Assignment 1

Autonomous Software Agents - UniTn 2021/2022

Name Surname

Introduction [2-3 paragraph]

[Provide here your introduction to the smart house domain and present the multi-agent approach in the smart house domain]

House description and blueprint

This section presents the house plan.

[Provide a description of the house, including rooms disposition on the floors, doors, windows…]

… At the ground level we have the garage, and with an independent entrance we enter the living room / kitchen . Stairs lead to the upper floor and we have two separate rooms with independent doors, bedroom and bathroom. (Note that, it is not possible to go from the garage to the bedroom without passing through the living room) …

[You may put a blueprint, or a representation of the house plan]

Rooms [at least 4]

This section provides more details for each room of the house…

[You can discuss here general aspects valid for all the rooms, or devices available in every rooms]

Example: Each room has an independent thermostat to control the heating. Electric solar panels are installed on the roof.

Kitchen [provide a unique name to each room]

[Description of the room in terms of position within the house, entrance/openings or doors and windows, and devices available in the room]

Example: Openings includes the main entrance door, the stairs to the upper floor, and two windows with curtains. In the kitchen there is a main light plus additional separated lights above the sofa and one above the table, a dishwasher, a stovetop, a oven, a fridge, and a TV.

[You can describe a specific scenario for the room, including the way residents uses the room]

Example: The garage is used by residents to park and recharge the electric car, and to store supplies. It is not heated.

Garage

…

Devices [at least 4]

This section discusses (smart) devices available in the house.

Lights

[General description of the device - Example: Lights provide illuminations to the rooms at night time, which we consider always from 8.00 to 19.00]

[List possible statuses of the device - Example: Light status is either on, off, or disconnected]

[List actions that can be executed with respect to device - Example: Actions that can be done on the lights are turn_on and turn_off]

[List prerequisites to turn on the lights]

[Eventually, it is possible to use a state machine to describe the device]

[Describe utilities consumption - Example: Each light consumes 20W of electricity when switched on]

Electric car

Example: The car in the garage has a capacity of 64KWH, and can be charged at 3.6kW or 7kW, up to 100% or 80% to preserve the battery. Status of the car includes whether the car is in the garage (car_in_garage) or not (car_not_in_garage); the charging status charging_0 or charging_3.6 or charging_7. The battery level, from 0 to 100, mapped into the following

discrete states: fully_charged, half_charged or need_recharge. Action are start_slow_charge, start_fast_charge and stop_charge. Prerequisites for start_slow_charge is (car_in_garage AND (half_charged OR need_recharge))

Solar panels

Example: produces an average of 1,5KW during day from 8.00 to 18.00 if it is sunny and 0W at night. Status… Actions…

…

Metrics [at least 1]

Cost of electricity [Example1]

[Short description and some numbers]

Example: Buy electricity is more expensive during the day. However, if it is sunny, solar panels provide free electricity. Buying electricity costs 0.20€/Wh, selling is paid 0.10€/Wh, so that it is better to use produced electricity instead of selling it.

…

Cleaning time [Example2]

Vacuum cleaner robot takes 0.5h to clean the living room, while only 0.1h to clean the bedroom.

People and agents

This section presents intelligent and autonomous entities in the house, including people and agents.

People

[List residents living in the house and describe their behavior]

Example: Residents in the house include Anna and Bob. People can be in one room at a time, or out of home. Anna is out-of-house from 8.00 to 18.00 monday-friday, while Bob works from 6.00 to 14.00 and he takes the car. On sunday they are usually at home while they need the car fully charged only on saturday.

[List of agents - at least one main house agent, plus one device-specific agent]

Only devices provided with autonomous behavior are controlled by an agent.

Example: Robot vacuum agent [at least one device-specific agent is required]

The robot is able to autonomously move among all the rooms through doors and stairs and clean them daily.

House agent [at least one house agent is needed]

[General description]

[Specific discussion of the autonomous behavior, including triggering events and procedures]

Example: The agent assists residents by taking autonomous decisions, while still being responsive to residents' behaviors. It tries to minimize energy consumption/cost.

1. Switch on the lights when people enter in a room;
2. …