CS331 (Spring 2018): Introduction to Artificial Intelligence
Written Assignment #1

Date handed out: April 4, 2018
Date due: April 11, 2018 at the start of class
Total: 25 points

This assignment is to be done individually. Please hand in a pdf through Canvas. Assignments done on a word processor are preferred but not mandatory. For hand written assignments, if we cannot read your writing, we cannot mark your assignment.

You will be answering questions 1-4 for a fraud detection agent operating on your credit card purchases. This agent monitors everything bought on your credit card and emails or text messages you if it detects a potentially fraudulent purchase.

1. Describe the following aspects of the task environment:
a) Environment [1 point]

b) Actuators [1 point]

c) Sensors [1 point]

2. You'll notice that *Performance* is left out of the PEAS description above. What performance measure should you use for your fraud detection agent? Be as specific as possible (eg. write down the performance measure as a formula). Be careful, this one is tricky! [4 points]

3. Describe the environment according to the following properties:
a) fully vs partially observable [1 point]

b) deterministic vs stochastic [1 point]

c) episodic vs sequential [1 point]

d) static vs dynamic [1 point]

e) discrete vs continuous [1 point]

f) single vs multi-agent [1 point]

4. Suggest the most appropriate agent design by choosing the most appropriate of the following agent types:

- simple reflex agent
- model-based reflex agent
- goal-based agents
- utility-based agent

Justify your answer with a few sentences. [2 points]

5. The following question deals with the vacuum-cleaner agent described below:

- Performance measure: awards one point for each clean square at each time step over a lifetime of 1000 time steps.
- The geography of the environment is known apriori but the dirt distribution and the initial location of the agent are not. Clean squares stay clean and sucking cleans the current square. The *Left* and *Right* actions move the agent left and right except when this would take the agent outside the environment, in which case the agent remains where it is.
- The only available actions are *Left*, *Right* and *Suck*
- The agent correctly perceives its location and whether that location contains dirt.

Consider a modified version of this vacuum-cleaner environment in which the agent is penalized one point for each movement.

a) Can a simple reflex agent be perfectly rational for this environment? Explain. [2 points]

b) Claim: a reflex agent with state can be perfectly rational in this environment (where this state is in addition to the current percept – note that this state makes the agent a model-based reflex agent). Describe how you can design a reflex agent with state that can act rationally in this environment. You may modify the actions performed by your agent to include a "Do nothing" action. [4 points]

c) How do your answers to 5a and 5b change if the agent's percepts give it the clean/dirty status of every square in the environment? [4 points]