

Tutorial Sheet 1

Search

- Open Discussion: What is Artificial Intelligence?
- Watch the videos:
 - Holy Grail of AI: <https://www.youtube.com/watch?v=t1S5Y2vm02c>
 - Humans Need Not Apply: <https://www.youtube.com/watch?v=7Pq-S557XQU>
 - Artificial Intelligence: <https://www.youtube.com/watch?v=oYqXQw2CryI>
 - The long-term future of AI: <https://www.youtube.com/watch?v=CK5w3wh4G-M>

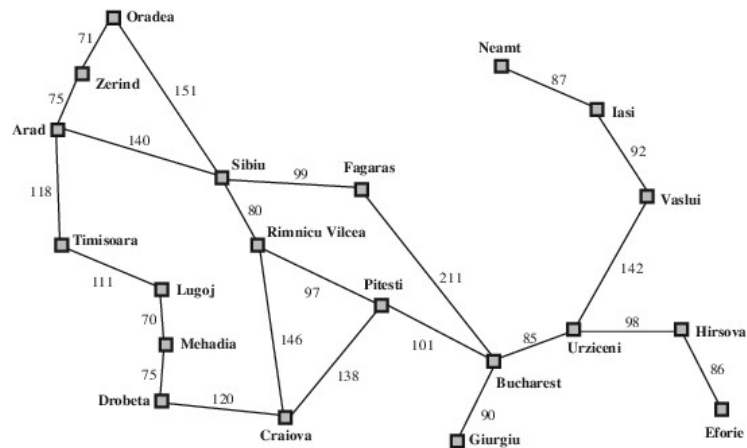
Exercises

1. (RN) Define in your own words the following terms: state, state space, search tree, search node, goal, action, successor function, and branching factor.
2. (RN) What's the difference between a world state, a state description, and a search node? Why is this distinction useful?
3. Consider this problem: We have one 3 litre jug, one 5 litre jug and an unlimited supply of water. The goal is to get exactly one litre of water into either jug. Either jug can be emptied or filled, or poured into the other.

For this problem give:

- (a) An appropriate data structure for representing a state.
 - (b) The initial state.
 - (c) The final states (there are 2 “classes”).
 - (d) A specification of the operators (or actions) which includes the preconditions that must be satisfied before the operator can be used and the new state generated.
 - (e) Draw the full state space.
 - (f) What is the solution to the problem.
4. Does a finite state space always lead to a finite search tree? How about a finite state space that is a tree?
 5. Consider the problem of getting from Arad to Bucharest in Romania. For this problem give:
 - State descriptions.
 - Initial State.
 - Final State.
 - Operators.

- The part of the search space that is realized in memory and the order of node expansion if uniform cost search is used.



6. (RN) Which of the following are true and which are false? Explain your answers.

- Depth-first search always expands at least as many nodes as A search with an admissible heuristic.
- $h(n) = 0$ is an admissible heuristic for the 8-puzzle.
- A is of no use in robotics because percepts, states, and actions are continuous.
- Breadth-first search is complete even if zero step costs are allowed.
- Assume that a rook can move on a chessboard any number of squares in a straight line, vertically or horizontally, but cannot jump over other pieces. Manhattan distance is an admissible heuristic for the problem of moving the rook from square A to square B in the smallest number of moves.

7. *You say more?* Lots of cool exercise in RN book, chapter 3....