

ShortestCycle

Asher Kirshtein

February 10, 2022

1 The Algorithm

The way I solved this problem was by using Dijkstra with a little bit of a twist. When I initialize my graph I remove the edge that the path must contain, I then use Dijkstra to find the Shortest path from one vertex on the Edge to the other vertex on the edge. Once I get that path from vertex 1 to vertex 2 I simply add in my path that the Cycle must contain making it a cycle of the shortest path.

2 Why does my Algorithm work?

Dijkstra finds the shortest path from one point to another and we know that. So when we find the shortest path from point A to point B and simply make it a cycle by adding the Final point. We simply just add our final edge and make it a cycle. So it has to contain the edge we are cycling around so by adding that to the smallest path it can't be any shorter.

3 My time Constraints

My time constraints are literally just Dijkstra plus adding a final edge. And Dijkstra's time constraints are $O(V + E * \log(V))$ So my time constraints are the same except you can add a 1 for me adding in the final edge that's needed to make it a cycle.