HOCHSCHULE BONN-RHEIN-SIEG

Artificial Intelligence for Robotics Homework

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1 Problem

You probably have used the Deutsche Bahn App to plan trips between two Train Stations. It also works for addresses that are not directly into train stations. The purpose of this exercise is to "duplicate" the functionality by using A*, so you should:

a) Create random maps that contains N > 3000 Train stations and the connections between them (also at random). Each train station has a global position on the map and can be connected directly (in a straight line) to any number of other stations.

b) Define the state space and heuristics to use A*. c) Implement A* with the purpose of finding the shortest path between 2 given points. d) Also consider the case when the starting point is not a Train station on the map, but a given point in cartesian coordinates.

Solution : The heuristic used is the Euclidean distance. The implementation is present in the uploaded zip file.

2 Problem

Read problem 1. Give convincing estimates about the size of the state space used by the Deutsche Bahn App. This mean you should give a comprehensive calculation about how you reached your estimate. You base your estimates on public data available on the web.

Solution : Referring to the fact sheet of Deutsche Bahn, under the Infrastructure title we notice 1,035 million train-path km train connections with 146.2 Station stops.Since the data is quite a lot, we can conclude that the size of the state space is going to be very very large.