CS 404 – Artificial Intelligence

HW 1 – Chp. 1,2

75pt

Please **type** your answers in the allocated space in this document **– keeping the questions as they are,** to ease grading (i.e. leave questions where you give answers) and submit via SUCourse, following the homework requirements listed on the web.

All your work must be your own; and you cannot share your homework, but you can discuss the topic or your answers after the deadline. I typically ask questions from homeworks in the exams.

Note that homeworks are great ways to see whether you have learned a topic and guide you for it. So you are strongly encouraged to do your own work and study while doing the homework. Exams will contain questions related to the homeworks.

You must follow the requirements about questions (e.g. answer in 1-2 lines etc). Irrelevant answers will result in points off.

Late homeworks incur a penalty of 5 points off each day, up to 2 days. Plz do not be late (so be careful about last minute glitches) as email exception requests each results in 30-60 min . extra work!

1. **0pt - Read Chapters 1 and 2.** See the ‘What to Know’ slides at the end of each slide set. In general, you are responsible of anything (discussion, example,…) covered in class and the more we talk about something in class, the more you are responsible to know that topic.
2. **10pts (5 pts each)**
3. **In which decade was the term ‘artificial intelligence’ coined and AI begin as an active research area?**

a) 1940s **b)1950s** c)1960s d) 1980s

The answer is **b**

1. **Circle True or False - After initial excitement, the AI research encountered the a setback and caused disappointment, when solutions offered on toy problems did not generalize to other or bigger problems.**

**True**

1. **40pts** - **Consider the vacuum cleaner world discussed in class**: current location and local dirt sensors; left,right,suck,noop actions; 2-room world (A-on the left and B-on the right); sucking action cleans the room and rooms stay clean once cleaned. **But for this question, each movement and sucking actions costs one point (energy).**
2. **10pts – Can a simple reflex agent be perfectly rational for this environment? Explain in 1 line.**

No. For instance, both room A and room B can be cleaned at some point, and rationally, simple reflex agent should do nothing but it keeps moving to other states since the current state is always clean, this is because it has only the current percept rather than having the previous percepts of the environment.

1. **10pts - Describe a rational agent function for the case in which each movement and sucking actions costs one point, in 1-2 lines. Does the corresponding agent program require internal state? (variable/memory needed?)**

Reminder: The agent function describes the action for each possible percept sequence, not just the current percept. The agent function basically states the desired behavior and not the implementation.

If the current environment is dirty, vacuum cleaner should suck it and stores that information in a memory such that the environment is cleaned, and should move to the other environment( if it is currently on A it should go right otherwise it should go left) only if the other environment is not clean (dirty) and perform the same operation stated above. If the current environment is clean and the other environment is also clean,then the agent should not do anything.

The corresponding agent program requires internal state such that it needs memory in order to keep track of the previous state of the environment.

1. **20pts – Complete the following pseudocode (the agent program) that will implement the desired rational agent function.** 
   * Format/language does not matter. You can use {} or just use indentation to mean {}s.
   * For simplicity of grading (uniform code), check both sensors at once, as in the given code part below.
   * Don’t forget that return exits the code!

**function Rational-Vacuum-Agent ([location,status]) returns an action**

static isACleaned = false

static isBCleaned = false

if (Dirty and Location == A)

isACleaned = true

return suck

else if (Clean and Location == A)

isACleaned = true

if(isBCleaned == false)

return move right

return no action

else if (Dirty and Location == B)

isBCleaned = true

return suck

else if (Clean and Location == B)

isBCleaned = true

if (isACleaned == false)

return move left

return no action

1. **25pts - For each of the following assertions, say whether it is true or false and support your answer with examples or counter examples where appropriate. 1 line explanation at most!**

Hint: You can answer many of these questions by thinking task environments and sample agents we have seen in class.

1. **T / F -** An agent that senses only partial information about the state cannot be perfectly rational.

False. Poker playing agent has partial information about the state since it can not see the whole cards but can be perfectly rational.

1. **T / F -** There exist task environments in which no pure reflex agent can behave rationally.

True. The card game called Memory can be an example, since previous perceptions and knowledge is needed to behave rationally.

1. **T / F -** The input to an agent program is the same as the input to the agent function.

False. Agent function takes the entire percept history for input, however, agent program only takes the current percept as input since there is nothing more available from the environment.

1. **T / F -** Every agent is rational in an unobservable environment.

False. Vacuum cleaner that sucks and moves to other state can be rational in an unobservable environment, on the other hand, one that does nothing may not be rational for the dirty environments.

1. **T / F -** A perfectly rational poker-playing agent never loses.

False. Although agent can play poker rationally according to the given state, since poker is based on luck, agent can lose if it has lack of luck.

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