Computer and Information Sciences
University of Strathclyde

Lab 2 – Strathclyde Taxis

Aim

This lab is a more advanced PDDL problem, and will allow you to use functions and numeric values

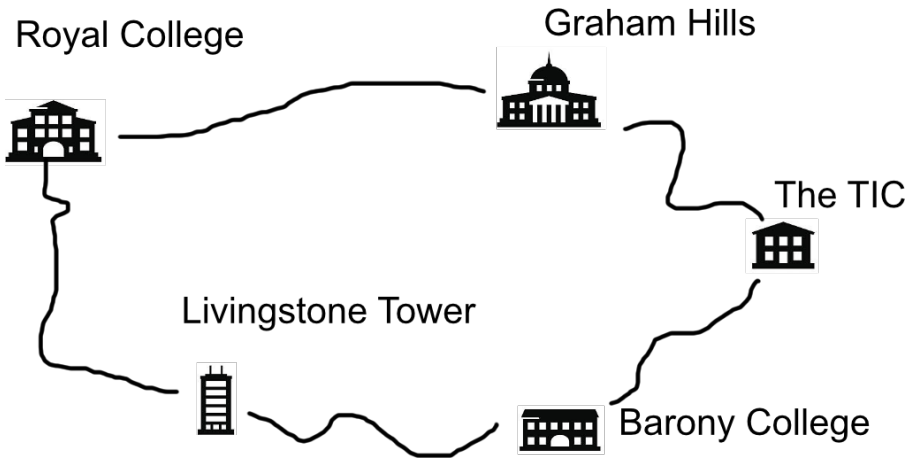
Tools and software required:

The first part of this lab can be run with the online planner, but you will need to use a different planner. There are two options. Firstly, you can install a planner to give you more advanced options, with instructions on a separate sheet. Alternatively, you can use a special session of the online planning:

http://editor.planning.domains/#read_session=JAlHoWLhP2

Strathclyde Taxis – Getting Started

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 taking fuel into account. 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

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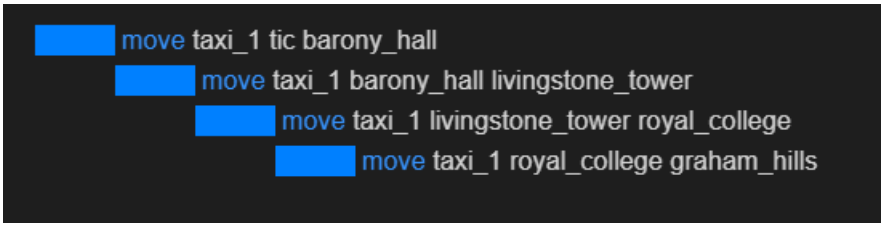
- The Get In action should have the effect of the person being inside the taxi, and the preconditions are that the taxi must be active, the taxi and a person must be at a location, and the person must be outside the taxi

- 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!

More Taxis

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! However, when using a temporal planner (see next step), it could reduce the time.

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!

Fuel Costs

So far, we have assumed that all our actions are instantaneous and cost free. However, again, this does not represent the world. We also have costs associated with our actions. This week, we will not deal with time durations, and will simply consider costs.

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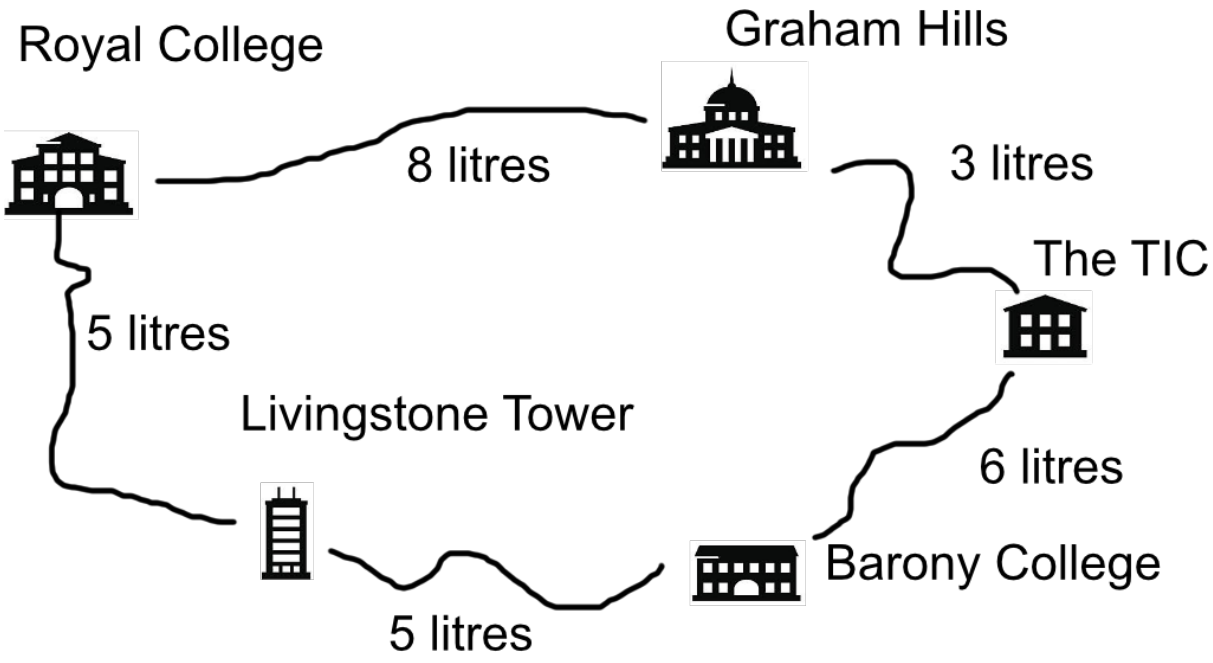
Up till now, you will have been able to use the standard planner, but if you have not done so already, then you will need to switch to either using the online planner with special temporal set up:

http://editor.planning.domains/#read_session=JAlHoWLhP2

Or you will need to set up Optic with linux, as per the guidance sheet. Chapter 3 of the pddl textbook introduces functions, and you will need them for this next stage.



We want to update our world so that we take the costs of fuel into account.

- Define functions for fuel level and fuel cost
- Change the move action to reduce the fuel level
- Set an initial fuel level and define fuel costs in the problem file
- Set an initial fuel level of 20. You should find that the planner is unable to find a solution. Why? Most likely, because your taxis are running out of fuel!
- Create a move action that will restore the fuel of a taxi to 20, however, a taxi can only refill when it is empty.
- Finally, set Barony Hall to be a fuel station location

- If all of this works, you will have your taxis moving between locations, picking up and dropping off, and also filling up where needed!

Next Lab

We will update this lab next to add action moves to take durations into account.

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