

Computer Vision 2018Fall

HW06

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使用環境說明：

```
#macOS Majave 10.14  
#Python 3.7.0  
#opencv 3.4.2  
#PIL 5.2.0  
#matplotlib 3.0.0  
#numpy 1.15.1
```

(a)Downsampling

取樣相片，將照片大小由512*512->64*64

```
(height, width) = size  
ratio_x = int(img.shape[1] / width)  
ratio_y = int(img.shape[0] / height)  
result = np.ones((height, width))  
for row in range(height):  
    for col in range(width):  
        result[row][col] = img[row*ratio_y][col*ratio_x]
```



512*512



64*64

(b)Yokoi Connectivity Number

```
def YokoiConnNum(img):
    height, width = img.shape
    ans = np.zeros((height, width))
    print(height, width)
    for row in range(height):
        for col in range(width):
            ans[row][col] = -1
            if img[row][col] == 0:
                continue
            neighbors = [0] * 9
            for i in range(-1, 2):
                for j in range(-1, 2):
                    if row+i >= 0 and row+i < height and col+j >=
0 and col+j < width:
                        if img[row+i][col+j] != 0:
                            neighbors[(i+1)*3+j+1] = 1
            a1 = H(neighbors[4], neighbors[5], neighbors[2],
neighbors[1])
            a2 = H(neighbors[4], neighbors[1], neighbors[0],
neighbors[3])
            a3 = H(neighbors[4], neighbors[3], neighbors[6],
neighbors[7])
            a4 = H(neighbors[4], neighbors[7], neighbors[8],
neighbors[5])
            A = [a1, a2, a3, a4]
            nq = A.count('q')
            nr = A.count('r')
            if nr == 4:
                ans[row][col] = 5
            else:
                ans[row][col] = nq

    return ans
```

```
def H(b, c, d, e):
    if b == c and (d != b or e != b):
        return 'q'
    if b == c and d == b and e == b:
        return 'r'
    if b != c:
        return 's'
```

Function $H(b, c, d, e)$ & YokoiConnNum 根據以下公式:

$$h(b, c, d, e) = \begin{cases} q & \text{if } b = c \text{ and } (d \neq b \text{ or } e \neq b) \\ r & \text{if } b = c \text{ and } (d = b \text{ and } e = b) \\ s & \text{if } b \neq c \end{cases}$$

$$f(a_1, a_2, a_3, a_4) = \begin{cases} 5 & \text{if } a_1 = a_2 = a_3 = a_4 = r \\ n & \text{where } n = \#\{a_k \mid a_k = q\}, \text{ otherwise} \end{cases}$$

```
yokoi.txt
111111111 12111111111122322221 11111111111 0 0
15555551 11555555511 2 11 11 15555555511 0
15555551 1 2115555112 21112221 1555555551 21
15555551 1 2 155112 2221511 15555555511 1
15555551 22 2112 22 121 0 0 155555555511 0
15555551 1 2 21 2 1 1 155555555551 0
15555551 12 1 121111 1321 1555555555511
15111551 1322 1155551111 1555555555551
111 1551 1 12155555511 1555555555511
11 1551 2115555511 155115555511
21 1551 2 1555555511 1551 1155511
1 1551 2 15555555511 1551 11551 1
1551 11211555555551 1551 15511 12
1551 155555555555511 1551 1111 111
1551 1 22211555555555511 1151 11 1151
1551 2 22 1 155555555555511 151 11111 1551
1551 2 1 1155555555555551 151 11551 11551
1551 2 115555555555555511151115551 115551
1551 12 1155555555555555555551 155551
1551 11 0 2215555555555555555555112 115551
1551 111 22 155555555555555555551 1 155551
1551 1511 1 125112111112111555555511 1155551
1551 15521 1 121 1 11 1 1555555511 0 1555551
1551 1151 132 2 1155555111 0 11555551
1551 151 0 322 115555111 121 1555551
1551 1221 2 155551 131 11555551
1551 2 0 1 11555511 1 11555551
1551 2 0 0 115555551 0 1 15555551
1551 2 115555551 211555551
1551 1 0 1155555551 155555551
1551 1 11511115555521 1 1155555551
1551 1 1 1111 115551 2 1555555551
1551 131 111 15111 2 1555555551
1551 121 0 1121 1 111 1 2 1155555551
1551 11 111 1 221 11 1 2 1555555551
1551 12 0 1 21 121 11 111 2 1555555551
1551 1 12 22 151111111551 2 115555555551
1551 1 2 15555111551 1 155555555551
1551 2 0 0 22 1255551 15551 1 155555555551
1551 1 155511 11511 2 1155555555551
1551 0 0 21 15551 1 151 2 155555555551
1551 2 1555112 151 2 155555555551
1551 1 1 1 1155555511111 2 1555555555551
1551 2 22 11151111212 21155555555551
1551 0 1 12 151 2 1 1555555511155551
1551 0 0 0 1111 121 15555551 155551
1551 0 1111111 15555551 155551
1551 11551 15555551 155511
1551 1551 21111111 155511
11521 1 12 12215551 2 11 115511
1 151 0 1 1 15555511 211 15511
22 1511 1 155555511 15511 1511
2 151 1 1555555551 155551 1151
2 1521 0 1 111555555551 15551 1511
2 151 121 155555555551 1551 12151
2 1511 0 1555555555551 15551 151
21 1511 11 1555555555551 11111151
11 151 0 11555555555551 111511
11 151 155555555555551 151
11 151 1155555555555551 211
11 151 115555555555551 1
11 151 0 155555555555551
11 111 0 121111111111111111
```