EC 4209/AI 5209: Artificial Intelligence
Homework Assignment 1
Due Date: April 1, 2020.

1. For each of the environments in Figure 2.5, determine what type of agent architecture is most appropriate (table lookup, simple reflex, goal-based or utility-based).
2. 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 and learning agent.
3. Write pseudo code agent programs for the goal-based and utility-based agents.
4. (Research Question) Examine AI literature to discover whether the following tasks can currently be solved by computers: Give appropriate references to validate your answer.
   a) Playing a decent game of table tennis.
   b) Driving in the center of Cairo, Egypt.
   c) Buying a week's worth of groceries at the market.
   d) Buying a week's worth of groceries on the web.
   e) Playing a decent game of bridge at competitive level.
   f) Discovering and proving new mathematical theorems.
   g) Writing an intentionally funny story.
   h) Giving a competent legal advice in a specialized area of law.
   i) Translating spoken English into spoken Swedish in real time.
   j) Performing a complex surgical operation.
5. (programming in python) Implement a performance-measuring environment simulator for the vacuum-cleaner world.

This world can be described as follows: Percepts: Each vacuum-cleaner agent gets a three-element percent vector on each turn. The first element, a touch sensor, should be a 1 if the machine has bumped into something and a 0 otherwise. The second comes from a photo sensor under the machine, which emits a 1 if there is dirt there and a 0 otherwise. The third comes from an infrared sensor, which emits a 1 when the agent is in its home location, and a 0 otherwise.

Actions: There are five actions available:

I. Go forward
II. Turn right by 90°
III. Turn left by 90°
IV. Suck up dirt
V. Turn off.

Goals: The goal for each agent is to clean up and go home. To be precise, the performance measure will be 100 points for each piece of dirt vacuumed up,

minus 1 point for each action taken, and minus 1000 points if it is not in the home location when it turns itself off.

Environment: The environment consists of a grid of squares. Some squares contain obstacles (walls and furniture) and other squares are open space. Some of the open squares contain dirt. Each "go forward" action moves one square unless there is an obstacle in that square, in which case the agent stays where it is, but the touch sensor goes on. A "suck up dirt" action always cleans up the dirt. A "turn off" command ends the simulation.