TDT4136 – Introduction to Artificial Intelligence

Assignment 1 – AI fundamentals and intelligent agents

Deadline: 08.09.2023, 23:59 h

Read the following questions and deliver a report (*typeset* `pdf` (Word/Docs/LaTeX)) on Blackboard with answers. Remember to cite your sources in a reference section, following any academic style[1].

Theoretical Questions

1. What is Artificial Intelligence (AI)? Include at least 3 definitions of AI that are not covered in the lecture.
2. What is the Turing test? What is its purpose and how is it conducted? Are there any new proposals for the Turing Test?
3. What is rationality and what is the difference between thinking rationally and acting rationally? Is rational thinking an absolute condition for acting rationally?
4. What is the connection between knowledge and action according to Aristotle? How can his argument be used to implement his idea in AI?
   (a) Who was (or were) the first AI researcher(s) to implement these ideas?
   (b) What is the name of the program or system they developed? Write a short description about it.
5. Consider a robot with the task of crossing the road, and an action portfolio A:

   $$A = \{lookBack, lookForward, lookLeft, lookRight, goForward, goBack, goLeft, goRight\}$$

   - While crossing the road, an elk crashes into the robot and smashes it. Is the robot rational?
   - While crossing the road on a green light, a passing car drives into the robot and crashes, preventing the robot from crossing to the other side. Is the robot rational?
6. Consider the **vacuum cleaner world** described in Figure 2.2 (Chapter 2.1 of AIMA 4th Ed.). Let us modify this vacuum environment such that the agent is penalised with 1 point for each movement:
   - Could a simple reflex agent be rational for this environment? Why?
   - Could a reflex agent with state be rational in this environment? Why?
   - Assume now that the simple reflex agent (i.e., with no internal state) can perceive the *clean* status of both locations at the same time. Could this agent be rational? Why? In case it could be rational, write the agent function using mathematical notation or a table.
7. Consider the **original vacuum cleaner environment** shown in Figure 2.2. Describe the environment using the properties from Chapter 2.3.2 (e.g. episodic/sequential, deterministic/stochastic, etc.) Explain why you chose such values and properties.
8. Write both advantages and limitations of the following types of agents:
   - Simple reflex agents
   - Model-based reflex agents
   - Goal-based agents
   - Utility-based agents

[1] See https://i.ntnu.no/academic-writing/using-and-citing-sources