Foundations of Artificial Intelligence

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Exercise Sheet 1

Due: February 26, 2023

Important: for submission, consult the rules at the end of the exercise. Non-adherence to the rules will lead to your submission not being corrected.

Exercise 1.1 (1+1+1+1 marks)

Characterize the following AI systems with respect to the four categories (acting humanly, thinking humanly, thinking rationally, acting rationally) that have been introduced in the lecture. Justify your answers in one to two sentences.

(a) Pepper (`https://en.wikipedia.org/wiki/Pepper_(robot)`)

(b) R1/XCON (slide set A2, slide 12)

(c) self-driving cars

(d) ChatGPT

Note: The four AI systems do need to cover all four categories. In some cases several categories can be argued for, meaning there is not only one correct answer. Choose one category and present your argument for it.

Exercise 1.2 (1+1+1 marks)

Check the literature and the internet to investigate to which extent the following tasks can nowadays be performed automatically by computers and/or robots. Describe your findings in one to two sentences and provide a source.

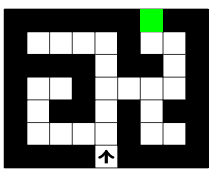
(a) playing the game of Go

(b) paint a (digital) picture

(c) prove a mathematical theorem

Exercise 1.3 (2+1 marks)

Consider an agent trying to reach the goal in a 2D labyrinth grid. It can move forward, turn 90° to the left or right, detect whether an adjacent cell is blocked and detect if it is at the goal location. 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. The figure below shows an example labyrinth, where the goal is marked in green and the starting position of the agent marked by an arrow.



(a) A *reflexive* agent is an agent that acts only based on the information it received in its *last* observation. Provide pseudocode of an algorithm of a reflexive agent to reach the goal in any labyrinth as described above. Also describe the idea of your algorithm in one to two sentences.

Hint: You are allowed to combine several actions into one action.

(b) Does your agent still work as intended if the turning action has a chance to fail? What if the wall sensors are faulty?

Submission rules:

- Exercise sheets must be submitted in groups of two 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. Either use page numbers on all pages or put your names on each page. Make sure your PDF has size A4 (fits the page size if printed on A4).
- For programming exercises, only create those code textfiles 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.
- For the submission: if the exercise sheet does not include programming exercises, simply upload the single PDF. If the exercise sheet includes programming exercises, upload a ZIP file (ending .zip, .tar.gz or .tgz; *not* .rar or anything else) containing the single PDF and the code textfile(s) and nothing else. Do not use directories within the ZIP, i.e., zip the files directly.
- Do not upload several versions to ADAM, i.e., if you need to resubmit, use the same file name again so that the previous submission is overwritten.