

Intergalactic Travel Restriction

You are manning a spaceship, the CS-381. You wish to travel from Earth to Kepler-452b, as fast as possible, hopping from outpost to outpost. However, the intergalactic authorities have issued a travel restriction due to a plague. They have designated certain outposts as testing centers, where you must not visit 5 outposts without visiting a testing center.

To model this, let $G = (V, E)$ be a graph where the vertices V represent the outposts and the edges E represent the travel routes between them, along with the travel time. Let $T \subset V$ be the set of testing centers. The goal is to find the shortest path from the vertex representing Earth to the vertex representing Kepler-452b such that no more than 4 consecutive vertices on the path are outside T .

Alice and Bob

Let s, t be two distinct vertices in a graph $G = (V, E)$. Alice is located at vertex s and Bob is located at vertex t . Alice and Bob play a game where on each round they have to travel to an adjacent vertex along an edge of the graph. Alice and Bob wish to meet at the same vertex in the minimum number of rounds, or determine this is not possible. Develop an algorithm to determine the minimum number of rounds required for Alice and Bob to meet, or to conclude that it is impossible for them to meet.