電腦視覺 CV Home Work 6 資研一 R07922003 劉濬慶

首先先將原圖 512*512 的大小,每 8*8 的區塊掃過整張圖,取每一塊的最左上角的 pixel,並輸出成新的 64*64 的 binary image,接著對 binary image 做 Yokoi的演算法。

以每個 pixel 為中心設為 x0, 周圍 8-connect 的 pixel 編號如下:

8-connected neighborhood

x_7	x_2	x_6
x_3	x_0	x_1
x_8	x_4	x_5

	x_2	<i>x</i> ₆
	x_0	x_1

<i>x</i> ₇	x_2	
x_3	x_0	

x_3	x_0	
x_8	χ_4	

$$\begin{array}{c|c} x_0 & x_1 \\ \hline x_4 & x_5 \end{array}$$

照著上述 4 個順序跑: a1 = h(x0, x1, x6, x2)

a2 = h(x0, x2, x7, x3)

a3 = h(x0, x3, x8, x4)

a4 = h(x0, x4, x5, x1)

$$f(a_{1}, a_{2}, a_{3}, a_{4})$$

$$= \begin{cases} 5 & \text{if } a_{1} = a_{2} = a_{3} = a_{4} = r \\ n & \text{where } n = number of \{a_{k} | a_{k} = q\}, \text{otherwise} \end{cases}$$

再跑 f(a1,a2,a3,a4)即可

● Lena 64x64 binary 圖



yokoi_num.txt

 $\frac{1}{5}, \frac{5}{5}, \frac$ $\frac{1}{5}, \frac{5}{5}, \frac{5}{5}, \frac{5}{5}, \frac{5}{5}, \frac{1}{11}, \frac{1}{11}, \frac{1}{11}, \frac{1}{15}, \frac{1}{5}, \frac{1}{5}, \frac{1}{5}, \frac{1}{5}, \frac{1}{11}, \frac{1$

• yokoi_num_		
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 5 5 5 5	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	
1 5 5 5 5 5 5 1 1 5 1 1 1 5 5 1 1 1 1 1	2 1555555511 1551 1155511 2 15555555511 1551 115551	1
1 5 5 1 1 5 5 1	2 2 1 1555555555555555511 151 1111 15 2 1 115555555555	1 2 1 1 5 1 5 1 5 1 5 1
1 5 5 1 1 5 5 1	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	5 1 5 1 5 1 5 1 5 1
1 5 5 1 1 5 5 5 1	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	5 1 5 1 5 1 5 1 5 1 5 1
1 5 5 1 1 5 5 1	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	5 1 5 1 5 1 5 1 5 1 5 1
1 5 5 1 1 1 5 5 1 1 1 5 5 1 2 1 5 5 1 1 1 1	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	5 1 5 1 5 1 5 1 5 1
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	155555555555555555555555555555555555555
1 5 5 1 1 1 5 2 1 1 1 5 1 2 2 1 5 1 1 2 2 1 5 1 1 2 2 1 5 1 1	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	i
1 1 5 2 1 1 1 5 1 1 2 2 1 5 1 1 2 2 1 5 1 1 2 2 1 5 1 1 2 1 5 2 1 2 1 5 1 1 2 1 5 2 1 2 1 5 1 1 2 1 5 1 1 1 1 1 5 1 1 1 1 5 1 1 1 1 5 1	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	
1 1 1 5 1 1 1 1 5 1 1 1 1 5 1 1 1 1 5 1 1 1 1 1	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	

● 程式碼

```
def binary_image(coulmn,row,pix,lena):
     pix=lena.load()
     img_new=Image.new(lena.mode,(66,66))
     for i in range(0,coulmn,8):
         for j in range(0,row,8):
              if pix[i,j] < 128:
                    img_new.putpixel((int(i/8)+1,int(j/8)+1),0)
              else:
                    img_new.putpixel((int(i/8)+1,int(j/8)+1),255);
     img_new.save('lena_binary64x64.bmp')
     array=np.array(img_new)
     return array
def h(b,c,d,e):
     if b==c and ((d != b)or(e != b)):
         return 'q'
     if b==c and ((d == b)or(e == b)):
         return 'r'
     if b!=c:
         return 's'
def f(a1,a2,a3,a4):
     if a1==a2==a3==a4=='r':
         return 5
     else:
         num=0
         if a1=='q':
              num += 1
         if a2=='q':
              num += 1
         if a3=='q':
              num += 1
         if a4=='q':
              num += 1
         return num
def Yokoi(matrix):
```

```
yokoi_matrix = np.zeros((64,64),dtype=int)
     for i in range(1,65):
          for j in range(1,65):
               if matrix[i,j]==255:
                    x0 = matrix[i][j]
                    x1 = matrix[i][j+1]
                    x2 = matrix[i-1][j]
                    x3 = matrix[i][j-1]
                    x4 = matrix[i+1][j]
                    x5 = matrix[i+1][j+1]
                    x6 = matrix[i-1][j+1]
                    x7 = matrix[i-1][j-1]
                    x8 = matrix[i+1][j-1]
                    a1 = h(x0, x1, x6, x2)
                    a2 = h(x0, x2, x7, x3)
                    a3 = h(x0, x3, x8, x4)
                    a4 = h(x0, x4, x5, x1)
                    yokoi matrix[i-1][j-1] = f(a1,a2,a3,a4)
     return yokoi_matrix
lena=Image.open("lena.bmp")
pix=lena.load()
coulmn,row=lena.size
matrix=binary image(coulmn,row,pix,lena)
array=Yokoi(matrix)
f = open('yokoi num.txt', 'w')
k = open('yokoi num without 0.txt', 'w')
for i in range(64):
     for j in range(64):
          f.write("%d " %(array[i][j]))
     f.write("\n")
for i in range(64):
     for j in range(64):
          if array[i][j]==0:
               k.write(' ')
          else:
```

```
k.write("%d " %(array[i][j]))
k.write("\n")
f.close()
k.close()
```