# Search and Planning

Exercise SP1 (8 points)

An agent has to collect a treasure. The treasure is locked behind a door and a key is needed to open the door. The cell with the door can only be entered when the agent has the key. On the way there are several pits. The agent can move between cells if they are adjacent to each other, and jump over a pit only if it has a hanging rope and the cell following the pit is not a pit. Two cells are not adjacent if they are not in the same row or in the same column. The initial state is represented in the figure.
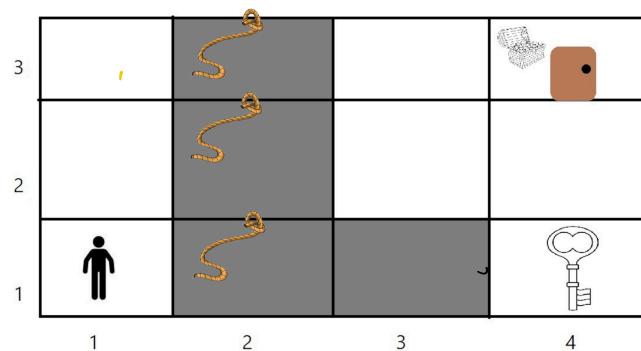
(a) Model the problem in PDDL by defining the problem and domain file.

(b) Define a plan that achieves the goal of getting the treasure, given the initial configuration in the figure; show each state in the plan, by specifying the initial state and the changes caused by each action.

(c) Draw the first 3 levels of the tree generated by forward search, showing all the actions applicable at each of the states that are traversed in the plan found in (b), without further expanding the states that do not belong to the plan.

Exercise SP2 (4 points)

Discuss the concept of heuristic for search in the state space. Describe the admissibility property and the methods to find heuristics. Provide an example of heuristic by referring to the problem in Exercise SP1.

Exercise SP3 (4 points)

Define the notion of Partial Order Plan and sketch the POP algorithm. Discuss the main advantages and disadvantages with respect to state space planning.