6.825 Recitation Problems: Lec. 1

Solutions to Exercises

September 19, 2003

Recitation Problems: 2.3, 2.4

1 AIMA Problem 2.3

a Can there be more than one agent program that implements a given agent function?
Yes there may be more than one agent program that implements an agent function. For example, the agent function of navigation may be implemented by agent programs that approach this problem through stored tables vs. a map plus a general purpose search.

b Are there agent functions that cannot be implemented by any agent program?
Yes there are agent functions that cannot be implemented by any agent program. One example function would be the halting problem.

c Given a fixed machine architecture, does each agent program implement exactly one agent function?
Yes, if it is single-threaded and otherwise deterministic.

d Given an architecture with n bits of storage, how many different possible agent programs are there?
There will be $2^n$ possible programs.

2 AIMA Problem 2.4

a Show that the simple vacuum-cleaner function described in Figure 2.3 is indeed rational under the assumptions listed on page 36.
To be rational in these circumstances it maximizes its performance measure 1 pt per each clean square.
If there is dirt here, suck gains you a sure point now and doesn’t impact your chances of getting other dirt in the future, so suck. If There’s no dirt here, the only possible way of getting another point in the future is to move to the other square.

b Describe a rational agent function for the modified performance measure that deducts one point for each movement. Does the corresponding agent program require internal state?
This objective function doesn’t require memory even though the problem is partial order. But what if you have to pay 1 for each move or such action? Then you have to remember where you are.

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?
In the absence of special distributional assumptions, our first policy is probably best. Though if we could learn the rates at which the individual squares become dirty and adjust our policy accordingly, that would be cool.