

Assignment 4

Written Assignment - Planning

Max points:

- CSE 4308: 75 (90 with EC)
- CSE 5360: 75

The assignment should be submitted via [Blackboard](#).

Instructions

- The answers can be typed as a document or handwritten and scanned.
 - Name files as assignment4_<net-id>.<format>
 - Accepted document format is .pdf.
 - If you are using Word, OpenOffice or LibreOffice, make sure to save as .pdf.
 - If you are using LaTeX, compile into a .pdf file.
 - Please do not submit .txt files.
 - If you are scanning handwritten documents make sure to scan it at a minimum of 600dpi and save as a .pdf or .png file. Do not insert images in word document and submit.
 - If there are multiple files in your submission, zip them together as assignment6_<net-id>.zip and submit the .zip file.
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Task 1 (CSE 4308: 30 Points; CSE 5360: 25 points)

Three adults and three children are on the left side of the river. Each adult weighs 150 pounds. Each child has half the weight of an adult, so each child weighs 75 pounds. They all want to cross to the right side of the river. However, the only means of transportation they can use is a boat, and the boat can carry a maximum of 225 pounds. Thus, the boat can carry one adult, one adult and one child, one child or two children. Any adult or child can operate the boat, but the boat cannot be operated without having at least one person on the boat. The goal is to come up with a plan for moving everyone from the left side to the right side using multiple boat trips.

Describe the initial state and the goal, using PDDL. Define appropriate actions for this planning problem, in the PDDL language. For each action, provide a name, arguments, preconditions, and effects. Also, give a complete plan (using the actions described) for getting from the start to the goal state

Task 2 (CSE 4308: 30 Points; CSE 5360: 25 points)

Suppose that we are using PDDL to describe facts and actions in a certain world called JUNGLE. In the JUNGLE world there are 4 predicates, each predicate takes at most 4 arguments, and there are 5 constants. Give a reasonably tight bound on the number of unique states in the JUNGLE world. Justify your answer.

Task 3 (CSE 4308: 15 Points; CSE 5360: 10 points)

We have state descriptions and action definitions written following the conventions used in the graphplan software of Optional Assignment 1. One of the actions is defined as follows:

```
(operator
  aaa
  (params
    (<b> ttt1) (<c> ttt1))
  (preconds
    (ppp1 <b> <c>) (ppp2 <b>) (ppp3 <c>))
  (effects
    (eee1 <b> <c>) (eee2 <b>) (del eee3 <c>)))
```

Suppose we are at a state S1 described as follows (again, using graphplan syntax):

```
(A ttt1)
(B ttt1)
(C ttt1)
(ppp1 B C)
(ppp2 A)
(ppp2 B)
(ppp3 C)
(eee1 A C)
(eee2 C)
(eee3 C)
(eee3 A)
```

What is the state resulting from applying action `aaa(B,C)` to S1? Give a complete specification.

Task 4 (CSE 4308: 15 Points (EC); CSE 5360: 15 points)

Consider the problem in Task 1. Let us say that, if there is only one person in the boat, the boat can be blown off course and end up back on the side it originally started from. How would you modify the actions you described in Task 1 to account for this if you were going to try and handle this scenario by

- Execution Monitoring/Online Replanning
- Conditional Planning

In both cases, show what the modifications are (If no modification is necessary, Justify).