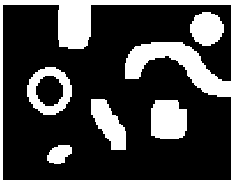
MATLAB Programming NCTU Spring 2017 Assignment#3 due 2017/5/9

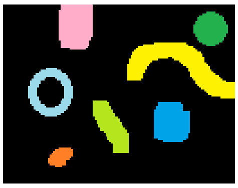


In this assignment, you will implement a function for a standard binary image operation: connected-component labeling. In addition, the outputs generated include a structure array containing the properties of the components. To the right is an example binary image with 7 components.

- There are functions in the image processing toolbox (such as **bwlabel** and **bwconncomp**) that have similar or related functionalities. You are not allowed to use them for this assignment, but you can check them out yourself.
- The function header looks like **[CC,imL]=cclabel(im)**. The input **im** is a binary image (type **uint8** or **logical**: "=0": black; ">0": white).
- The pseudo-code of connected-component labeling (based on non-recursive region-growing):

```
imL ← an array of zeros of the same size as im
nCC ← 0
while there exists a pixel p with im(p)>0 and imL(p)==0
    nCC ← nCC + 1
    initialize a queue Q with p
    while Q is not empty
        q ← Q.pop
        if im(q)>0 and imL(q)==0
            imL(q) ← nCC
            push the four pixels around q (left, right, above, below) into Q
        end if
    end while
end while
```

- This pseudo-code is not the only way to implement this function. If you have other methods (such as using recursion), you can use those methods instead.
- The pseudo-code above will generate the required output **imL**: when **imL(q)>0**, it is the component index of **q** in **im**; when **imL(q)==0**, **im(q)==0** as well.
- Output **CC** is a structure array. Each element in **CC** is a structure representing one connected component and should contain the following fields:
  - **count**: The number of pixels in the component.
  - **index**: The linear indices of the pixels in the component.
  - **xmin**, **xmax**, **ymin**, **ymax**: The max and min x and y coordinates of the pixels in the component.
- Display a color image such that each component is shown in a different color. For the sample binary image above, and example is shown to the right. Hint: You can convert **imL** to an indexed image, or you can use **imagesc** with a colormap specified by yourself.



<u>**Submission**</u>: Submit your code (m file) through e3. Name your file **P3_#######.m**, where the **#######** represents your student ID. There will be a three-day grace period after the due date, during which there will be a 10%/day deduction for your grade.

A "copy detection" will be applied to your submissions, and those found to have copied assignments will receive zero points for the assignment.

Your code should include sufficient comments. This will be part of the grade. Include your name and ID at the top of your code.

There will be demo session with the TAs (date/time to be announced later).