target is fully surrounded by eight same value pixels.)

Step.3 Print it



```
11111111       12111111111122322221    111111111111
15555551        115555555511 2 11  11  1155555555511
15555551       1 2115555112  21112221   155555555551      21
15555551       1 2 155112 22221511      1555555555511     1
15555551        22 2112 22    121       15555555555511
15555551        1  2  21 2     1   1    15555555555551
15555551          12 1  121111    1321  155555555555511
15111551          1322 1155551111       155555555555551
111 1551           1  121555555511      155555555555511
11  1551                21155555511     15511155555511
21  1551                2 15555555111   1551 11555511
1   1551                2 155555555511  1551  115551         1
    1551              1121555555555551  1551   15511        12
    1551              15555555555555511 1551   1111        111
    1551       1     222115555555555511 1151    11        1151
    1551       2    22 1 155555555555511 151  11111       1551
    1551       2    1   1155555555555551 151 115551      11551
    1551       2       1155555555555555111511155511     115551
    1551      12      1155555555555555555555555551      155551
    1551      11     22155555555555555555555555112     1155551
    1551      111   22 1555555555555555555555551 1     1555551
    1551      1511  1 12511211111211155555555111      11555551
    1551      15521  1 121 1 11  1  15555555111       15555551
    1551      1151  132 2          1155555111        115555551
    1551       151    322         115555111 121      155555551
    1551       1221   2           1555551  131      1155555551
    1551        2     1          115555511  1       1155555551
    1551        2               1155555551         1 155555551
    1551        2              11555555551         21155555551
    1551        1             115555555551         15555555551
    1551         1           11511115555521 1     115555555551
    1551       1 1          11111  1155511  2     155555555551
    1551      131           111     15111   2     155555555551
    1551     121          1121   1  111 1   2    1155555555551
    1551     11           111 1  221 11 1   2    1555555555551
    1551   12       1     21 121  11 1111   2    1555555555551
    1551    1      12    22  151111111551   2   11555555555551
    1551  1              2   1555551115511  1   15555555555551
    1551  2             22  12555551 15551   1  15555555555551
    1551  1             1    1555511 11511   2 115555555555551
    1551              21     155551 1 151    2 155555555555551
    1551              2      15555112 151    2 155555555555551
    1551        1   1 1     1155555511111    2 155555555555551
    1551        2  22       111511111212     21155555555555551
    1551        1 12          151   2 1      15555555115555551
    1551                      1111  121      155555551 1555551
    1551                       11111111      155555551 1555551
    1551                        115551       155555551 1555511
    1551                         15551       211111111 155511
    11521     1   12          122155511      2     11 115511
1    151      1    1            155555111    2111     15511
22   1511         1             15555555111  155111   1511
 22  1511         1             15555555551  155551  1151
  2  151             1        11155555555511 155511  1511
  2  1521            1        15555555555511 15551 12151
  2  151          121         15555555555551 155511 1551
  2  1511                     15555555555551 115551 1511
  21 1511           11        15555555555551  11111151
  11 151                     1155555555555511    111511
  11 151                     1555555555555551      151
  11 151                    11555555555555551      211
  11 151                    115555555555555511     1
  11 151                     15555555555555551
  11 111                    1211111111111111111
```