CSCI 4350/5350

Homework 1

Due: Tue. Sep. 11, 11:00 PM

1. (1 point) What are the "four corners" of Artificial Intelligence?

    1.) Acting Rationally   3.) Acting Humanly
    2.) Thinking Rationally 4.) Thinking Humanly

2. (1 point) Where was the first conference in Artificial Intelligence held in 1956?

    -- Dartmouth College

3. (1 points) What is an agent function and how is it different from an agent program?

    -- An agent function is a function that describes how a history of perceptions by an agent

       maps to corresponding actions, and it differs from the agent program in the sense that the

       agent program is an instantiation of the agent function encoded in an agent's behavior.

4. (2 points) Is there a problem/task such that the environment is fully observable to the agent, but the agent cannot behave optimally? If yes, why? If no, why?

-- I would contend that there exists problems where it is impossible for an agent to behave optimally, but
   it would seem to be in a sense where behaving optimally is ill-defined, which may render my argument
   moot. If we consider a type of problem which is impossible to optimize due to having a divergent optimum
   (such as a hypothetical problem where an agent is paid every day until it tells the payer to stop, and the
   agent is tasked to maximize income), then such a problem does not allow optimality since the agent could
   obtain a new maximum from waiting longer than any stopping point, however the statement of the problem
   seems to assume that a maximum exists, which may entail that the problem is ill-formed.

5. (2 points) In complexity theory, _NP-Complete_ problems
   are a subset of problems in NP to which any problem in NP
   can be reduced in _polynomial_ time.

6. (4 points) Draw the complete state space for the vacuum-cleaner problem with three locations (A,B,C). Be sure to clearly label each state and the transition arcs between states.