Foundations of Artificial Intelligence

M. Helmert
J. Seipp
Spring Term 2019

University of Basel
Computer Science

Exercise Sheet 1
Due: February 27, 2019

Exercise 1.1 (4 marks)

Characterize the following definitions of Artificial Intelligence with respect to the four categories (acting humanly, thinking humanly, thinking rationally, acting rationally) that have been introduced in the lecture. Justify your answers.

(a) "A collection of algorithms that are computationally tractable, adequate approximations of intractably specified problems." (Partridge, 1991)

(b) "The enterprise of constructing a physical symbol system that can reliably pass the Turing Test." (Ginsberg, 1993)

(c) "The field of computer science that studies how machines can be made to act intelligently." (Jackson, 1986)

(d) "The exciting new effort to make computers think ... machines with minds, in the full and literal sense." (Haugeland, 1985)

Exercise 1.2 (5 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.

(a) Recognizing the semantics of natural language

(b) Carrying heavy loads in rough and bumpy terrain

(c) Playing first person shooters

(d) Synthesizing text

(e) Playing no limits Texas hold'em (in contrast to heads-up limit Hold'em)

Exercise 1.3 (3 marks)

Consider the following vacuum cleaner domain. There exist two cells (*right* and *left*) that can either be in a dirty state or in a clean state. The vacuum cleaning agent can drive from left to right and from right to left. Furthermore, the agent has a sensor to detect the current state of the cell. Consider the following stochastic extension of this domain.

(a) When trying to clean a cell that is already clean, in some cases the cell gets dirty.

(b) The agent's sensor is faulty: With a probability of $p \in (0, 1]$, a cell which is possibly dirty is recognized as clean.

Consider the three scenarios where only (a) holds, where only (b) holds, and where both (a) and (b) hold. Investigate for each of these scenarios if there is an agent that guarantees that the cells are clean after finitely many steps. Specify how such an agent looks like in case it exists, or justify why such an agent does not exist.

Important: Solutions should be submitted in groups of two students. However, only one student should upload the solution. Please provide both student names on each file you submit. We can only accept a single PDF or a ZIP file containing *.java or *.pddl files and a single PDF.