

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. **Opt - 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.

Done.

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, since it only has local dirt sensors, it needs to go to check other room. Although both rooms are clean, the agent will continue to cyclic movements which is not rational.

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?)

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.

The rational agent function needs to minimize the cost. Since each movement costs one point, it shouldn't make unnecessary movements. If it has a memory to remember its past actions, it can remember that the other room was clean, and it doesn't move to the other room.

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 bool Aclean, Bclean

if (Aclean == False and Location == A):
    Aclean = True
    return Suck()
else if (Aclean == True and Location == A):
    if(Bclean == True):
        return NoOp()
    else:
        return MoveRight()
else if (Bclean == False and Location == B):
    Bclean = True
    return Suck()
else if (Bclean == True and Location == B):
    if(Aclean == True):
        return NoOp()
    else:
        return MoveLeft()
```

4) 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.

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

False, for the vacuum cleaning agent it doesn't see adjacent room's status, but it can be perfectly rational if the performance measure is given as keeping the room clean.

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

True, if a memory is needed for a task, a pure reflex agent cannot behave rationally.

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

False, the input to an agent program is the current percept, but the input to the agent function is the percept history.

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

False, there can be an agent which is not rational regardless of the environment is observable or not.

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

False, because for the game poker, chance is involved; for an unlucky play agent can lose.