

GWV – Grundlagen der Wissensverarbeitung

Tutorial 2: Search Space and Artificial Intelligence

Exercise 1.1: (Search Space 1)

1. Imagine you have to design a route planning application for public transport (German: Öffentlicher Nahverkehr). What would be the state-space in this application? And what would be the semantic of nodes and edges in the graphs representing the state-space for this application? (1 Pt.)
2. *You are given two jugs, a 4-liter jug and a 3-liter jug. Neither has any measuring markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 liters of water into the 4-liter jug?*

Solve this riddle using your knowledge about searching gained so far. The following steps will guide you to a solution:

- (a) Develop a formal model of the problem and select appropriate methods to solve it.
 - Define a model of the state of the two jugs. Give a complete listing of all possible states.
Hint: It is OK to assume that a jug can only contain a whole number of liters in any state to keep the state-space manageable.
 - Define start and goal state of the search problem.
 - Define the possible transitions between states. These transitions represent actions that you could perform with the two jugs like filling one jug to its top either from the the pump or the other jug, filling one jug completely into the other if this is possible, emptying one jug into the drain and so on. Remember that neither of the water jugs has measuring markers on it.(4 Pt.)
- (b) Imagine instead of water you would have to measure 2 liters of expensive wine, so wasting any liquid is not an option. Is the riddle still solvable? (1 Pt.)

Exercise 1.2: (Search Space 2)

In the last assignment you had to give three examples of problems from the field of AI. Try to relate one problem to search. Can you come up with a search space, the start and end states and the transitions for the problem? Where are difficulties you encounter during modeling? (In case none of your AI Problems can be related to search pick another AI problem discussed in class.) (6 Pt.)