Computer Vision - Assignment 6

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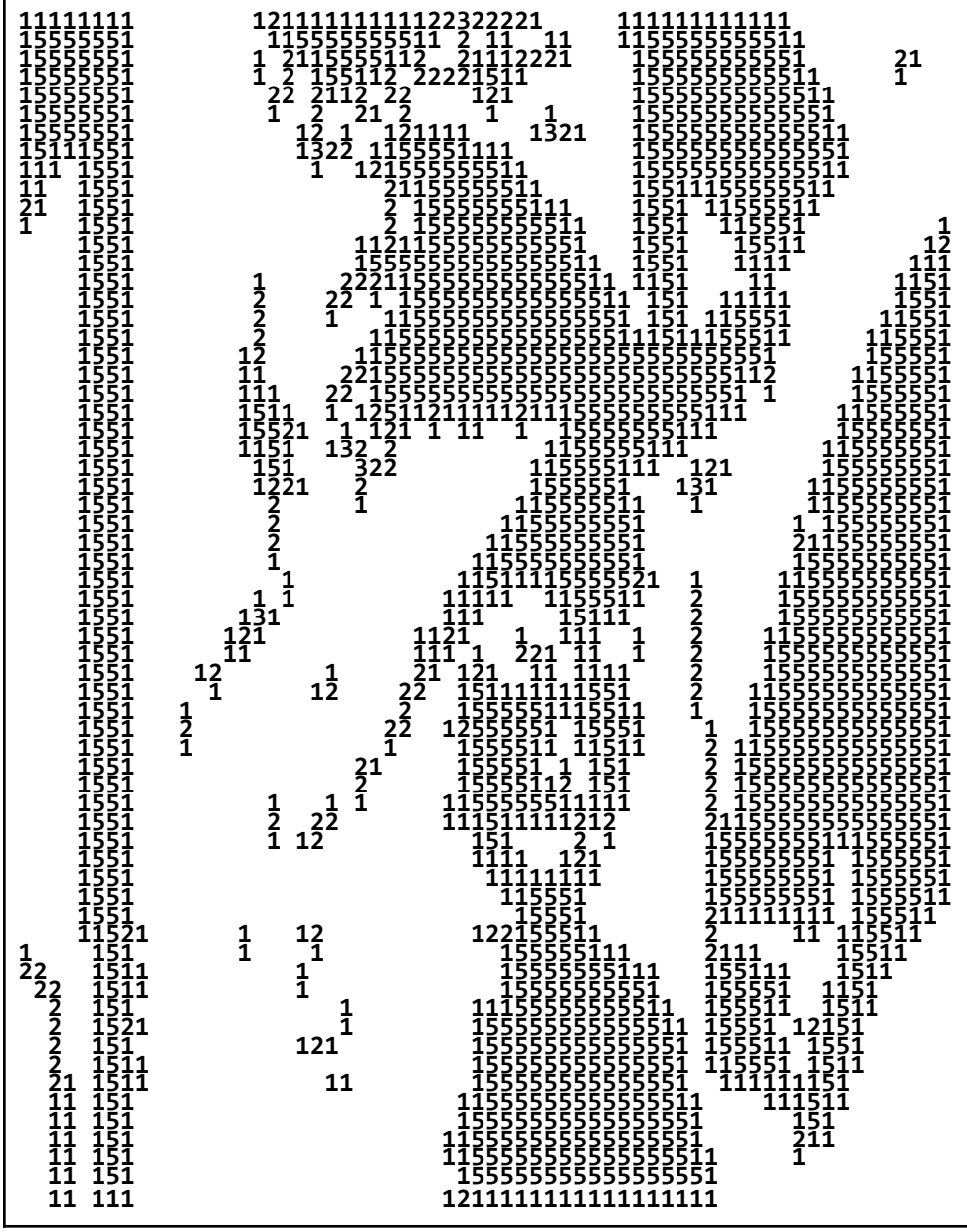
(a) Yokoi connectivity

Define function h and f by the below equations. Iteratively scan through each pixel and pass corner neighborhoods pixels to the h function. Pass all the h function's output from the last step to f function and get the pixel's label.

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

$$f(b,c,d,e) = \begin{cases} 5 & if\ a_1 = a_2 = a_3 = a_4 = r \\ n & where\ n = \#\{a_k | a_k = q\}, otherwise \end{cases}$$



[Code]

```
def h(b, c, d, e):
    if b == c and (b != d or b != e):
        return "q"
    elif b == c == d == e:
        return "r"
    elif b != c:
        return "s"

def f(a1, a2, a3, a4):
    if a1 == a2 == a3 == a4 == "r":
        return 5
    return len([a for a in [a1, a2, a3, a4] if a == "q"])

def get_neighbors_pixel(img, y, x):
    coords = [
        (x, y), (x + 1, y), (x, y + 1), (x - 1, y), (x, y - 1),
        (x + 1, y - 1), (x + 1, y + 1), (x - 1, y + 1), (x - 1, y - 1),
    ]

    neighbors_pixel = []
    for x, y in coords:
        if x < width and x >= 0 and y < height and y >= 0:
            neighbors_pixel.append(img[y, x])
        else:
            neighbors_pixel.append(None)

    return neighbors_pixel

if __name__ == "__main__":
    for y in range(height):
        for x in range(width):
            if img[y, x] == 255:
                x_i = get_neighbors_pixel(img, y, x)
                a1 = h(x_i[0], x_i[1], x_i[6], x_i[2])
                a2 = h(x_i[0], x_i[2], x_i[7], x_i[3])
                a3 = h(x_i[0], x_i[3], x_i[8], x_i[4])
                a4 = h(x_i[0], x_i[4], x_i[5], x_i[1])
                n = f(a1, a2, a3, a4)
                out_img[y, x] = n
            else:
                out_img[y, x] = 0
```