CS765 Hands-on Workshop: “Robot Psychoanalysis”

Your task today is to investigate how these robots work. You will only be able to do so by analysing their behaviour – you can’t take them apart, you can’t look at the code driving their behaviour, etc.

Below you will find some questions that will guide your investigation. Among the questions are spaces where you can take notes, that you will later type up as part of your report. **Take legible notes, they form part of your assessment!**

After today’s session is over, there is a reading assignment that you should complete before writing a 500 word report on the project (detailed instructions for the report are included at the end of this document).

I want to emphasize that the goal today is for you to think creatively and to explore. When evaluating your notes, I will not be focusing on whether or not you got thing right, I will focus on your justification for your theories and the kinds of questions you raise while working today. Explore these robots and let them spark your imagination. If you have ideas for one or more experiments that you could do if you had more time, or better access to the robots, write it down in your notes and explain why the experiments could be interesting or useful.

The experiments will be done in groups. You can discuss things, but avoid explicitly discussing answers to the questions or what to write down. Take notes during this session that you can then use to type up your final report (a digital version of this document will be available on Canvas for you to download and fill in using your favourite word processor.) **Please submit everything (notes and written report) as a single PDF to canvas.**

What you write down here (your notes and your report) should be your own thoughts and should not be shared with other people. Don’t plagiarise! If you are unsure, check the University of Auckland Academic Integrity web-page, and if you are still unsure, ask me!

Instructions

1. Using the questions below as a guide, experiment with the robots so as to understand what they do and how they work. Take notes as you go and remember that **time is limited.**
    - Don’t push any of the buttons on the robots, or modify the robots without checking with me first. If a robot stops working, let me know and I will restart it.
    - If you have any questions during the session, ask me!
2. After today’s session is finished, I will post a link on canvas to some assigned reading. Read this material before writing up your final report.
3. Write up your notes. A digital version of this document is in the file section of Canvas.
4. Following the “Report Instructions” below, write up your 500 word report.
5. Don’t forget to hand in both your **notes (worth 20%)** and your **report (worth 80%)**. These should be submitted by 5pm on the 27th of April (just under 2 weeks after the workshop).

Part 1: Observation

To start, I will perform a demonstration of the robot behaviours. During this time you can observe (but not interact with) the robots, and answer the following questions.

1. Describe each robot's behaviours in 1 or 2 sentences. These initial description should be at a high-level i.e. if you were to describing the robot to a child.

    a. high-level description of the symmetrical robot's ("Sym") behaviour:

    b. high-level description of the asymmetrical robot's ("Asym") behaviour:

2. Do you see any situations where one or both robot appears to fail?

3. What details of the world does each robot capture in its internal model? How do you think this information might be stored (e.g. what kind of data-structure)?

    a. Sym:

    b. Asym:

4. Briefly describe the bodies of the robots. What sensors and motors does it have? How do you guess these things work? (OK to not know the answer – you haven't been taught this, but have a guess. Later you can do some experimenting to figure it out). Where are the sensors on the body. Is this important?

5. Describe without going into detail how you think the robots are working.

Part 2: Experimentation!

Spend some time experimenting with the robots. How can you probe their abilities? What do the sensors measure? At what level of detail? Under what conditions do the motors turn? Under what conditions does the robot 'succeed' or 'fail' (you may want to experiment with the barricades)? Is one robot's behaviour more robust (i.e. harder to break) than the other's? Can you make the wheels move in a particular way?

6. Experiments conducted and lessons learned:

After having experimented with the robot, can you describe its behaviour at a 'lower,' more mechanistic level? Under what conditions do the wheels turn etc.? Has your perception of how complicated its 'brain' is changed? Why or why not? If your perspective has changed, describe what you think the software 'brain' is doing.

7. Post-experimentation description:

What happens when you switch the left/right blue coloured sensors on the symmetrical robots? (Get my help to do this.) Why does this happen?

8. What happens when you swap the sensors (left/right)?

Consider the environment that the robots are operating in. What role is it playing in driving the behaviour? If you were to simulate these robots, what aspects of the environment would need to be included in the simulation?

9. What role is the environment playing in driving the behaviour?

Report Instructions

Write 500 words describing the robots that you experimented with, referring to the “vehicles” in the assigned reading for comparison. You should...

- describe which (if any) of the vehicle(s) in the assigned reading are similar to those that you experimented with, explaining why you think so
- include a brief comparison between vehicles in the assigned reading and Shakey the Robot
- compare the environments in which our workshop took place, and that in which Shakey the Robot operated
- briefly outline your view of some limitations (and advantages) of the approach taken in the assigned reading and the Cognitive System’s approach taken in building Shakey the Robot
- explain what is meant by “uphill analysis and downhill invention.”