

Knowledge, Reasoning and Planning

Bachelor in Artificial Intelligence and Data Science

University of Coimbra (DEI)

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Practical Sheet 8

Automated Planning

1. Analyze the provided Planning Domain Definition Language (PDDL) implementation of the gripper problem and the respective Python planner script. Identify and describe the predicates, actions, and problem specification. Run the planner script with a different engine (`fast-downward`) and compare the generated plans.

Note: Install the following Python packages for the planner:

```
pip install unified-planning up-pyperplan up-fast-downward
```

2. Modify the gripper problem to handle a more complex scenario:
 - Create a new problem file with three rooms (roomA, roomB, roomC) instead of two. Place six balls initially distributed across the rooms: three balls in roomA, two balls in roomB, and one ball in roomC.
 - Define a goal state where specific balls must be moved to different target rooms. For example, balls from roomA should go to roomB, balls from roomB should go to roomC, and the ball from roomC should go to roomA.
3. Extend the domain to support multiple robots operating in the environment:
 - Replace the predicate (`at-robot ?x`) with (`at-robot ?r ?x`) where `?r` identifies a specific robot and `?x` is its location. Add a predicate (`ROBOT ?r`) to identify robot entities. Moreover, modify all existing actions (`pickup`, `drop`, `move`) to include a robot parameter and update their preconditions and effects accordingly.
 - Create a problem with two robots (`robot1` and `robot2`), each with two grippers and four balls in room A that must be transported to room B.