Multi-agent systems
Project 1, 2 & 3

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To send by e-mail by 14 December 2020

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 17 December 2020.
A great deal of attention will have to be paid to the report.

Project 1 : mobility simulation

Design and implement a multi-agent system to represent the movements of vehicles and passengers in a neighborhood. The neighborhood is described at a minimum by roads, traffic lights and bus stops. Travellers have an origin and a destination in the neighborhood that they can reach by car, on foot or by public transit. The objective is to simulate various strategies for traffic light plans : fixed green light duration, dynamic duration depending on the length of the queues, presence of buses in the queue, etc. The aim is to simulate various strategies for traffic light plans. The strategies will be compared according to the travel time of passengers and vehicles.

To do so, you will need :

1. Define the system parameters
2. Represent the neighborhood (e.g. grid)
3. Represent modes of transportation (car, bus, etc.)
4. Define user and vehicle movements (agents behaviors)

Any enrichment of the project will be rewarded with bonuses.

Project 2 : Covid 19 simulation

Design and implement a multi-agent system to represent the propagation of a Covid 19-like pandemic. People move on a grid and can infect others. Every person can be in one of these states :

1. Susceptible
2. Infectious with symptoms
3. Infectious without symptoms
4. Recovered

5. Deceased

An susceptible person that interacts with an infectious person has a probability ρ_{inf} to be infected. An infected person can recover with a probability of ρ_{rec} and can die with a probability of ρ_{die}.

The objective is to simulate various movement scenarios (random movements, random movements with central attractors (malls, schools, workplaces, etc.)) and various strategies for pandemic limitation (lockdown, curfew, isolation of infectious persons, etc.).

To do so, you will need :

1. Define the system parameters
2. Represent the environment (e.g. grid)
3. Represent the movement scenarios
4. Represent the limitation strategies
5. Define persons behaviors with respect to the scenarios and strategies

Any enrichment of the project (impact of age, hospitals, etc.) 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.