CSE422 Lecture/Worksheet-3 (Sec:11/6)

Name:

ID:

1. For the following activities, write down the PEAS description of the task environment, write down the properties of the environment and from your own understanding write the pseudocode/algorithm for these agent programs.

a. Exploring the subsurface oceans of Titan.
b. Shopping for used books on the internet.
c. Playing a tennis match.
d. Practicing tennis against a wall.
e. Performing a high jump.
f. Bidding on an item at an auction.

Note:

PEAS stands for **P**erformance measure, **E**nvironment description, **A**ctuators and **S**ensors.

Agent = Agent Program + Architecture

Agent programs can be Table-driven agent, Simple-Reflex agent, Model-based Reflex agent, Goal based agents, Utility based agents.

Example:

Agent	**Performance Measure**	**Environment**	**Actuators**	**Sensors**
Part picking Robot	Percentage of parts in correct bins	Conveyor belt with parts, bins	Jointed arm and hands	Camera, joint angle sensors

Agent	**Properties of Environment**					
Part picking robot	Partially	Single agent	Stochastic	Episodic	Dynamic	Continuous

Agent program: Model-based reflex agent.

2. In this task we are going to design a Learning agent. Draw the process for a general learning agent using the concepts of performance standard, learning goals, knowledge base, sensors, actuators, critic, performance element, learning element, problem generator, environment etc.

Learning agent

Alan Turing first came up with the idea of programming an intelligent machine. He designed a Learning machines which can be taught. Learning agents are crucial in creating a State-of-the-Art.

- The learning agent allows the agent to operate in initially unknown environments.
- Adds into its knowledge base.
- Improves its performance by constantly evaluating the performance measure

Conceptual components of a Learning Agent

- **Learning element:** Responsible for making improvements. Given an agent design learning element can be made to improve every part of the agent.
    - The design of the learning element depends on the design of the performance element.
- **Performance element:** Responsible for selecting external actions. Previously what was considered as the entire agent.
    - It takes percept as input
    - Decides on actions
- **Critic:** Responsible for providing feedback to the learning element.
    - How well the agent is doing with respect to the fixed performance standard.
    - Determines how the performance element should be modified to do better in future.
- **Problem Generator:** Responsible for suggesting actions that will lead to new and informative experiences.
    - WHY? Given a knowledge base, the performance element may choose actions that it knows to be the best and never learn better ways.
    - How? The problem generator suggests some exploratory actions in other words, suboptimal actions in the short run and generate better actions for the long run.

3. Now consider the case of automated taxi and in your own words explain the learning agent construction for this case.

220/221 Refresher

4. Formalizing a state space search algorithm.
   a. What do you understand by open, closed and not generated yet nodes?
   b. Explain the Four-tuple (N, A, S, GD) state-space-search representation.
   c. What are the key procedures in generating a solution state/path?
      i. Expand
      ii. Goal-test
      iii. Queueing-function
      iv. Node data structure.
   d. Questions about Node
      i. State
      ii. Parent
      iii. Depth (number of operator applications since initial state)
      iv. Cost of the path (sum of each operator application so far)
   e. Search tree
      i. Root
      ii. Leaf node (nodes that don't have any successor, nodes that are not generated yet)
      iii. When can a search tree lead to an infinite loop?
      iv. What should the search tree return?
      v. What is a solution to a search strategy?
      vi. What is the cost of a solution?
      vii. How to evaluate a search strategy?
         - Completeness
         - Time Complexity
         - Space Complexity
         - Optimality/Admissibility

5. Given a full 5-gallon jug and an empty 2-gallon jug, the goal is to fill up the 2-gallon jug with only 1 gallon of water.
   a. Specify the initial state and goal state of the problem.
   b. Write the set of condition-action rules.
   c. Draw the search tree starting from a (0,0) state and show the find the solution.

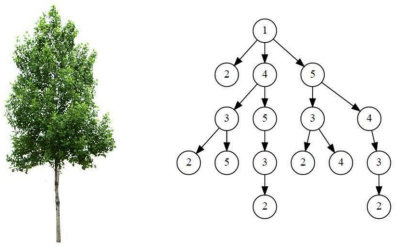

Fig: You vs the One they asked you to not worry about