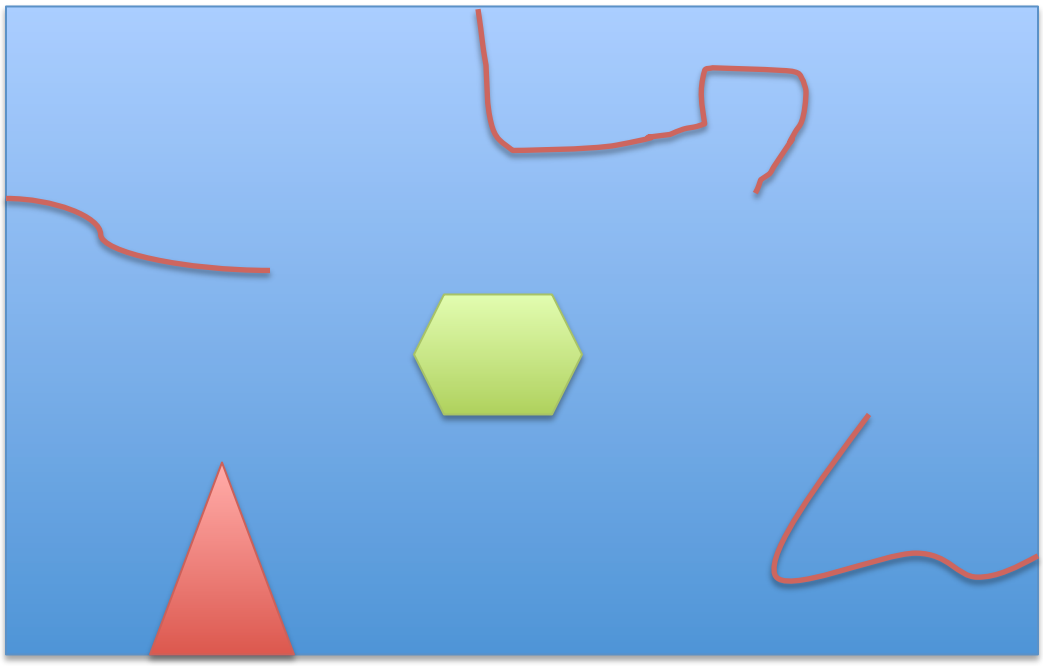
Homework #3: Programming Exercise

Design an algorithm that identifies the external gaps in a map. An external gap means that there is an outlet reaching the outside of the map. You may imagine that these gaps are rivers that reach a boundary of a map, while an internal gap cannot reach the outside of the map. The following is an example where all red gaps are external gaps, while the green one is internal.



You need to write a C++ program to implement your algorithm and test a case using the provided text file as an input map. The file consists of 1s and 0s, where 1 means there is a gap at the current location, and 0 means no gap. Your program should identify all external gaps, and mark them using number 2s. Do **NOT** change the values of internal gaps.

input:

0 0 0 0 0 0 0 1 0 0 0 0
1 1 0 1 1 0 0 1 0 0 0 0
0 1 1 1 0 0 0 1 1 1 0 0
0 0 0 0 0 0 0 0 0 1 0 0
0 0 0 0 1 1 0 0 1 1 0 0
0 0 0 0 1 1 0 0 1 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 1 1 0 0 0
0 1 0 0 0 0 0 0 1 1 1 0
0 0 0 0 0 0 0 0 0 0 1 1
0 0 0 1 1 1 1 1 0 0 0 0
0 0 0 0 0 0 0 1 0 0 0 0

Expected Output:

0 0 0 0 0 0 0 2 0 0 0 0
2 2 0 2 2 0 0 2 0 0 0 0
0 2 2 2 0 0 0 2 2 2 0 0
0 0 0 0 0 0 0 0 0 2 0 0
0 0 0 0 1 1 0 0 2 2 0 0
0 0 0 0 1 1 0 0 2 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0
0 1 0 0 0 0 0 2 2 0 0 0
0 1 0 0 0 0 0 0 2 2 2 0
0 0 0 0 0 0 0 0 0 0 2 2
0 0 0 2 2 2 2 2 0 0 0 0
0 0 0 0 0 0 0 2 0 0 0 0