

16.410-13 Recitation 5 Problems

Problem 1: PDDL example

We car that has a flat tire. We are in the following situation.

- The car has its *flat* tire on the *axle*.
- There is a *spare* tire in the *trunk*.
- The driver can *remove* any *tire* from any *place* (i.e., either axle or trunk) and put it on the *ground*.
- The driver can *put* any *tire* that is on the *ground* to any *place* that is *empty*.

Formulate this problem in PDDL and draw the corresponding plan graph.

Problem 2: More PDDL

Suppose you have a robot that moves in a house with several rooms and can pickup balls and put them down. More precisely, the robot has three actions: **Navigate** from one room to another, **Pickup** a certain ball from a certain room, and **Putdown** a certain ball to a certain room. Your robot can carry several balls all at once. Model this problem using PDDL. Write down the *predicates* and the *actions*.

Assume that the house has a **bedroom** and a **kitchen**. Assume also that there is only one ball called the **blueball**. Initially, the **blueball** is in the **bedroom**. The robot starts in the **kitchen**. The goal is to take the **blueball** to the **kitchen**. Write down your *objects*, *initial condition*, and *goal condition* in PDDL.

Problem 3: Planning graphs – baking the cake

Consider the following PDDL specification. Draw the corresponding plangraph until it levels off, i.e., reaches a fixed point. Indicate the mutexes.

```
(:predicates (AT ?ball ?room)
             (IN ?room)

(:action Eat :parameters (?cake)
            :precondition (HAVE ?cake)
            :effect       (and (not (HAVE ?cake))
                               (EATEN ?cake)))

(:action Bake :parameters (?cake)
            :precondition (not (HAVE ?cake))
            :effect       (HAVE ?cake))

(:objects cake)

(:init (HAVE cake))
(:goal (and (HAVE ?cake)
            (EATEN ?cake)))
```

Problem 4: More planning graphs – Robot navigation

Recall the PDDL specification you had worked with in Problem 2. Draw the first two levels of the corresponding plan graph. Explain the execution of the GRAPHPLAN algorithm on the first two layers.

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