ASSIGNMENT 4
(due on February 8 at class)

Read Chapter 2: Agents and the lecture notes and address the following Exercises (which refer to figures and text from the Third Edition of Russell&Norvig textbook):

1. Let us examine the rationality of various vacuum-cleaner agent functions.

    a) Show that the simple vacuum-cleaner agent function described in Figure 2.3 is indeed rational under the assumptions listed on page 38.
    b) Describe a rational agent function for the case in which each movement costs one point. Does the corresponding agent program require internal state?
    c) Discuss possible agent designs for the cases in which clean squares can become dirty and the geography of the environment is unknown. Does it make sense for the agent to learn from its experience in these cases? If so, what should it learn? If not, why not?

2. Both the performance measure and the utility function measure how well and agent is doing. Explain the difference between the two.

3. For each of the following assertions, say whether it is true or false and support your answer with examples or counterexamples where appropriate.

    a) An agent that senses only partial information about the state cannot be perfectly rational.
    b) There exist task environments in which no pure reflex agent can behave rationally.
    c) There exists a task environment in which every agent is rational.
    d) It is possible for a given agent to be perfectly rational in two distinct task environments.
    e) Every agent is rational in an unobservable environment.

4. For each of the following activities, give a PEAS description of the task environment and characterize it in terms of the properties listed in Section 2.3.2.

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