

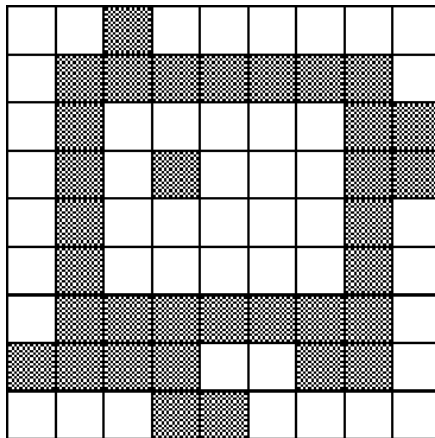
## LAB S09 – CLUMP, YOU'RE GONE

### Background:

An image can be represented as a grid of black and white cells. A *clump* in the image is defined as a group of connected black cells that touch on one side (Please note: cells are **not** connected if they only touch at a corner). The diagram below represents an image that contains two clumps; one of the clumps is a single cell.

A way to test whether a group of cells is a clump (within an image) is to ask:

- Can you move from any black cell in the group to any other black cell in the group by moving one square at a time, keeping on black cells the whole way?
- Each move must be up, down, left, or right; diagonal moves are not allowed.
- If you can, then the group of black cells is an *clump*.



Many drawing or graphic programs include erasing features. With such an eraser tool, a clump can be completely erased by double-clicking on that clump with a mouse.

This problem involves erasing a clump stored as a collection of black squares in a matrix image.

### Assignment:

1. The first entry in the provided text file (*digital.txt*) is the number of pairs that follow (i.e., 55). Each subsequent line contains a pair of integers, separated by a blank space. Each pair is a row and column coordinate that specifies the location of a black cell in the starting grid. The row and column values range from 1 to 20.
2. Write a program that accomplishes the following:
  - a. Load the text file *digital.txt* representing the 20 x 20 grid of black and white squares.
  - b. Ask the user for the starting coordinate of an attempted erasure. If this starting coordinate is part of a clump, the program should erase the entire clump (change black to white).
  - c. Print out the grid afterwards.

**Instructions:**

1. The left hand image is the result of loading the data from *digital.txt*. After loading the data file, print out the image.
2. Erase any one of the clumps; print out the remaining two clumps.
3. Erase any one of the remaining two clumps; print out the single remaining clump.
4. Your code must be submitted to Canvas with a Googly Doc before Sunday, March 8 at 11:59 pm. Alternatively, you may show your code to Holm in class before the due date. **If you submit through CANVAS, you must provide a sample output in your Googly Doc.**

Image before an erasure:

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0

1 -----  
2 -----  
3 -@ @ @ @ @ @ @ @ @ @ @ @ @ @-----  
4 -----@-----  
5 -----@-----  
6 -----@-----  
7 -----@-----  
8 -----@-----  
9 -----@-----  
10 -----@ @ @ @ @ @-----  
11 -----@ @ @ @ @ @-----  
12 -----@ @ @ @ @ @-----  
13 -----@ @ --@-----  
14 -----@ --@ @-----  
15 -----@ @ @ @ @-----  
16 -----  
17 -----@ @ @ @ @-----  
18 -----@-----  
19 -----@ @ @ @-----  
20 -----@-----

Image after first erasure:

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0

1 -----  
2 -----  
3 -@ @ @ @ @ @ @ @ @ @-----  
4 -----@-----  
5 -----@-----  
6 -----@-----  
7 -----@-----  
8 -----@-----  
9 -----@-----  
10 -----  
11 -----  
12 -----  
13 -----  
14 -----  
15 -----  
16 -----  
17 -----@ @ @ @-----  
18 -----@-----  
19 -----@ @ @ @-----  
20 -----@-----

Image after second erasure:

[illegible]