C: Canal Crossing

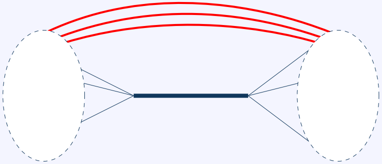
Michael Zündorf

Problem

Given a tree and a set of extra edges (bridges), find the shortest tour through the extra edges, that uses each tree-edge at most once.

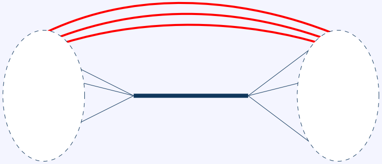
Solution

- Each tree edge connects two parts of the graph.



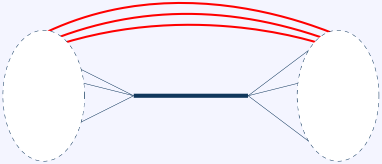
Solution

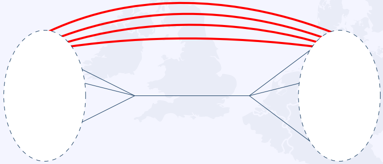
- Each tree edge connects two parts of the graph.
- If an odd number of bridges connect the two parts, the tree edge must be used in the optimal tour.



Solution

- Each tree edge connects two parts of the graph.
- If an odd number of bridges connect the two parts, the tree edge must be used in the optimal tour.
- The inverse is also true, if the number is even, the tree edge is not used in the shortest solution.





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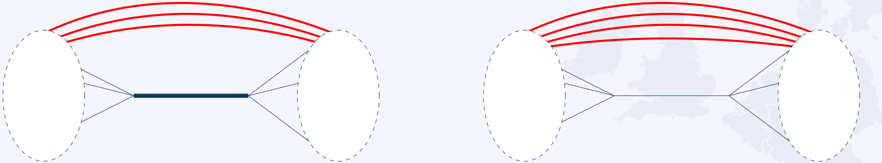
- Starting with leaves, count amount of bridges connected to that sub tree. Only the parity of this number matters.



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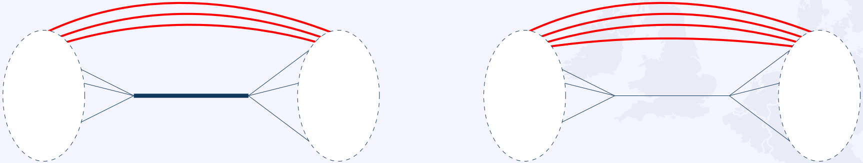
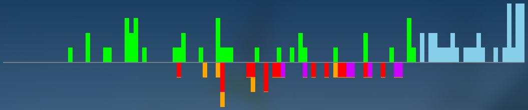
- This gives an $\mathcal{O}(n)$ DFS solution.





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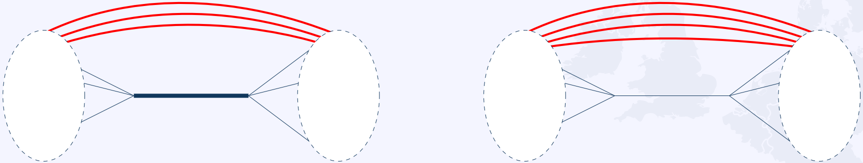

Statistics: 99 submissions, 39 accepted, 33 unknown