CS347 FS2003 Quiz 1

This is a closed-book quiz. The only item not supplied during the quiz that you are allowed (and required) to use, is a pen or pencil (that’s right, no calculators!). Mark all paper you use with your name, the date, and the string “cs347fs2003”. If you are caught cheating, you will receive a zero grade for this quiz. The max number of points per question is indicated in square brackets after each question. The sum of the max points is 100. You have exactly 30 minutes to complete this quiz. Good luck!

1. What is the difference between systems that think like humans and systems that act like humans? [15]

   The primary difference between systems that think like humans and systems that act like humans is in the implementation. Systems that think like humans try to emulate how the human brain works, while systems that act like humans simply try to mimic human behavior. In general, systems that act like humans can be considered a black box, since they are more concerned with the behavior of the system as opposed to the underlying data structure and algorithms.

2. What is a rational agent? [15]

   A rational agent is one who selects an action that is expected to maximize its performance measure given the percept sequence and any built-in knowledge.

The next three questions are about a soda machine which excepts only quarters, charges two quarters per soda bottle, and offers the choice between two kinds of soda.

3. Give the PEAS description for a soda machine. [20]

   **Performance Measure:**
   - Charge two quarters per soda
   - Correctly dispense the chosen soda

   **Environment:**
   - Soda Cans and Quarters

   **Actuators:**
   - Change Dispenser
   - Soda Dispenser

   **Sensors:**
   - Soda A Button
   - Soda B Button
4. Classify your soda machine task environment according to the following properties: [3]

- **Fully observable**/Partially Observable
- **Deterministic**/Stochastic
- Episodic/*Sequential

*Depending on the reasoning in 4, the Soda Machine Agent could be considered Episodic.*

5. Explain each of your three choices in the previous question. [15]

- **Fully observable**: The sensors on the soda machine can detect every element that is required to maximize the performance measure. The buttons can detect the person’s soda preference and the change slot/validation sensor can detect when a quarter is entered. The agent can then use these precepts to determine the most optimal solution.

- **Deterministic**: As far as the agent is concerned, the next state of the environment is completely determined by the current state of the agent and the actions taken in response to the precepts.

- **Sequential**: Each internal state is dependent on the preceding states and the agent’s precepts. This is especially true if the soda machine has a limited number of Soda. In this case, each state of the soda machine was defined to be \{No Quarters, \}, \{One Quarter, \}, \{Two Quarters, Soda A Button Depressed\}, \{Two Quarters, Soda B Button Depressed\}.

6. Give the pseudo-code for a model-based reflex agent for the soda machine. [32]

```plaintext
0: SodaMachine(status)
  if quarters >= 2 then
    if status = BUTTON_SODA_A then
      quarters ← quarters − 2
      return(DISPATCH_SODA_A)
    else if status = BUTTON_SODA_B then
      quarters ← quarters − 2
      return(DISPATCH_SODA_B)
    else if status = QUARTER_ENTERED then
      return(DISPATCH_QUARTER)
  end if
  else if status = QUARTER_ENTERED then
    quarters ← quarters + 1
  end if
  if status = CHANGE_RETURN then
```
if quarters > 0 then
    quarters \leftarrow quarters - 1
    return(DISPATCH_QUARTER)
end if

end if

return(NOOP)

Where DISPATCH_SODA_* directive tells the machine to give a soda of the specified type, DISPATCH_QUARTER tells the machine to give the customer a quarter. BUTTON_SODA_* represents the state where the button corresponding for the Soda was depressed, and QUARTER_ENTERED represents the state after the user has entered a quarter. The internal state is represented by the variable quarters and contains the number of quarters the user has entered.