# CV hw6 / 電機所R06921082 陳與賢

## Description:

利用python來處理bmp檔，進行**Yokoi Connectivity Number**
讀入hw2的binary圖檔，code如下：

```
6 img_input = Image.open('binary.bmp')
7 pixels_input = img_input.load()
```

## Algorithm:

首先要先做downsampling，以8*8的block為unit，採用左上角的pixels值，code如下：

```
0 downsampling = Image.new(img_input.mode, (64, 64))
1 pixels_downsampling = downsampling.load()
2
3 i = j = -1
4 for x in range(0, img_input.width, 8):
5     i += 1
6     j = -1
7     for y in range(0, img_input.height, 8):
8         j += 1
9         pixels_downsampling[i, j] = pixels_input[x, y]
```

downsampling後的圖如下：

接著開始算出Yokoi Connectivity Number，演算法蠻簡單的，首先找出x0~x8(超出邊界就給0)，然後算出q跟r的數量，若r的數量為4則回傳5，否則回傳q的數量，code如下：

```
def find_number(x, y):
    x0 = 255
    x1 = x2 = x3 = x4 = x5 = x6 = x7 = x8 = 0

    if x + 1 < 64:
        x1 = pixels_downsampling[x + 1, y]
    if y - 1 > -1:
        x2 = pixels_downsampling[x, y - 1]
    if x - 1 > -1:
        x3 = pixels_downsampling[x - 1, y]
    if y + 1 < 64:
        x4 = pixels_downsampling[x, y + 1]
    if x + 1 < 64 and y + 1 < 64:
        x5 = pixels_downsampling[x + 1, y + 1]
    if x + 1 < 64 and y - 1 > -1:
        x6 = pixels_downsampling[x + 1, y - 1]
    if x - 1 > -1 and y - 1 > -1:
        x7 = pixels_downsampling[x - 1, y - 1]
    if x - 1 > -1 and y + 1 < 64:
        x8 = pixels_downsampling[x - 1, y + 1]

    r_count = 0
    q_count = 0

    if x0 == x1:
        if x2 == 0 or x6 == 0:
            q_count += 1
        else:
            r_count += 1
    if x0 == x2:
        if x3 == 0 or x7 == 0:
            q_count += 1
        else:
            r_count += 1
    if x0 == x3:
        if x4 == 0 or x8 == 0:
            q_count += 1
        else:
            r_count += 1
```

```
    if x0 == x4:
        if x1 == 0 or x5 == 0:
            q_count += 1
        else:
            r_count += 1

    if r_count == 4:
        return 5
    else:
        return q_count
```

## Result

最後是結果，由於助教的上課ppt沒有把0印出來(isolated label)，但我個人覺得isolated label的0值應該要印出來，因為他跟pixel值為0不一樣，所以我這邊附上有印出isolated label跟沒有isolated label的答案。

不印出isolated label:

印出isolated label: