

Multi-Agent Systems

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Summer Semester 2017

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Exercise Sheet 3

Due: May 22th, 2017, 10:00

Exercise 3.1 (GOAL and Prolog, 4+4)

Your first task is to install the GOAL framework and familiarize yourself with the environment. You can find information on how to set up everything, as well as tutorials and a very detailed programming guide at <https://goalap1.atlassian.net/wiki>.¹ To get familiar with Prolog, visit <http://lpn.swi-prolog.org>.

- (a) Generate the included Hello World example (in the GOAL perspective click File → New → GOAL example project) and try to understand what is going on (explanations can be found in the programming guide). Take a closer look at HelloWorld10x.mas2g. Commit the whole Eclipse project folder into your git submission folder.
- (b) Change the agent of the HelloWorld10x-Example to successively print out the numbers of the Collatz sequence² beginning with an arbitrary positive integer c_0 (e.g., try it with $c_0 = 27$). The $n + 1$ -th number in the sequence can be computed by:

$$c_{n+1} = \begin{cases} c_n / 2 & c_n \text{ is even} \\ 3c_n + 1 & c_n \text{ is odd} \end{cases}$$

The agent's goal is to eventually output number 1.

Exercise 3.2 (Your first BDI Agent, 5+2)

In this and the following exercises, we want to implement a BDI agent for a domination-style setting: The task is to continuously activate and control as many checkpoints as possible on a grid world. Once a checkpoint is activated, it will deactivate automatically after a fixed period of time (30 seconds). For each active checkpoint, the team receives one point per second. Important tasks of the agents may involve exploration of the map, division of the checkpoints among the agents, and continuous (re-)activation of the checkpoints.

You can find the template for this project in an already existing Eclipse workspace folder `ex03/workspace` in your repository (load the workspace folder into Eclipse and then import the project via File → Import → General → Existing Projects into Workspace). Both the simulation and the GOAL agent specification are adapted from the original GOAL example project VacuumBots.

- (a) Design (and implement) the knowledge base of your agents representing the observed environment. This representation should include knowledge and beliefs beyond current perception, i.e., about entities seen some cycles before. Note that the current coordinates of the agent, as well as its orientation are available as percepts. (Hint: you can see all available percepts when running the simulation in debug mode.)
- (b) Explain how you plan to use your knowledge base to inform your agents' practical reasoning. Which roles do beliefs, desires, and intentions play?

¹We have tested the GOAL environment with Java 8, and Eclipse Neon installed.

²<https://de.wikipedia.org/wiki/Collatz-Problem>