HW 1
Assigned 01/18, Due 01/29

Q1. Give 2 examples of agents (not necessarily intelligent) that you know of, define:

(a) the environment, the environment state set and specify the environment type according to the classification given in class, i.e,, deterministic vs. nondeterministic, etc.

(b) agent action set and decision making rules.

(c) the goal or design objective of the agent.

Q2. Prove that

(a) for every purely reactive agent, there is a behaviorally equivalent standard agent.

(b) there exist standard agents that have no behaviorally equivalent purely reactive agent.

Q3. Prove that state based agents are equivalent in expressive power to standard agents, i.e., that for every state based agent there is a behaviorally equivalent standard agent and vice-versa.

Q4. Consider the vacuum world example and let the specification be the same as in class, save for the fact that we want the agent to stop at $(2,2)$ and not get back to $(0,0)$. Recall that the route was given as $(0,0), (0,1), (0,2), (1,2), (1,1), (1,0), (2,0), (2,1), (2,2)$. Also recall that the initial dirt distribution is at $(0,2)$ and $(1,2)$.

(a) Write the complete set of rules that will take the agent from $(0,0)$ to $(2,2)$.

(b) Write a sequence of agent states with transitions (actions) that will start at $(0,0)$ and end at $(2,2)$. That is, a sequence of the form

$$\Delta_0 \xrightarrow{a_0} \Delta_1 \xrightarrow{a_1} \cdots \xrightarrow{a_{n-1}} \Delta_n$$

(c) write a valid history for this example starting at the initial state s_0 of the environment and ending at the state s_n that will correspond to robot being in $(2,2)$.

(d) develop a solution to this problem using reactive architecture. Again you go from $(0,0)$ to $(2,2)$.

Q5. Read the paper on METATEM (you can find it on the reading list on the webpage) and answer the following:

(a) Explain how a set of rules for a given object in Concurrent METATEM is executed in order to provide its basic behaviour.

(b) Explain how the communication mechanism is implemented.

(c) Read the example in section 4 of the paper and write an example execution for Snow White of length 7, that is start at s_0 and end at s_7, you will need to know how the execution is defined to be able to do this.