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IEEEXtreme 10.0 > Pirates

Pirates

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Problem

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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

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