Exercise 1
TDT4136, AI intro

Lars Liverød Andersen, Truls Mørk Pettersen

Task 1

A Turning test is a test where a human interrogator gives a computer a set of questions as an input, and the computer compose a set of written answers. The computer passes the test if the interrogator cannot tell if these answers are from a computer, or a human.

For this test to be possible, the computer would have to have a set of capabilites, including natural language processing, knowledge representation, automated reasoning, and machine learning. It is questionable however, wheather we can call a computer intelligent by passing such a test!

Task 2

When thinking rationally you are using your tought to evaluate and find logical reasons. Acting rationally is that the action being made is the most rational based on what information is avaliable.

Rational thinking is the thought itself while a rational action is a action that is believed to be the correct decision. The rational thought and knowledge is it based on could be incorrect. The rational action is always correct based on the information avaliable.

It is not necesarry to think rational to perform rational actions. The thoughts of what is rational could already have been performed and stored in a Agent that will performs actions based on the rational rules set.

Task 3

Tarskis "Theory of reference" is about showing how to relate the objects in a logic to objects in the real world.

Task 4

Rationality is the quality or state of being reasonable, based on facts or reason. For an agent, what is rational depends on the following:

- The performance measure that defines the criterion of sucess

- The agent's prior knowledge of the enviroment

- The actions that the agent can perform

- The agent's percept sequence to date

So, rationality is the knowledge which will guide an action to the most optimal and effective outcome.

Task 5

a)

In this scenario, the robot can only percieve it's enviroment by looking back, forward, left and right. Although, it's not mentioned, I persume that the robot will stop, or use it's ability to go back if it visualize an obstacle, or something else. The helicopter which falls down on the robot comes from above, which is outside of the robot's enviroment. It has no function or ability to know about the helicopter, and will by definition still have acted rational, even though it exploded.

b)

In this scenario, the car which smashes into the robot's side is in the robot's enviroment. The robot has the ability to look to the side and spot the car, and (if it has the ability I persumed in task a) it could use it's ability to move back when it saw the car. Therefor, the robot did not act rationally in this scenario. If the robot was rational, it would use it's ability to look left-right before it went over the road, which would avoid the crash in the first place.

Task 6

a)

A simple reflex agent will not be rational in this scenario. Once the dust in both squares is cleaned up, it will continue to move left and right and check if it's dust in it's current location. Since it has no state of wheather all locations are cleaned up, it will continue to do so endlessly, and thus get infinite penality points.

b)

The reflex agent will in this case be able to see the state of the areas and be able to determine what area needs to be cleaned. After all areas are clean it will stop moving. This agent is rational in the way that it has a limited number of movements before it knows it is done cleaning.

c)

This agent will be rational, because allthough it will never stop, after all locations are cleaned up, it will not continue to move. The agent will continue infinetly to percieve it's enviroment for dust, but stand still once everything is clean, and therefore not recieve any excessive penality points.

```
cleaning() {
    if (a = clean && b = dirty) {
        move right;
        suck;
    }
    else if (a = dirty && b = clean) {
        suck;
    }
    else if (a = clean && b = clean) {
        pass;
    }
    else if (a = dirty && b = dirty) {
        suck;
        move right;
        suck;
    }
}
```

Task 7

This enviroment is episodic, because it will only perform one action at a time. That is; either suck, not suck, or move left or right. A deterministic enviroment is only affected by agents actions and what it has done in the previus steps. All changes to the enviroment is set by the agent and there is no external influences. The vacuum cleaner enviroment has no other influnces than the agent itself, and therefore it is deterministic.

Task 8

a, Simple reflex agents)

A simple reflex agent is the most simple variant of the Agents. It bases its actions only on direct knowledge. It has no memory of previus actions or a goal of the actions it is performing. This limits the usage of the Agent to basic controllers.

b, Model-based reflex agents)

The advantages of a model-based reflex agent, is that it is able to update it's internal state, or memory to reflect the changes of it's world. It has a knowledge of the world to understand how critical things relevant to itself work, for example that a car driving in a given speed will be at a different lacation after a given time. Obviously, the agent cannot know about any logic that wasn't programmed, only for example the boolean circuits that it was given.

c, Goal-based agents)

When the model-based reflex agent meets decitions in the world, which will give different outcomes, it will not be able to know the most rational choice by default. The goal-based agent however, is able evaluate sequence of decitions and for each twist, make the choice that will give the most desirable outcome. By specifying a decition as a goal, this agent can easily change it's behavior depending on these goals. This agent is not very effective, but is very flexible. It is also not guarantied that the agent's "goal" will be the rational choice.

d, Utility-based agents)

Implements the same functionality as Goal-based agents but looks at several variables to what is the best action to be done. The utility based agent learns while performing actions. The advantage of the agent is that is has the possibility to decide and learns what actions should be performed based on several variables. The disadvantage of this agent is that does not have memory of how the world was, it only looks on how the world is and what it can do to improve it.