PDDL

This assignment is **individual**.

Deadline: The deadline is **October 28, 2022, 17:00** and it is strict.

Submission: Please, submit one text file for each assignment in Canvas as a single text file.

1 PDDL

In this exercise, we are going to look into encoding a planning domain using PDDL. You are recently hired for the position of Chief Technology Officer at the TED foundation (Technology, Entertainment, Design). You are in charge of planning the upcoming conference, which is quite a challenge with all the extra restrictions due to COVID-19. There are different TED talks given at different times. These can also be held in different rooms. To control the spread of COVID-19, lunch will be served in separate groups in separate rooms and face masks are given out at the entrance of the venue. It is your task to take care of the logistics.

In the first problem you will explore, there are 4 rooms where the attendees can attend a TED talk, 1 of them has catering for lunch. The TED talks are given in the morning and/or in the afternoon. Before attending an afternoon talk the attendees must have had lunch first. The speakers can have lunch at any time to accommodate for their busy schedules.

The four basic actions to solve this problem are:

- **Move:** a person moves from one room to another;

- **Have lunch:** a person has lunch with their designated group in a room with catering;

- **Attend morning talk:** an attendee attends a morning talk;

- **Attend afternoon talk:** an attendee attends an afternoon talk.

1.1 DEFINING THE DOMAIN

Download the package **conference-attendance.zip** from Canvas. Your task is to complete the file **conference-domain.pddl** to formalize the planning domain. The syntax used in the file is a standardized syntax used in state-of-the-art PDDL solvers, such as in this on-line editor and solver [2]. There are numerous examples of problems encoded in this syntax under the Import tab in this tool. There are also numerous tutorials on this syntax, for instance this one [1]. The relevant tab to explore there is PDDL Background.

Note that the file conference-domain.pddl will only contain the definition of the *domain. The problem instance* including the definition of objects in the world, the initial state and the goal specification are given in a separate file. You can find one problem instance for the domain in this exercise in **problem-1.pddl**, illustrated in Figure 1.1). In this scenario, we want to plan the day of a single attendee who wants to attend a few TED talks.

Your task is to complete only the code for each of the four actions, which involves writing the parameters, the preconditions, and the effect. Note that each action comes with a comment that gives more details than the brief domain introduction above. All the predicates you are allowed to use are already given in the file. You will not need to define any requirements or functions. Figure 1.1 show the setting of the conference and initial state of the objects in the world. Table 1.1 provides you with information regarding which speaker gives which talk.

You can use the above mentioned on-line editor and solver [2] to see whether your domain definition allows finding a solution to problem-1.pddl. It should provide one although it may not be most efficient (don't worry about that).

Please, submit your solution to Exercise 1.1 as a text file **student-life-domain.pddl** in PDDL1.1 assignment. Make sure that your submitted file does not contain syntax errors.
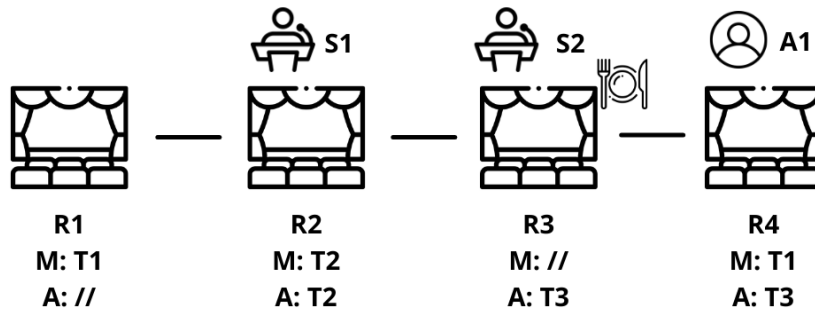
Figure 1.1: Venue set-up and initial conditions of the problem. R_i are the rooms: keep in mind that only the connections shown in the figure are available (i.e. in this set-up people can not move directly from R1 to R3). For each room you can find information in regard to the talks that take place in that specific room in the morning (M) or in the afternoon (A). S_i and A_k stand for speaker and attendee. Finally there is an icon showing which room also contains catering. Because of the small setup, all persons have lunch with group G1 in the room with catering. The icons are taken from Flaticon [3].

Speaker	Talk
S1	T1, T2
S2	T3

Table 1.1: Table showing which speaker S_i gives which talk T_j.

1.2 DESIGNING A PROBLEM

In the previous exercise, you defined the planning domain and tested it in a given problem instance. Now the task is to adapt problem-1.pddl in order to reflect the objects and initial conditions defined in Figure 1.2 and Tables 1.2 and 1.3.

Your goal is to plan the day of three different conference attendees that want to attend different talks: in Table 1.4 you can find the information regarding which talks are to be attended by each attendee. Furthermore, you should keep in mind that part of the goal is that both speakers and attendees should have lunch.

Submit your solution to Exercise 1.2 as a text file **problem.pddl** in PDDL1.2 assignment.

1.3 REFERENCES

[1] A PDDL 2.1 tutorial, `https://www.cs.cmu.edu/afs/cs/project/jair/pub/volume20/fox03a-html/JAIRpddl.html`, Accessed: 2018-09-26

[2] An online PDDL editor and solver, `http://editor.planning.domains/`, Accessed: 2021-02-22

[3] Website for icons, `https://www.flaticon.com`, Accessed: 2021-12-06
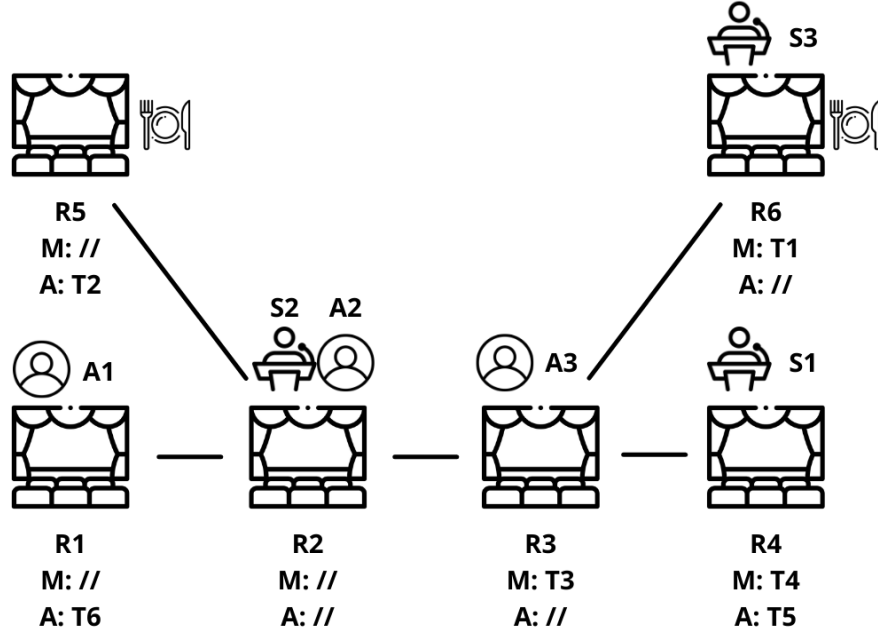
Figure 1.2: Venue set-up and initial conditions of the second problem to design.

Speaker	Talk
S1	T1, T3
S2	T2, T4
S3	T5, T6

Table 1.2: Table showing which speaker S_i gives which talk T_j.

Group	Room	Persons
G1	R5	A2, S1, S3
G2	R6	A1, A3, S2

Table 1.3: Table showing which persons (attendees A_i or speakers S_j belong to group G_k in room R_l for lunch.

Attendee	Talk
A1	T2, T3
A2	T4, T5
A3	T1, T6

Table 1.4: Table showing which attendee A_i must attend which talk T_j.