# Pirates

locked

by *IEEEXtreme*



Intended complexity O(N * M + Q log N)

Solution:

We can build an undirected graph in which every node represents a connected zone from the map having the same value and the edges are between two zones that touch. In the example there are 5 such zones, 2 islands and 3 seas. You can prove that the graph is in fact a tree (undirected graph in which any two vertices are connected by exactly one path). To answer a query, you have to find the nodes x and y in the tree which represent the components that contain cell (x1, y1) and (x2, y2). The answer is the number of island nodes in the tree between x and y. This can be solved in O(log N) time complexity using any fast lowest common ancestor algorithm. The complexity is O(log N) per query because the tree has a maximum height of N. The total complexity is O(N * M) to build the tree and O(Q log N) to answer all of the queries.

## Statistics

**Difficulty:** Hard

**Publish Date:** Aug 04 2016