IAI - Exercise Sheet 4

This sheet should be read in conjunction with your lecture notes and handouts for Week 4. We begin with a set of questions to help you think about intelligent agents, and end with some typical exam style questions on this topic.

Question 1

The definition of an "agent" given in the lectures is quite broad. Can everything be described as an agent? What is an example of a non-agent? What about clocks – in what sense are they agents? Does the distinction between agents and non-agents really make any sense?
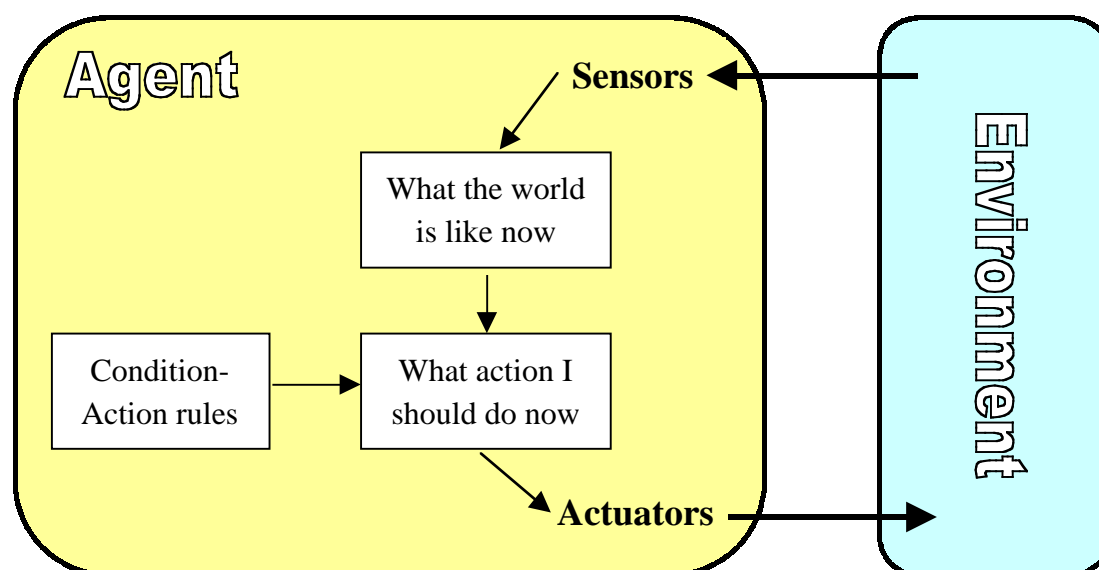
Question 2

Pick an Artificial Intelligence system that has appeared in the news or on TV recently and work out PAGE (i.e. Percepts, Actions, Goals, Environment) descriptions for it. How do these relate to their PEAS (i.e. Performance, Environment, Actuators, Sensors) descriptions?

Question 3

Classify the environment for your AI system in Question 2 according to the five principal distinctions: Accessibility, Determinism, Discreteness, Episodicness, and Staticness.

Question 4

In their Figures 2.9, 2.11, 2.13 and 2.14, Russell & Norvig (2003) suggest schematic diagrams for each of the four main types of agent: Simple reflex agents, Reflex agents with an internal state, Goal based agents, and Utility based agents. For example, they represent the interaction of a Simple reflex agent with its environment as:

Try to come up with alternative/better ways of representing those four types of agent.

Question 5

Classify your AI system from Question 2 as one of the four types of agent listed in Question 4. Is your general schematic diagram sufficient to represent your system? Is Russell & Norvig's diagram better or worse in this respect than your diagram?

Question 6

To what extent does your system from Question 2 involve machine learning? If it doesn't, then consider how it could be improved by incorporating machine learning.

Question 7

Extend your ideas from Question 4 to produce a schematic diagram for a learning agent. How does this compare with the corresponding diagram suggested by Russell & Norvig (their Figure 2.15)?

Question 8

How do the artificial neural networks and the brain models discussed in the Week 3 lectures fit into the agent framework? What types of agent are they?

Question 9

Suppose, instead of building a single intelligent agent to perform a given task, you wanted to build a team of two or more intelligent agents to perform the task together. Discuss the extra factors and complications you would need to consider. Suppose, your intelligent agents were competing rather than co-operating – what differences would that make?

Question 10 (Questions from previous exams)

(a) Give a general definition of an *agent*, and then explain how a *simple reflex agent* operates.

(b) Four additional features that can be built into AI agents are: *internal states*, *goals*, *utility functions,* and *learning*. Explain how each of these can enable an agent to act more intelligently. Illustrate your answer with some simple examples.

(c) In describing intelligent agents it is often convenient to specify them in terms of Percepts, Actions, Goals and Environment. State briefly what each of these *PAGE* concepts mean.

(d) List what these *PAGE* concepts correspond to in the following agents:
   (i)   A medical diagnostic system.
   (ii) A refinery controller
   (iii) An interactive Spanish language tutor.