

電腦視覺 HW6 report

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Write a program which counts the Yokoi connectivity number on a downsampled image(lena.bmp)

Step1: 二值化

```
# step1: a binary image (threshold at 128)
for i in range(row):
    for j in range(col):
        np_img[i][j] = 255 if(np_img[i][j] >= 128) else 0
```

Step2: 8-block, 並以最左上進行採樣

```
# step2: down-sampling from (512, 512) to (64, 64)
down_size = 64
new_img = np.zeros((down_size, down_size), np.int)
step_row = row // down_size
step_col = col // down_size
for i in range(0, row, step_row):
    for j in range(0, col, step_col):
        new_i = i // step_row
        new_j = j // step_col
        new_img[new_i][new_j] = np_img[i][j]
```

Step3: 以 4 連通的方式, 構築 Yokoi connectivity number。實作上, 我先將 x0~x8 的判例都先算好, 最後帶入講義算式來完成

```
# step3: calculating the Yokoi connectivity number by 4-connected component
output = np.zeros((down_size, down_size), dtype=int)
out_row = output.shape[0]
out_col = output.shape[1]

for i in range(out_row):
    for j in range(out_col):
        # x7  x2  x6
        # x3  x0  x1
        # x8  x4  x5
        # use the shape to check the border of image
```

```

x0 = new_img[i][j]
x1 = 0 if j == out_col - 1 else new_img[i][j + 1]
x2 = 0 if i == 0 else new_img[i - 1][j]
x3 = 0 if j == 0 else new_img[i][j - 1]
x4 = 0 if i == out_row - 1 else new_img[i + 1][j]
x5 = 0 if (i == out_row - 1 or j == out_col - 1) else
new_img[i + 1][j + 1]
x6 = 0 if (i == 0 or j == out_col - 1) else new_img[i - 1][j
+ 1]
x7 = 0 if (i == 0 or j == 0) else new_img[i - 1][j - 1]
x8 = 0 if (i == out_row - 1 or j == 0) else new_img[i + 1][j
- 1]

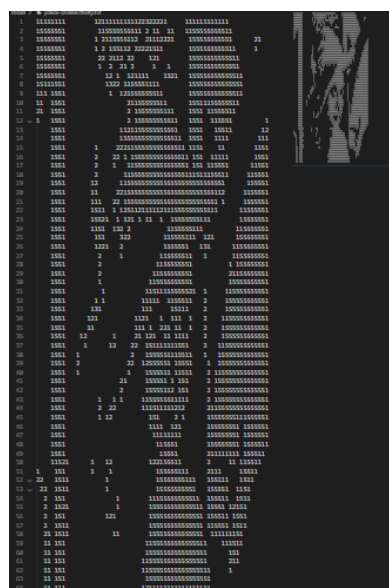
a = "" # tag of the Yokoi connectivity
if x0:
    a += h(x0, x1, x6, x2) # a1 = h(x0, x1, x6, x2)
    a += h(x0, x2, x7, x3) # a2 = h(x0, x2, x7, x3)
    a += h(x0, x3, x8, x4) # a3 = h(x0, x3, x8, x4)
    a += h(x0, x4, x5, x1) # a4 = h(x0, x4, x5, x1)
    out = f(a)
else:
    continue

output[i][j] = out

```

Step4: 將矩陣，輸出成 txt 檔案 (此部分太簡單省略)

輸出_縮圖版本:



輸出(用小畫家截圖並合併, 詳見 txt 檔案):

1	11111111	12111111111112232221	111111111111
2	15555551	115555555511 2 11 11	115555555511
3	15555551	1 2115555112 21112221	15555555551 21
4	15555551	1 2 155112 22221511	155555555511 1
5	15555551	22 2112 22 121	15555555555511
6	15555551	1 2 21 2 1 1	1555555555551
7	15555551	12 1 121111 1321	15555555555511
8	15111551	1322 1155551111	15555555555551
9	111 1551	1 12155555511	15555555555511
10	11 1551	2115555511	1551115555511
11	21 1551	2 1555555511	1551 1155511
12	1 1551	2 15555555511	1551 11551 1
13	1551	112115555555551	1551 15511 12
14	1551	1555555555555511	1551 1111 111
15	1551	1 22211555555555511	1151 11 1151
16	1551	2 22 1 155555555555511	151 11111 1551
17	1551	2 1 115555555555551	151 11551 11551
18	1551	2 11555555555555511151115511	115551
19	1551	12 1155555555555555555551	155551
20	1551	11 22155555555555555555555112	115551
21	1551	111 22 155555555555555555551 1	155551
22	1551	1511 1 1251121111121115555555111	1155551
23	1551	15521 1 121 1 11 1 1555555111	1555551
24	1551	1151 132 2 1155555111	11555551
25	1551	151 322 115555111 121	15555551
26	1551	1221 2 155551 131	11555551
27	1551	2 1 11555511 1	11555551
28	1551	2 115555551	1 15555551
29	1551	2 1155555551	2115555551
30	1551	1 11555555551	1555555551
31	1551	1 11511115555521 1	11555555551
32	1551	1 1 11111 115511 2	15555555551
33	1551	131 111 15111 2	15555555551
34	1551	121 1121 1 111 1 2	115555555551
35	1551	11 111 1 221 11 1 2	155555555551
36	1551	12 1 21 121 11 1111 2	155555555551
37	1551	1 12 22 151111111551 2	1155555555551
38	1551	1 2 1555551115511 1	1555555555551
39	1551	2 22 12555551 15551 1	1555555555551
40	1551	1 1 1555511 11511 2	11555555555551
41	1551	21 15551 1 151 2	1555555555551
42	1551	2 15555112 151 2	1555555555551
43	1551	1 1 1 115555511111 2	15555555555551
44	1551	2 22 111511111212 211555555555551	
45	1551	1 12 151 2 1 155555511155551	
46	1551	1111 121 15555551 155551	
47	1551	11111111 15555551 155551	
48	1551	115551 15555551 1555511	
49	1551	15551 211111111 155511	
50	11521	1 12 122155511 2 11 115511	
51	1 151	1 1 155555111 2111 15511	
52	22 1511	1 15555555111 155111 1511	
53	22 1511	1 1555555551 155551 1151	
54	2 151	1 11155555555511 155511 1511	
55	2 1521	1 15555555555511 15551 12151	
56	2 151	121 15555555555551 155511 1551	
57	2 1511	155555555555551 115551 1511	
58	21 1511	11 155555555555551 111111151	
59	11 151	1155555555555511 111511	
60	11 151	1555555555555551 151	
61	11 151	11555555555555551 211	
62	11 151	115555555555555511 1	
63	11 151	15555555555555551	
64	11 111	1211111111111111111	