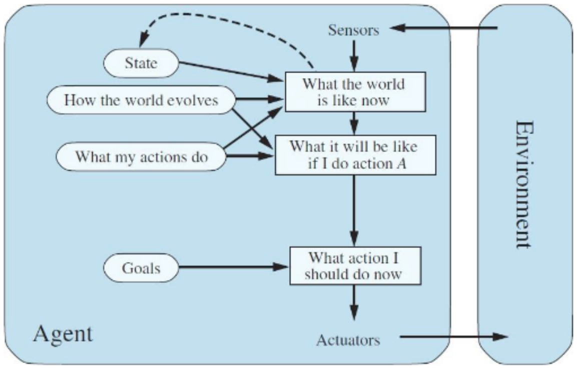
Assignment 1

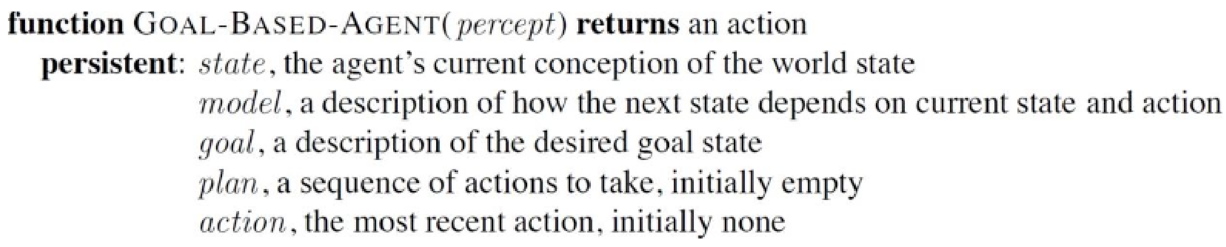
↗ Courses	Artificial Intelligence
Due Date	@February 11, 2025 11:59 PM
# Grade Weight	12.5%
Link	https://www.gradescope.com/courses/975568
Status	In progress

Question 1:

Consider the following **goal-based agent** architecture:


Sensors
State
How the world evolves
What my actions do
What the world is like now
What it will be like if I do action A
Goals
What action I should do now
Agent
Actuators
Environment

Write the Pseudocode for this agent, given the following construct:



```
function GOAL-BASED-AGENT(percept) returns an action
  persistent: state, the agent's current conception of the world state
              model, a description of how the next state depends on current state and action
              goal, a description of the desired goal state
              plan, a sequence of actions to take, initially empty
              action, the most recent action, initially none
```

Answer:

```
current_state ← Update-State(state, action, percept, model)

if plan is empty then
    plan ← FORMULATE_PLAN(current_state, goal, model)

if plan is not empty then
    action ← FIRST(plan)  // returns first element in plan
    plan ← REST(plan) // returns the remaining elements in plan
else
    action ← null  // Means no plan is possible

return action
```

Question 2

Suppose two friends live in different cities in the same country. On every turn, we can simultaneously move each friend to a neighboring city on the map. The amount of time needed to move from city *i* to its neighboring city *j* is equal to the road distance *d(i, j)* between the cities, but on each turn, the friend that arrives first must wait until the other one arrives before the next turn can begin. We want the two friends to meet as quickly as possible. Formulate this situation as a search problem. Use formal notations if you want to. You must define the following:

a. ***State Space***

    a. All possible pairs of cities where the two friends can be.

       (A, B) where A is the city of the first friend and B is the city of the second friend

b. ***Initial State***

    a. Both friends in their starting position/initial city

       (A_initial, B_initial)

c. ***Goal State/goal test***

a. The friends meet in the same city

A == B

d. ***Transition model / successor function***

a. For each state (A, B), the successor function generates all possible next states by moving each friend to a neighboring city simultaneously. For instance, if friend A can move to {A1, A2} and friend B can move to {B1, B2}, the successors are (A1, B1), (A1, B2), (A2, B1), and (A2, B2).

e. ***Action cost function***

a. The cost for each action is the maximum of the two friends individual times.

b. Moving from (A, B) → (A*, B*) is the max road distance/time from A → A* and B → B*.