

Search and Planning

Exercise 1 (8 points)

A repair robot is equipped with an arm handling a screwdriver and another arm to manipulate objects. The two arms can not operate simultaneously. The robot must repair a refrigerator, which is already placed in the working space of the robot, by replacing the broken compressor. The refrigerator is still on and a new compressor is available. The compressor is accessible by removing the backplane, which is held by 2 screws. Before extracting the compressor, the fridge must be powered off. The two actions to unmount the broken compressor and to mount the new one into the fridge can be modelled as primitive actions without further decomposing them. The goal is to have the fridge repaired, fully reassembled and powered off.

- (a) Describe the domain in PDDL;
- (b) Describe the problem in PDDL;
- (c) Discuss the forward planning process to reach the goal, using a *perfect* heuristic that gives for each state the number of steps to reach the goal; for each step, show the current state, the applicable actions and the state resulting from the application of the chosen action.

Exercise 2 (4 points)

Describe the language for HTN planning. In particular, explain the notion of *reachable set*.

Exercise 3 (4 points)

Describe the algorithm A^* , focussing in particular on correctness, completeness and memory requirements. In addition, address the limitations of A^* and possible approaches to mitigate them.