COMP_SCI 371
HW 5
Due 2/25/2020 1:59 p.m.

In this assignment, we will explore hierarchical planning. In particular, we will write a set of methods to be executed using the HTN planner in Companions.

To contextualize the assignment, let us remember our friend Carmel San Francisco. This time, we have switched sides and would like to help Carmel escape to safety. Our job is to plan Carmel's travel.

To get started, download hw5-PlanningOntology.krf and hw5-PlanningFacts.krf. Load them into Companions. Then, download hw5-Plans.krf and open it in your favorite editor. You will submit the completed file.

The Task
Carmel is hiding out in YantaiHotel in Yantai, Shandong Province, China. Unfortunately, it seems the detectives are onto them. Carmel believes that the safest place for them right now is CarmelHotel in Carmel-By-The-Sea, California, USA.

Carmel can travel by bus, train, airplane or walking. They feel safest flying between the biggest airports in the world, so we will assume that only the Atlanta Airport, Beijing Airport, and Los Angeles airport are available. Furthermore, we will assume that all flights are direct.

1) Our top-level plan (i.e., the task) is called `travel`. It helps determine the appropriate mode of transportation between two points. We will use the following constraints:
    a) Carmel will `walk` distances that are less than 2 miles
    b) They will `takeBus` for distance between 2 and 200 miles
    c) They will `takeTrain` for distances between 200 and 500 miles
    d) They will `fly` for any distances longer than 500 miles

    We will ensure that these constraints are followed through preconditions. Preconditions to call `walk` and `takeBus` are done for you. Fill in the preconditions for `takeTrain` and `fly`.

2) We can now determine Carmel's mode of transportation between two points. However, things are never this simple. Airplanes only fly between airports, buses only stop at bus stops, and trains only stop at train stations.

    Take a look at the first method definition for `fly`. It ensures that Carmel starts flying from airports. In the preconditions, it first finds what the closest airport is to the starting point. If the closest airport and the starting point are not the same place, two

plans are kicked off: `travel` from the starting point to the airport and `travel` from the airport to the destination.

The second method for `fly` should similarly ensure that Carmel finishes flying at airports. This plan should only be considered if the starting point is an airport (otherwise, the previous plan should do the work). This is done for you. Finish filling in the preconditions to check if the endpoint is an airport.

We now know what airports Carmel will fly between. However, we do not know how they will get from the arrival airport to the final destination. Fill in the plan that should be called to plan travel from the airport.

The final method for `fly` is for flying between two airports. It stores a fact in `MyTravelMt` that tells us which airports Carmel will fly between.

3) `takeBus` and `takeTrain` are similar to `fly`: we need to ensure that Carmel only plans on taking the bus between bus stops and the train between train stations. Ensure that all the preconditions and methods are filled in for these plans. HINT: look for TODOs.

4) Now that our plans are written, let's generate Carmel's travel agenda. Load your file into Companions. Right click on the session-reasoner and select "Browse Agent". In the session-reasoner's Profiler tab, click on Planning. Back at your Companion, go to the Commands tab, type in `(travel YantaiHotel CarmelHotel),` and hit enter.

   Go back to the session-reasoner. Under the Knowledge Base tab, search for MyTravelMt . If the suggestions look reasonable (note that they will be in alphabetical order, rather than order of execution), copy them and paste into a comment at the bottom of your krf file. When we run your plan, we should get the same result.

   If something seems fishy, go to the session-reasoner's Profiler tab, click "end profiling" on your Planning Profiler. Click "view". Use the profiler to find bugs. HINT: solutions to preconditions are hidden under "fire::best-method-for…" > "fire::acceptable-methods-for" > "fire::query-pre".

   Don't forget to clear the session-reasoner's working memory (by calling `(doClearWorkingMemory)` at the Commands tab) and forget MyTravelMt and TravelPlansMt (by calling `(doForgetKBMt <mt>))` before fixing any mistakes and trying again.