MAS: Activity 1 – Silly Vacuum Cleaner

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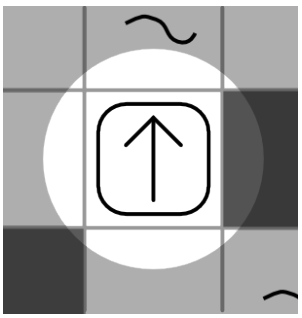
The Problem: a rectangular room with $m \times n$ tiles contains p elements of trash and debris, each element in one tile; such a tile will be called a *J-tile* (junk tile). In the room there are also static objects, each occupying 1 full tile; call this an *X-tile*; no two X-tiles are at a Manhattan distance of 2 or less. Any tile free of trash or objects (i.e. not a J- or an X-tile) is a *normal tile*. In order to clean the room at night, you can buy a cheap and limited (budget) cleaning robot. The robot is controlled by a reactive software agent. You will have to program the agent yourself.



Specifications

- the initial position of the robot is always in the bottom left corner of the room, facing north.
- the robot has four operations: *Forward*, *Left* (90° counter-clockwise turn), *Right* (90° clockwise turn), *Pick* (to pick trash from the floor – the operation results in a clean tile).
- **only** the *Forward* operation moves the robot, turns are executed in place.
- the robot has sensors and can perceive if any of the 8 adjacent tiles is an X-tile.
- the robot can perceive if the **current** tile is a J-tile.
- the robot can know when the whole room is clean.
- the robot should not try to enter X-tiles or go through walls, as it would damage both the robot and / or the objects in the room.
- the robot is totally **unable to remember** anything after an operation is completed (it has no memory).
- the robot has a compass, so it knows its own orientation.

Work **only** in the **my** package. If you need to modify anything else, discuss with assistant.

To Do 1: Create a Java project using the provided sources and understand the content of the provided sources. See page 2 for some helpful pointers.

To Do 2: Implement `MyEnvironment.step()` to generate perceptions and apply the action returned by `Agent.response`. Test it using the `DummyAgent`.

To Do 3: Design and implement a reactive behavior for your agent in `MyAgent`, that guarantees that the agent will solve the problem in any correct environment.

Helpful pointers:

- In `AbstractGridEnvironment`:
  - the agents added to the environment are available via `getAgents()`, which returns a list of `GridAgentData` structures, each containing a pointer to the agent's implementation, as well as the agent's current position and orientation.
  - getters are available for all possible positions, positions of all J-tiles and positions of all X-tiles. Use `cleanTile()` to eliminate J-tiles.
- `GridPosition` offers methods to find:
  - which position is at a specified orientation relative to this one – 2 versions of `getNeighborPosition`;
  - whether another position is a neighbor – `isNeighborOrtho` and `isNeighbor`;
  - what is the relative orientation of a neighbor position relative to this one – `getRelativeOrientation`;
  - also, comparison methods such as `equals` and `hashCode` are correctly overridden.
- `GridOrientation` is an enum with the 4 available absolute orientations (or directions).
  - it offers the `computeRelativeOrientation` method to obtain the direction with the specified relative orientation to this one.
- `GridRelativeOrientation` is an enum with the 8 possible relative directions (e.g. front-left, back-right, left, etc);

Cum să raportați activitatea:

- **la sfârșitul laboratorului:** trimiteți arhiva conform cu instrucțiunile de mai jos.
- **la terminarea taskurilor** aferente laboratorului (înainte de următorul laborator, altfel cu depunctare): trimiteți din nou arhiva, conform cu aceleași instrucțiuni, eventual adăugând ceva la nume.

Conținutul arhivei: numai directorul `src`, arhivat într-o arhivă cu numele `PrenumeNume_MAS-N.zip`, unde `N` este numărul laboratorului pe care l-ați rezolvat.

Cum trimiteți: trimiteți arhiva în atașament la un mesaj către adresa cs+mas@andreiolaru.ro. Dacă adresa este corectă și există atașament, veți primi un mesaj automat de confirmare.

Notă: Folosiți adresa de mai sus numai pentru a trimite activitatea de laborator. Pentru alte probleme folosiți modalitățile de contact indicate la curs.