CS 431 Quiz 1 Solution

1. (2 points) What constitutes autonomy in an intelligent (rational) agent? (two sentences)
   a. To learn and adapt its behavior based on percepts sequence and built-in knowledge.
   b. To act without human intervention.

2. (8 points) Design-describe an intelligent agent that controls indoor room temperature (say, in your house) throughout the year. Be succinct; don’t write essays!
   a. Characterize its environment? The environment for the agent is the indoor atmosphere and (human) inhabitants. Its characteristics are:
      - the human element makes it inaccessible (e.g. what is a comfortable temperature?); otherwise it is accessible;
      - in general, the environment is nondeterministic (e.g. weather effects). If the environment is well insulated and controlled (e.g. an oven) then it can be considered deterministic as changes are affected by the effectors only;
      - the environment is non-episodic, dynamic and continuous.
   b. What sensors and effectors would be needed?
      Sensors: temperature measuring device(s).
      Effectors: Heating and cooling devices.
   c. What performance measures (not just goals) would be appropriate? Why?
      - The time-temperature deviation product. That is, the amount of time (say, in a month) during which the room temperature was not equal to the desired temperature. This performance measure captures both the amount and extent of temperature deviation.
      - The energy consumed over a period of time (say a month, in kWh). These represent conflicting goals.
   d. What type of agent would be most appropriate? Why?
      - If the environment is accessible and only the first performance measure is considered, then a simple reflex agent would be sufficient. Such an agent will respond to changes in temperature immediately by turning heating or cooling on or off.
      - if the environment is inaccessible (because of the human factor; desired temperature, empty room, full room, etc) then a reflex agent that has internal state would be most appropriate. Such an agent will know the effect of turning off and on the heater and cooler at different times of the day and year and make decisions accordingly.
      - if both performance measures are considered then a utility-based agent would be most appropriate. The agent can then arrive at a trade-off between energy consumption and maintenance of indoor temperature.