Computer Vision Homework #6

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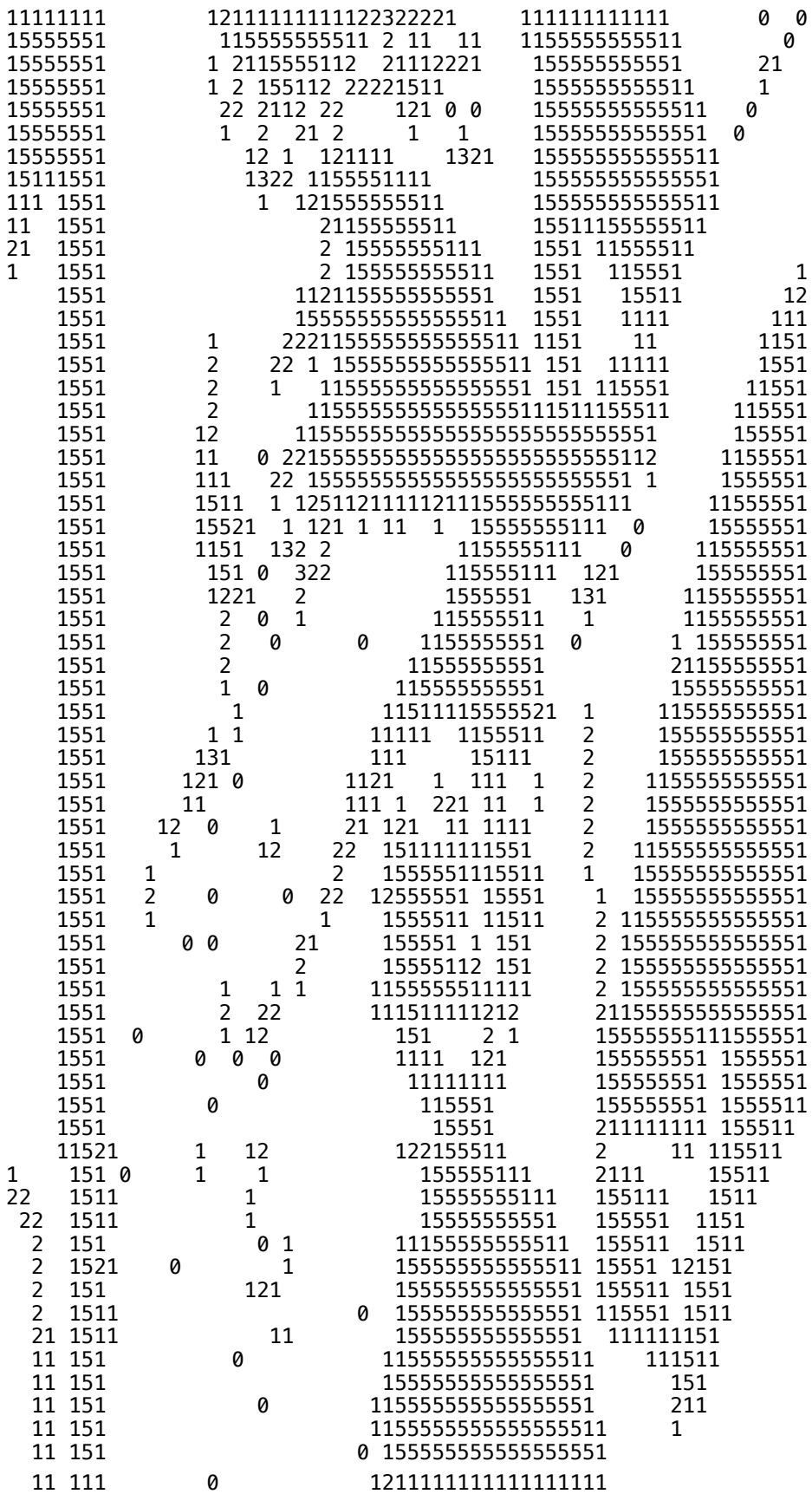
[Results]



[Code Fragment & Explanation]

p.s. Please refer to the complete code in assignment folder. In this section, I just put the important functions I used.

Step1) Downsample original source image and binarize it.

```python
def downsample(img, sampleSize=(64,64)):
    downsample_img = Image.new('L', sampleSize)
    downsample_img_pixel = downsample_img.load()
    for x in range(sampleSize[0]):
        for y in range(sampleSize[1]):
            downsample_img_pixel[x, y] = img.getpixel((x*8, y*8))
    downsample_img.save('./downsampled_lena.bmp')
    return downsample_img

def binarize(img):
    imageW, imageH = img.width, img.height
    new_img = img.copy()
    new_img_pixel = new_img.load()
    for x in range(imageW):
        for y in range(imageH):
            new_img_pixel[x, y] = 255 if img.getpixel((x,y)) > 127 else 0
    new_img.save('./binarize_lena.bmp')
    return new_img
```

Step2) Compute Yokoi Connectivity Number for each pixel whose value is not zero. I just follow the notation in lecture slides to design the functions.

```python
def pixel_val(x, y):
    if (x >= 0 and x < 64 and y >= 0 and y < 64): return img.getpixel((x,y))
    return 0

def neighborhood(img, x, y):
    return [
        pixel_val(x,y)    , # x0
        pixel_val(x+1,y)  , # x1
        pixel_val(x,y-1)  , # x2
        pixel_val(x-1,y)  , # x3
        pixel_val(x,y+1)  , # x4
        pixel_val(x+1,y+1), # x5
        pixel_val(x+1,y-1), # x6
        pixel_val(x-1,y-1), # x7
        pixel_val(x-1,y+1)  # x8
    ]

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

def fFunction(a1, a2, a3, a4):
    if a1 == 'r' and a2 == 'r' and a3 == 'r' and a4 == 'r': return 5
    numberOfQ, records = 0, [a1, a2, a3, a4]
    for r in records: numberOfQ = numberOfQ + (1 if r == 'q' else 0)
    return numberOfQ

def YokoiConnectivityNumber(x):
    return fFunction(
                hFunction(x[0], x[1], x[6], x[2]),
                hFunction(x[0], x[2], x[7], x[3]),
                hFunction(x[0], x[3], x[8], x[4]),
                hFunction(x[0], x[4], x[5], x[1])
            )

def writeYokoiResult(yokoi_res, sampleSize=(64,64)):
    f = open("yokoi.txt", "w+")
    for x in range(sampleSize[0]):
        for y in range(sampleSize[1]):
            f.write(str(yokoi_res[y][x]))
        f.write('\n')
    f.close()
```