CS 404 – Artificial Intelligence
HW 1 – Chp. 1,2
75pt

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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)**

a) **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

b) **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.**

3) **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).**

a) **10pts – Can a simple reflex agent be perfectly rational for this environment? Explain in 1 line.**

No, because it cannot detect which room is having dirt because of local sensors and the agent percept does not give any information about which square is already clean so it has chance to move to the same location or make a cycles or control next room even though its clean.

b) **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?)**

The task of rational agent function is to maximize expected performance. In this case, it should minimize number of movements because they cost energy, it should stop after it cleans a cell and as internal state it should remember the past squares it cleaned(memory).

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.

c) **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 previousinternalstate;
static currentinternalstate;
//this preserves previous cells status which is internal state and
memory

if (currentinternalstate = Dirty and Location == A)
      [location , statues] = [clean, A];
      previousinternalstateA = dirty,
      return suck(),

else if [currentinternalstate = Dirty and Location = B]…
      [location , statues] = [clean, B];
      previousinternalstateB = dirty;
      ……return suck();……

else if (currentinternalstate =Clean and Location = A)
      if(previousinternalstate = clean)
            return NoOp();
      else
            return MoveRight();

else if(currentinternalstate = clean and location = B)
      if(previousinternalstate = clean)
            return NoOp();
      else
            return MoveLeft();
```

4) **25pts - For each of the following assertions, <u>say whether it is true or false and support your answer with examples or counter examples where appropriate. 1 line explanation at most!</u>**

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

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

False Rational behavior is doing the right thing based on the available information and as an example, the rational vacuum cleaning agent cannot detect other squares clean or not but it can be perfectly rational.

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

True - As an example if we think vacuum cleaner if we don't want to spend energy and not clean the same cell everytime this the task environment requires memory and it should remember the past actions.

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

False - Agent function maps percept sequence(history) to action however agent program the input is current percept so agent program will decide saving history or not.

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

False, if environment observable, it is almost impossible to maximize performance without any data if we think the vacuum agent moved but did not clean,it would not be rational.

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

False because there is a factor of chance and the card coming out differently even though it knows how to play.