TDT4136 Assignment 1

AI Fundamentals and Intelligent Agents

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**1. What is the Turing test, and how it is conducted?**

The Turing test is test conducted on artificial intelligence systems to determine whether a system can be separated from a human. The test was introduced by Alan Turing in 1950. The test has three participants, a human, an AI system, and an interrogator. I the interrogator can not differ between the AI and the human, the test is passed.

**2. What is the relationship between thinking rationally and acting rationally? Is rational thinking an absolute condition for acting rationally?**

Thinking rationally is the standard way for humans, but it created a lot of algorithmic challenges to represent knowledge in a generic manner. Rational thinking is basically the same as doing the most logic and efficient move for every action that you plan to execute.

Acting rationally on the other hand is about reaching your goals and acting through one’s beliefs. There are situations where rational thinking is not the best option to act rationally. If you for example see a kid on the street is about to get hit by a car, you cannot ponder rationally on what the best course of action is, the only action is to throw yourself and the kid away from the road as quickly as possible, even if it might lead to you also getting hit by the car.

**3. What is Tarski’s “theory of reference” about?**

The Theory of Reference describes how to link objects in logic to real world objects and instances. *Window (X) # refers X to a window.*

**4. Describe rationality. How is it defined?**

Rationality is basically the action or belief that best follows logic. A rational decision to act should be the optimal move in the current situation based on all possible moves.

**5. Consider a robot whose task it is to cross the road. Its action portfolio looks like this: look-back, lookforward, look-left-look-right, go-forward, go-back, go-left and go-right.**

**(a) While crossing the road, a helicopter falls down on the robot and smashes it. Is the robot rational?**

Yes, the robot is still rational. If the robot didn’t have some sort of heli-crash-sensor on its head scanning for possible accidents at all times, there is no way it could possibly except this. In fact, for a human, it would be considered irrational to go around looking for possible helicopters crashing into your head.

**(b) While crossing the road on a green light, a passing car crashes into the robot, preventing it from crossing. Is the robot rational?**

I am not sure if the question is saying the green light is for the robot or the car, but if the robot walks over the street on a green light for the robot, and gets hit by a car, I would say it is no rational. This is because the robot should check to see if the road is safe to cross no matter what the traffic light might indicate.

**6. Consider the vacuum cleaner world described in Chapter 2.2.1 of the textbook. Let us modify this vacuum environment so that the agent is penalized 1 point for each movement.**

**(a) Can a simple reflex agent be rational for this environment? Explain your answer**

A simple reflex agent would be fine if the environment needed cleaning, in this case it would suck the dust of the floor and keep going. If the environment was already clean on the other hand it would just move around forever. A simple reflex robot would also be the most prone to doing stupid things like running into a chair or wall forever. So yes, kind of.

**(b) Can a reflex agent with state be rational in this environment? Explain your answer.**

Yes, if we add state to the reflex agent it would be able to act rationally. With state it would remember where it has already been and which parts of the environment are still unchecked and might be dirty.

**(c) Assume now that the simple reflex agent (i.e., no internal state) can perceive the clean/dirty status of both locations at the same time. Can this agent be rational? Explain your answer. In case it can be rational, design the agent function.**

Yes, is can be rational:

*Def AgentFunction():*

*If percept = left.dirty:*

*If wall\_left: suck():*

*elif not right\_dirty:*

*move\_left()*

*elif percept = right.dirty:*

*if wall\_right: suck()*

*else: move right()*

**7. Consider the vacuum cleaner environment shown in Figure 2.3 in the textbook. Describe the environment using properties from Chapter 2.3.2, e.g. episodic/sequential, deterministic/stochastic etc. Explain selected values for properties in regards to the vacuum cleaner environment.**

This environment is: Episodic, partially observable, deterministic, dynamic, discrete, and single-agent.

**8. Discuss the advantages and limitations of these four basic kinds of agents:**

**(a) Simple reflex agents**

The most simple and easy to implement and produce agents, these agents are OK in very easy conditions but are quite dumb and will easily fail fulfil its purpose.

**(b) Model-based reflex agents**

This agent can take into account how the world may be evolving by taking educated guesses, this may help in making the environment observable.

**(c) Goal-based agents**

A goal based agent can be useful because it searches and plans out what to do next based on what is the optimal route to reach its end state or goal. This agent will have a higher tolerance for noise in the environment at the cost of higher complexity and lower efficiency.

**(d) Utility-based agents**

This agent applies search and plans the optimal route or actions to fulfil its goal. This is done by searching every possible action and assigning each action a happiness score. Much like a greedy algorithm it chooses whichever action has the higher happiness score and at the moment.