Computer and Information Sciences
University of Strathclyde

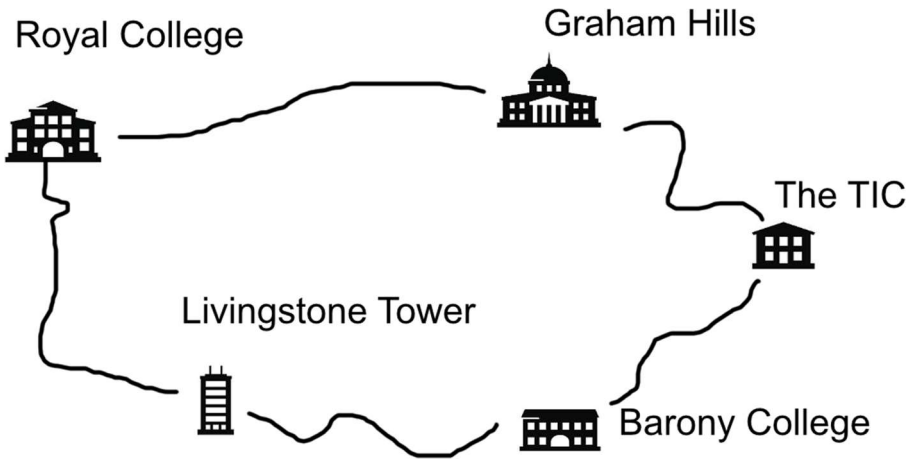
Week 10 – Planning with Strathclyde Taxis (4% of your mark)

Aim

This exercise is an introduction to modelling planning problems using the Planning Domain Definition Language (PDDL) and is a small introduction to planning using simple propositional logic. You can use the online planner or you can install PDDL on VSCode by searching for PDDL in the extensions. You will find the week 10 lecture notes useful, and I have made chapter 2 of a useful textbook available on MyPlace week 10.

Part 1: Strathclyde Taxis – Getting Started (2%)

The University of Strathclyde has decided to run a shuttle service to allow students to travel between lectures. The initial conditions are that taxis can only travel clockwise, and we are not worrying about fuel costs. The taxis can only travel from location to location.



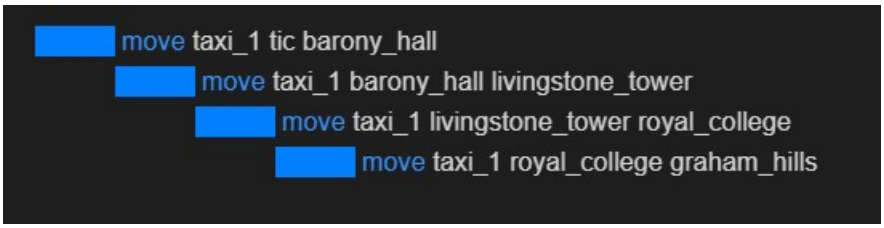
So, for example, a taxi can travel from Royal College (RC) to Graham Hills (GH) in one action, but to travel from GH to RC, then the taxi must travel to the TIC, Barony, Livingstone, and then RC, requiring 4 actions. A problem file has been provided on MyPlace, giving a scenario for one taxi, 5 locations, and clockwise travel only. Three people have also been added, with initial locations and a goal of dropping them all off at their chosen location.

Your first task is to create a domain file to solve this problem. Some hints are given below:

- You will need 3 actions, one to allow a person to “get in” a taxi, one to allow a person to “get out”, and one to allow the taxi to move
- In the current problem, you do not need to worry about how many people are in the taxi
- The Get In action should have the effect of the person being inside the taxi, and the preconditions are that the taxi and a person must be at a location, and the person must be outside the taxi

Modified March 2024, created March 2023
By Dr Andrew Abel

- Hint: Try changing the problem to build it up slowly. For example, comment out the passengers, and have the goal simply to be to move the taxi to a different location so that you can test the move action. If we comment out all the goals and, set the goal to **"(tlocation taxi_1 graham_hills)"** then we can produce a plan like



- You should be able to solve this problem in around 12 actions!

- Show this to a lab demonstrator when you have completed it to get signed off for part 1

Part 2: More Taxis (2%)

There are some changes we can make to the problem, to make it a bit more realistic

- We can add some people to represent a busier world, so add 3 more people going to different locations. This should (obviously) make your resulting plan much longer.
- Another problem is that people do not want to share taxis, they would rather get a taxi alone, so adjust the domain so that people can only get into empty taxis. This will also make your plan longer. My version resulted in 36 steps. Yours will be different.
- It is not realistic to say that we can only drive clockwise, so adjust the problem so that cars can go in both directions, clockwise and anticlockwise. This may or may not reduce your plan length, depends on your passengers!
- Add a second taxi. You may think that it might make your plan shorter, but with more taxis, you are adding more variables, so mine was slightly longer!

At this point you should have 2 taxis and 6 people and be able to make a plan to pick up and drop them all off!

Submission Instructions

When you are ready, get your parts 1 and 2 signed off by a lab demonstrator.
Make sure you understand your output.