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

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.**
2. **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).**
3. **10pts – Can a simple reflex agent be perfectly rational for this environment? Explain in 1 line.**

**ANSWER:** No, because agent cannot know if other room is clear or not. Agent will choose action which yields robot to oscillate between rooms to check if the room is clear or not.

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.

**ANSWER:** At any time, robot will check if current room is clear or not. If room is dirty then it will suck, but if the room is clear then robot will check the status of the other room. If the status of the other room is dirty then it will go to other room and suck it, but if the other room is clear too; robot will do noop action because robot knows room is clean then it cannot be dirty after.

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 bool roomA = false;

static bool roomB = false;

if (Dirty and Location == A){

roomA = true;

return suck;

}

else if (Dirty and Location == B){

roomB = true;

return suck;

}

else if(Clean and Location == A){

roomA = true;

if(roomB == true){

return noop;

}

else{

return right;

}

}

else if(Clean and Location == B){

roomB = true;

if(roomA == true){

return noop;

}

else{

return left;

}

}

else{

return noop;

}

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.

According to definition of the rational agent, it should choose the action which maximizes the expected output. So even if the vacuum-cleaning agent with no information about clearness of the other room could be rational because it will clean both rooms even it oscillates between them.

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

If any information needed from past, which requires memory, simple reflex agent cannot behave rationally.

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

Input to agent program is about current status but input to agent function is history of percept sequence.

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

If agent do not have any prior knowledge, it cannot choose actions that will maximize the output so it cannot be rational.

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

There is a luck factor in poker game. So our agent could be really unlucky and lose all the games even it is perfectly rational.