

# Introduction to Artificial Intelligence

Dr. Thomas Keller  
C. Büchner, C. Grundke, A. Kauffmann

University of Zürich  
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## Exercise Sheet 1

**Due: March 2, 2022**

Points total: 20 marks

### Exercise 1.1 – AI Systems/Technology

**6 marks**

Investigate to which extent the following tasks can nowadays be performed automatically by computers, particularly in comparison to humans. Describe your findings in 2-4 sentences and provide sources for your statements.

- (a) writing weather forecast reports (2 marks)
- (b) playing StarCraft II (2 marks)
- (c) proving a mathematical theorem (2 marks)

### Exercise 1.2 – Rationality

**2 marks**

Consider a self-driving taxi that takes the most scenic route instead of the fastest route. Does it behave rationally? Justify your answer.

### Exercise 1.3 – Task Environments

**6 marks**

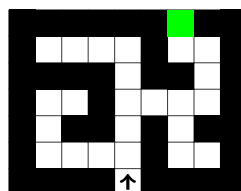
Analyze the problem domains below with respect to the following properties: partially observable vs. fully observable vs. unobservable, single- vs. multi-agent, deterministic vs. non-deterministic vs. stochastic, episodic vs. sequential, static vs. dynamic, and discrete vs. continuous. Briefly justify your answers.

- (a) Tetris (3 marks)
- (b) a group of robots dancing synchronously (3 marks)

### Exercise 1.4 – Reflexive Agent

**6 marks**

Consider an agent trying to reach the goal in a 2D labyrinth grid. Its sensors can detect whether an adjacent cell is blocked and whether it is at the goal location. Its actuators can turn 90° to the left or right, move forward, and turn 90° to the left or right **plus** move forward (i.e., the third action concatenates the first two). The starting location is always in the south edge with the agent facing north and the adjacent east and west cells blocked, and the goal is always on an edge.



- (a) Provide a description of a possible implementation such that the agent is a *reflexive* agent. Also describe the idea of your implementation in one to two sentences. (4 marks)
- (b) Does your agent still work as intended if the turning action has a chance to fail? What if the wall sensors are faulty? (2 marks)

### Submission rules:

- Exercise sheets must be submitted in groups of three students. Please submit a single copy of the exercises per group (only one member of the group does the submission).
- Create a single PDF file (ending `.pdf`) for all non-programming exercises. Use a file name that does not contain any spaces or special characters other than the underscore “`_`”. If you want to submit handwritten solutions, include their scans in the single PDF. Make sure it is in a reasonable resolution so that it is readable, but ensure at the same time that the PDF size is not astronomically large. Put the names of all group members on top of the first page. Make sure your PDF has size A4 (fits the page size if printed on A4). Submit your single PDF file to the corresponding exercise assignment in MOODLE.
- For programming exercises, only create those code text files required by the exercise. Put your names in a comment on top of each file. Make sure your code compiles and test it. Code that does not compile or which we cannot successfully execute will not be graded. Create a ZIP file (ending `.zip`, `.tar.gz`, or `.tgz`; *not* `.rar` or anything else) containing the code text file(s) (ending `.py`) and nothing else. Do not use directories within the ZIP, i.e., zip the files directly.
- Do not upload several versions to MOODLE, i.e., if you need to resubmit, use the same file name again so that the previous submission is overwritten.