Project 2 Description and Submission Policy

In this project, you need to use reinforcement to learn promising paths in robot-style grid world. You should obtain experience in designing agent-based systems that explore and learn in initially unknown environments.

Task Details:

Assume that an agent starts initially at the main gate of ZC. It needs to pick objects and deliver them from one location to another inside ZC with the minimum number of steps. The pickup locations are the NB and HB, meanwhile the drop off buildings are the AB and the One-stop-shop. Assume that each pickup location contains 4 items to be delivered and that each delivery location can have at most 4 items. The agent can't hold more than one item. Your goal is to design a route for the agent to send all items from pick-up locations to delivery locations with the shortest path using Q-learning.

In your design (and report), you need to consider the following:

1. Define the state space, initial and goal states.
2. Define the actions (most probably will be move ahead/ move right/move left/pickup/drop off ..etc.)
3. Assign rewards to actions: e.g., If moving with no items→negative reward, If moving with items→positive large reward
4. Set the learning rate to 0.5
5. Set the discount factor to 0.3
6. Initialize all q values to zeros
7. If pickup or deliver action are available, choose them first, if not, then choose any other random action.
8. Run the algorithm initially for 3000 steps (you may add more steps if needed)
9. If the agent reaches a terminal state, reset its location but don't reset the learned q-values
10. Report the obtained Q-values in the middle of the experiment and in the final step as a table. The Q-table should be presented as a matrix, with s rows (states) and t columns (operators).
11. Develop a method to summarize and analyze how the agent moves and to interpret the obtained results and the behavior of the agent. Determine the best path, if any, in the obtained results.

Submission Policy

Number of students per team:

- Up to 3-student groups are allowed.
- Same groups for project 1 are recommended.

Project Delivery

Phase #	Project Phase	Deliverables	%	Due
Phase1	Modeling of the problem with complete specifications of all parameters and experiment setup	-a 3-min Demo for the initial design-video recoded	20%	Saturday 24th Dec. at 11:59 pm
Phase2	Final Report, Demo, code submission	1. Report with complete results 2. Presentation and a 5-min Demo, video-recorded 3. Commented and well-organized code analysis	65%	Saturday 7th Jan., at 11:59 pm
Phase3	Individual Discussions		15%	Tutorial times, lab-exam week

Late policy

- 25% of the phase grade will be deducted for every late day by maximum 2 days. If a phase is submitted after the deadline by more than 2 days, no grade will be given.

Submission

- One team member should submit a compressed file (.zip, .rar, ….etc) containing the required files for the selected phase.
- The compressed file should be named as follows < Phase#_TeamName.zip>
- Submission should be done on Google classroom by only one member in the team.

- You are requested to deliver the following:

    1. Report: It should contain how work was distributed among the team, your introduction for the problem, how your program managed to solve it and how to use your program. All points in the task description need to be addressed.
    2. Powerpoint presentation: a well-organized and concise ppt of your project with conclusions and challenges you faced. In your demo, you must adhere to the announced time limit.
    3. Project files: All project source files in addition to any other related files.
    4. Any violation of the mentioned submission rules will be penalized.

- you will be requested to have your individual discussion with your TA. Your evaluation in this part is based on whether your role in the project is clear, you communicated effectively about the project, provided cogent responses to questions, and defended the design choices that were made in the project.