Multi-agent systems
Project 1, 2 & 3

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To send by e-mail by 8 December 2023

General

Projects are carried out in groups of two students. A report will accompany the project, detailing :
— design choices (types of agents, interaction modes, representation of the environment, etc.),
— the structuring of the program (control system, environment, agents, etc.)
— Difficulties encountered (design, programming, etc.),
— a user manual (step by step).
— Deliverables : an archive, named after the students' names, containing :

1. The source codes of the project (in an archive, named after the students' names)
2. A report explaining the design choices, the difficulties encountered and a user manual for the application. Particular attention will be paid to the quality of the report.

— The report and source codes should be sent by email to mahdi.zargayouna@univ-eiffel.fr. Please use a Cloud for the sending to avoid saturating the mailbox.
— 10 minutes demos are planned for 15 December 2023.
A great deal of attention will have to be paid to the report.

Project 1 : Public Transport Mobility Simulation

Design and implement a multi-agent system that represents the movements of passengers and public transport vehicles in a city. The city is described at a minimum by roads and bus stops. Passengers have an origin and a destination in the city that they can reach by foot or by public transport. The public transport follow predefined timetables. The objective is to simulate the movements of passengers and vehicles. In a second step, we would like to introduce disturbances in the system. The disturbances can be a disconnection of a road or the breakdown of a vehicle. The objective is to observe and quantify the impact of these disturbances on the travel time of passengers.

To do so, you will need :

1. Define the system parameters
2. Represent the city (e.g. grid)
3. Represent the public transport vehicles
4. Define passengers and vehicles movements (agents behaviors)

Any enrichment of the project will be rewarded with bonuses.

Project 2 : VANET Cybersecurity simulation

Design and implement a multi-agent system that represents the propagation of a cybersecurity attack on connected vehicles. The vehicles move on a grid and can infect others. Every vehicle can be in one of these states :

1. Not infected
2. Infected
3. Repaired
4. Broken down

A not infected vehicle that interacts with an infected vehicle has a probability ρ_{inf} to be infected. An infected vehicle can be repaired with a probability of ρ_{rep} and can be broken down with a probability of ρ_{break}.

The objective is to simulate various movement scenarios (random movements, random movements with central attractors (malls, schools, workplaces, etc.)) and various percentages of initially infected vehicles.

To do so, you will need :

1. Define the system parameters
2. Represent the environment
3. Represent the movement scenarios
4. Define vehicles behaviors

Any enrichment of the project will be rewarded with bonuses.

Project 3 : STRIPS planner

Design and build a planner (forward or backward chaining) working with the STRIPS language. The program takes as input a text file describing :

1. the possible actions (an action is made of PRE, DEL and ADD rules),
2. the initial state of the world, and
3. a goal to achieve.

It provides as output the sequence of actions (if any) leading from the initial world to the world satisfying the goal.

You can either define a generic planner with a standard search strategy (Depth-first or Breadth-first), or a specific planner to a certain problem, with a heuristic of your own.