CSE112 Artificial Intelligence – Week 2, 1st January 2019

**Exercises and Tutorial Questions**

1. Discuss and answer the following general questions:
2. Which type of agent is characterized with an internal state of the environment?

Model-based reflex agents

1. Which is the characterization of a static environment?

No changes in the environment while the problem is being solved

1. What type of environment is the most challenging for agents?

Discrete

1. Which type of intelligent agent takes future into account?

Goal-Based Agents

1. A cleaning agent goes from room to room, making sure not to clean the same room twice. What type of agent is this?

Utility-based agents

1. Discuss the important advantages of endowing an agent with learning capabilities

Learning is essential for unknown environments,

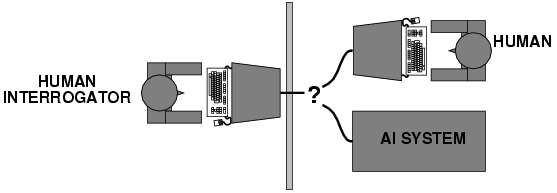
Learning is useful as a system construction method,

Learning modifies the agent's decision mechanisms to improve its performance

1. Can artificial intelligence take over the world?

No

1. What is Turing Test? Describe the Turing test in words and a picture.



1. Do you think Turing Test is still a Valid Test of Artificial Intelligence? In many peoples’ opinion, the Turing test is not very helpful for designing intelligent systems, why?
2. What is an agent? Which instruments are used for perceiving and acting upon the environment?

An agent is anything that can be viewed as perceiving its environment through sensors and acting upon that environment through actuators (oreffectors) to maximize progress towards its goals.

Sensors:

Eyes (vision), ears (hearing), skin (touch), tongue (gustation), nose (olfaction), neuromuscular system (proprioception)

Actuators: limbs, tongue, …

1. Define in your own words the following terms: agent, agent function, agent program, rationality, autonomy, reflex agent, model-based agent, goal-based agent, utility-based agent, learning agent.
2. Rational agents are often specified by a PEAS description. What do each of the letters in the acronym “PEAS” stand for? For a web-based machine translation system, give the PEAS descriptions.

Performance measure - The performance measure that defines the criterion of success of the agent

Environment - The agent’s prior knowledge of the environment

Actuators - The actions that the agent can perform

Sensors - The agent’s percept sequence to date

1. What it means to be “rational” in the definition of a rational agent? Define Rationality and Rational Agent. Give an example of rational action performed by any intelligent agent.

An agent should strive to “do the right thing”, based on what it can perceive and the actions it can perform. The right action is the one that will cause the agent to be most successful

Performance measure – An objective criterion for success of an agent's behavior

For example, performance measure of a vacuum-cleaner agent could be amount of dirt cleaned up, amount of time taken, amount of electricity consumed, amount of noise generated, etc.

1. What is meant by agent’s percept sequence? And What is the rule of simple reflex agent?

Simple reflex agents are based on condition-action rules, implemented with an

appropriate production system (stateless devices which do not have memory of past states of the world)

1. Suppose you are designing an agent as a Mathematician’s theorem-proving assistant. Describe the PEAS.
2. For each of the following activities, give a PEAS description of the task environment and characterize it in terms of the properties of Task Environments.
3. Playing soccer.
4. Exploring the subsurface oceans of Titan.
5. Shopping for used AI books on the Internet.
6. Playing a tennis match.
7. Practicing tennis against a wall.
8. Performing a high jump.
9. Bidding on an item at an auction.
10. For each of the following assertions, say whether it is true or false and support your answer with examples or counterexamples where appropriate.
11. An agent that senses only partial information about the state cannot be perfectly rational.
12. There exist task environments in which no pure reflex agent can behave rationally.
13. There exists a task environment in which every agent is rational.
14. The input to an agent program is the same as the input to the agent function.
15. Every agent function is implementable by some program/machine combination.
16. Suppose an agent selects its action uniformly at random from the set of possible actions. There exists a deterministic task environment in which this agent is rational.
17. It is possible for a given agent to be perfectly rational in two distinct task environments.
18. Every agent is rational in an unobservable environment.
19. A perfectly playing poker-playing agent never loses.
20. Consider a modified version of the vacuum environment, in which the geography of the environment - its extent, boundaries, and obstacles - is unknown, as is the initial dirt configuration. (The agent can go Up and Down as well as Left and Right.)
21. Can a simple reflex agent be perfectly rational for this environment? Explain.
22. Can s simple reflex agent with a randomized agent function outperform a simple reflex agent? Design such an agent and measure its performance on several environments.
23. Can you design an environment in which your randomized agent will perform very poorly? Show your results.
24. Can a reflex agent with state outperform a simple reflex agent? Design such an agent and measure its performance on several environments. Can you design a rational agent of this type?