

CS 331: Algorithms and Complexity (Spring 2024)

Unique numbers: 50930/50935/50940/50945

Discussion Section 3

Road Trip!

You and some friends have decided to take a road trip across the country. It has fallen to you to plan the route. Due to an unfortunate incident during your last road trip, you all agree that you should not travel at night.

Your friends have already identified stopping points along the route (usually hotels in larger cities). All you need to do is plan the route so that you spend the fewest number of nights on the road as possible.

As you sit down to start planning, one of your friends messages you with an idea. She says that in order to minimize the number of nights you spend on the road, you should use the following strategy: whenever you arrive at a stopping point, figure out whether you can make it to the next point before sundown. If so, continue on. Otherwise, stop for the night. She claims that this will minimize the number of nights you spend away from home, and is easy-to-calculate to boot.

Let's suppose that your estimates for how far you can travel in a given period of time are always accurate. Does your friend's strategy always guarantee that you'll spend the least number of nights on the road, regardless of how your stopping points are arranged along the route? If not, give a counterexample. If so, prove that this strategy is optimal.