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!

* **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.
* **10pts (5 pts each)**
* **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

**Answer: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.**

**Answer:True**

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

**Since the agent have a local dirt sensor it can only decide whether or not to clean the square and decide which adjacent square to move and without the knowledge of the dirty squares the agent can move to an already clean spot.**

* **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.

**Yes it would require a memory which holds the cleaned spaces.**

**The function will check whether the current state is clean or not.If it is clean it would update the memory about the locations state and return the action where in this case it would be movement(left||right).If it is not clean then the function would still update the memory stating that the location is cleaned and returns action suck.**

* **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**

*if(Clean && Location == A ){*

*if(!InList(B)){*

*return right;//Since A is clean and B is not inside the list where the cleaned loc. hold*

*}*

*}*

*else if(Clean && Location == B ){*

*if(!InList(A)){*

*return left; //Since B is clean and A is not inside the list where the cleaned loc. hold*

*}*

*}*

*else if(Dirty && Location == A ){*

*AddCleanedList(A); //Machine is in A and the loc is dirty,clean it and remember*

*return suck;*

*}*

*else if(Dirty && Location == B){*

*AddCleanedList(B);//Machine is in B and the loc is dirty,clean it and remember*

*return suck;*

*}*

*else{*

*return noop;*

*}*

//There are 2 functions named AddCleanedList() and InList().First one is to hold the cleaned spaces in the memory and the second one is to check whether a space is in that list or not.

* **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.

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

In vacuum cleaner agent,the agent have partial information about the state which is only the current location(clean || dirty) but when memory is used the agent function was avaliable to make perfectly rational actions.

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

Since the simple reflex agents do not act on past perceptions it might not act rationally where Vacuum Cleaner can be a sample for this since when it does not hold the cleaned locations in memo it can try to clean them again which would cost energy(not rational).

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

**Answer:**False

The input to an agent function is the percept history ,the input to an agent

program is only the current percept.

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

**Answer:**False

When there exists an agent which does not stop,it is not rational since every move takes an amount of energy.

* **T / F -** A perfectly rational poker-playing agent never loses. **Answer:**True

If 2 perfectly playing agents try playing against each other there would be a winner and loser since the parameter of luck enters the game.