Question 1

(I) The **uncanny valley** was a statement made by **Masahiro Mori** in 1970, he suggested that the emotional response of humans to robots is very complex.
The more a robot gets a human-like appearance, there would be a more positive emotional response from humans and the more comfortable a human would be to interact with them.
However, if a robot starts to look nearly human, the observers will feel uncomfortable, such a thing would become repulsive to the observer.
And the positive feelings would be lost, or even replaced by revulsion, which is referred to **uncanny valley effect** or **zombie effect.**

(100 words)

All three stages of development towards affective robotics are briefly and clearly expressed, and the notion of 'uncanny valley' clearly identified.

(ii) today some robots look nearly human, one example is the Saudi Arabian robot called **Sophia,** which is a female robot that is nearly human-like, the skin and the facial expressions are almost identical to the human ones. this robot can make conversations interact with the observer tell jokes.
However, the uncanny valley will always be a problem, as people will always be uncomfortable with robots that have human characteristics, so the uncanny valley is here to stay.
A robot that resembles human characteristics and appearance will always have a mixed reception from humans.

(93 words)
Although there are robots that can pass the Turing test, humans are instinctively good at recognizing life and robots will never achieve sentience

(b) a **smart home heating** device can control the temperature around the house by itself without human intervention, and it can turn itself on and off when the owner is not at home, it can look at its database to see the monthly cost of the electric bills if it is higher it can make decisions by itself by reducing the use of heating.
So it is a **nearly autonomous smart device**. it takes inputs, can make decisions, and uses data collected to make changes in the ambient temperature.

(68 words)

There are four characteristics to be considered: mobile, autonomous, intelligent and robot.
Smart home heating systems are not mobile. There can be some functionality that home owners would consider intelligent, perhaps implemented using fuzzy logic.

(c)
(I)

A **semi-autonomous operation** can operate autonomously under some conditions but may require human intervention to work or achieve a goal.

A **supervised autonomous operation** is a framework, which makes the development of human-robot systems easier, by embracing its components in a human-oriented manner, to augment users in accomplishing their tasks. It incorporates supervisory control for robots, it does not rely on humans to perform all the basics of perception and action in a system.

An **autonomous operation** means machines that operate without human intervention as they continuously adapt to changes in their environment.

These outlines provide a more precise differentiation between the three modes.

'Semi-autonomy' usually implies that a machine performs a task and then waits for a human to take an action before continuing.

'Supervised autonomy' usually implies that a machine can sense, decide and act on its own. A human will supervise its operation and can intervene, if needed.

'Autonomy' implies that a human cannot intervene in the autonomous process.

Here is an example of a robot that operates in all three modes at different times

Perseverence, NASA's Mars Rover, essentially operates in semi-autonomous mode with each sol's task instructions uplinked from Earth for autonomous implementation. The little helicopter, Ingenuity, also flies in semi-autonomous mode. See https://www.jpl.nasa.gov/missions/mars-2020-perseverance-rover. Try taking a walk around the interactive model!

If Perseverence runs into certain types of problem during a traverse or drilling/sampling process, it can decide to stop in a safe mode and wait for further instructions usually when the next sol's instructions are uplinked. (Controllers will have received an almost continuous stream of telemetry to inform the instruction set.) Ingenuity has a broadly similar approach to any problems occurring during its sorties.

Many of a sol's tasks uplinked to Perseverence before sunrise are carried out autonomously unless a problem occurs which requires some supervision. Autonomy is needed for efficient and effective exploration because signals to and from the rover can take from five to 20 minutes to travel between Earth and the rover. Ingenuity has to be completely autonomous during its sorties, which only last a few minutes.

Overall conclusion: Mars surface exploration spacecraft operate in all three modes!

Follow this link for an example of leading edge autonomy in action. No human intervention is possible when radio signals take 20 minutes to travel

https://www.dropbox.com/s/6hpv9hynt0ezuz6/Perseverance_EDL.mp4?dl=0

(ii) None of them would be ethical because Lethal autonomous weapons **(LAW)** are unethical in my opinion since the machine now is empowered to make the decisions of who should be killed or should live, humans, what if the machine targets the wrong person? All I see is that **LAW** was created with bad intentions in mind, to kill civilians in war and most of them are innocent people who have different political views.

(73 words)

Your view is supported by many observers of the current conflict in Ukraine.

However, we wanted you to refer to the three modes of autonomy.

Question 2

(a)

(I) Deontology: Certain moral rules should never be broken

Consequentialism: Morality is ultimately about doing whatever has the best consequences.

(ii) The training navigation system in rural Wales would be a problem because of the lack of mobile network connection in rural areas, some roads are dirt roads or in bad condition or even flooded at certain seasons of the year, which would make navigation difficult.

Not to mention that Americans drive on the other side of the road!

Essentially, there is likely to be ‘data bias’. The data that the system is trained and validated on must match that expected from the operating environment.

(iii) It depends, I believe that the data from customers should be confidential, and should not be shared with anyone even inside the company, however, if the company make it clear to the customer that his/her data are shared with the company, and ask for the customer's consent and they agree with it, then the company is acting ethically, but if the company doesn't make it clear to their clients, then they are acting unethically.
However, many companies write terms and conditions as huge documents almost like a dictionary, just like this policy 380 pages, it's revolting it should be clearer for the client.

(105 words)

Finding the privacy policy on page 356 of a 380 page document should raise alarm bells.

Sam would have a professional responsibilty to object and potentially resign if the company is behaving unethically.

(b)

(I) Both should cooperate so both will score two points

MoTo should cooperate. Then Sam and MoTo would both receive a pay-of of 6.

(ii) Sam should defect as well, so Sam would get 2 points as well

Sam should compete (defect) – MoTo then only receives a pay-off of 1.
Unfortunately, Sam would also be penalised and get a pay-off of 3 compared to 5 if Sam cooperated.

(iii) because MoTo will always score something, Moto will never score zero

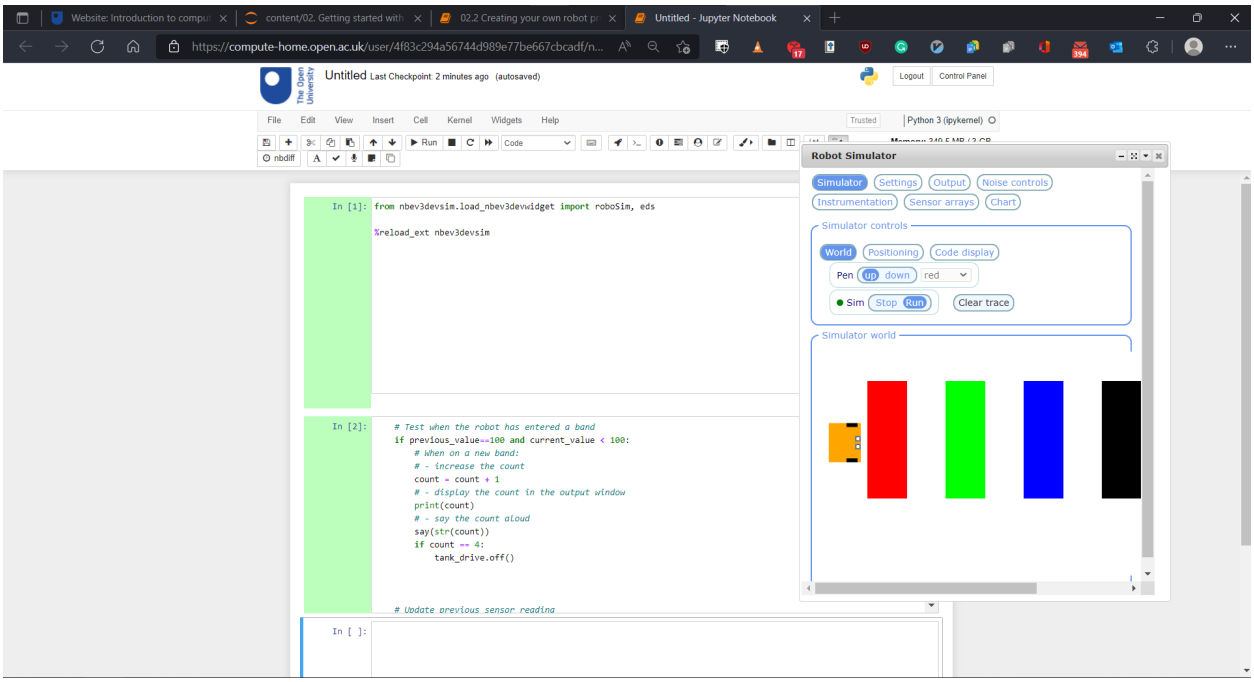
If MoTo always cooperate, they will maximise their own pay off: they score 2 if Sam defects and get a maximum pay-off of 6 if Sam cooperates. If MoTo defect, they get 1 if Sam defects and only get 4 if Sam cooperates.

(iv) because when navigating precision of which route to take is required, brute force tries every possible solution which is not ideal for navigation systems.
The search space would be too large to produce an answer in a usable timeframe using brute force.

Question 3

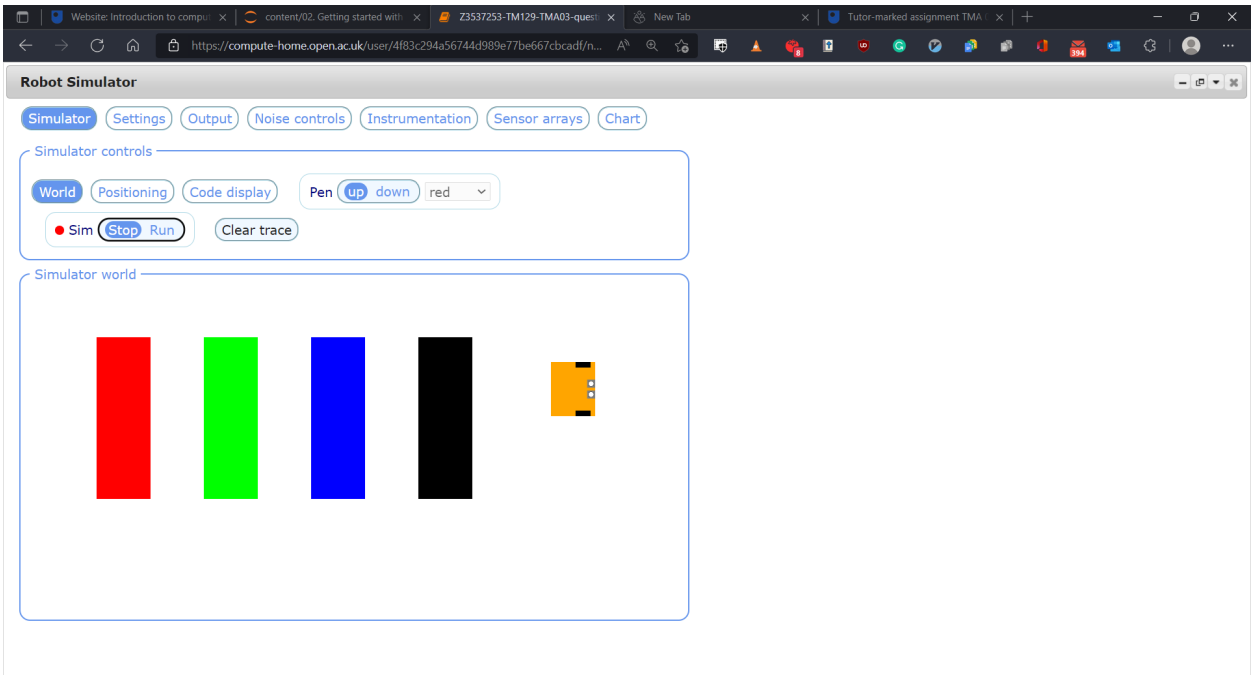
(a)

(I) I manage to make the robot stop after the dark band but It stopped way after it



What modifications did you make to the program?

Arguably, in part (a)(i) the simplest way to check for color bands is to use colorval = colorLeft.color (see notebook 02.4, exercise 4.3.2). However this does not work for Rainbow_bands as, for example, it does not distinguish between the two blues.



(ii) The program **(the robot**) did run, however, it did not count the rainbow bands properly, because the rainbow bands were next to each other.
It would be necessary to change the colour sensor in the program so that when the robot runs over a different colour it begins to count the previous one and keeps incrementing counting.

You would need to use RGB values or some other way of checking the colour bands

(iii) the use of functions in python or in any other programing language, is to enhance the readability of the program. Programs with lots of code are always difficult to read, it is always a good idea to break the code into smaller functions to keep the program organised, reusable and easy to understand.

Here is an outline

```
def hello_world():

    print("Hello, world!")

hello_world()
```

No response to part (b)

Question 4

Three examples of robots in agriculture

1- Drone-Powered Harvest Monitoring and Analysis

Drones can collect data on the current state of the crop and deliver it to the farmer's smartphone. Accurate analytical data allows farmers to take prompt actions to ensure that crops are germinating as planned.

Characteristics

- Is partially autonomous, a pilot still needs to monitor the drone to get data from the crops, soil and the temperature
- It's controlled by a human, so it has human interaction
- Some of its sensors are accelerometers which are used to determine the position and the orientation of the drone in flight, tilt sensors, current sensors, initial measurement units, and engine intake flow sensors.
- It detects and collects data from the soil and can analyses it, so it has some kind of intelligence

2- Effective Weed Control

This machine helps to kill the weeds, and is equipped with computer vision, it can separate a useful plant from a weed, pull it out along with the root and sprinkle as much chemical as is needed to eradicate the weed.

Characteristics

- It's fully autonomous**,** it can work without human supervision
- It doesn't need to communicate with anyone, no human interaction
- It has sensors to detect different kinds of crops, accelerometers to determine the position and orientation, and actuators.
- It can separate weeds from crops, and sprinkle chemicals. so, it is intelligent

3- Fertilization and Irrigation robots

This machine helps to prevent high usage of water and fertilizers. AI-powered robots can suggest the amount of water and herbicides to perfectly suit the plant's needs and reduce water usage, by using knowledge about a particular crop's characteristics.

Characteristics

- It's fully autonomous, it can do its work without human supervision
- It does not need human communication to operate
- It has sensors, actuators and accelerometers to determine the position and orientation
- It is AI-powered and uses its knowledge about the crop's characteristics, so it is intelligent

The increasing use of robots in agriculture will have a big impact on the way farmers do their work, hard work is no longer required. They will need some kind of technical knowledge related to the information of technology field, due to this automation process.

This can solve the problem that many developed countries suffer from, which is labour shortages in the agriculture sector.
Another positive impact will be on is that machines can work for long hours without getting tired or needing to stop. and with intelligent machines, usage of water and pesticides will be reduced, this means less water usage and less usage of pesticides on the soil which helps to reduce the environmental contamination in the soil by pesticides and fertilizers

Personal Opinion about the agricultural robots

The use of robots in agriculture will continue to grow in the next three years, the robots and AI will get smarter and more capable, and any task on a farm such as picking the crops, irrigation, ploughing, driving tractors and machines will be automated.

(498 words)

References:

Types of robots for agriculture

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For the drones autonomy levels

McNabb, M. (2019) *DRONEII: Tech Talk – Unraveling 5 Levels of Drone Autonomy*, *DRONELIFE*. Available at: https://dronelife.com/2019/03/11/droneii-tech-talk-unraveling-5-levels-of-drone-autonomy/ (Accessed: 24 April 2022)

The impact of robots in agriculture

Agricultural Robots – How robotics is changing agriculture (2021) *Hdi. global*.

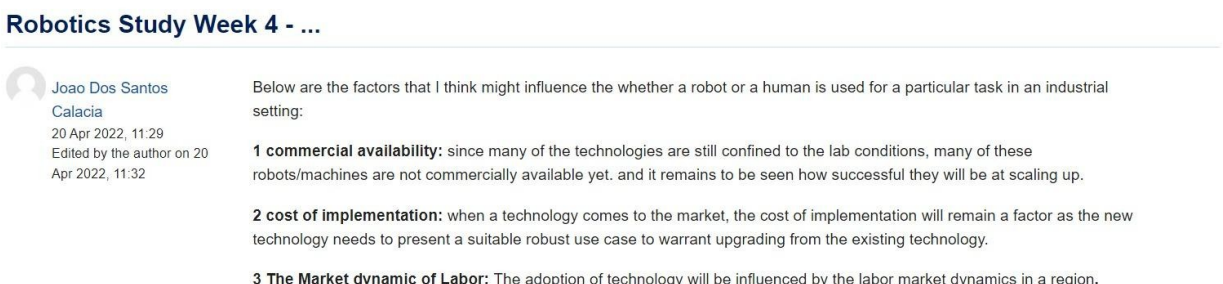
Available at: https://www.hdi.global/infocenter/insights/2021/agricultural-robots/

(Accessed: 25 April 2022).

Question 5

(a) Week 4-activity 4.1: In this activity, I am discussing in the forum my opinion on whether a robot or a human is used for a particular task in an industrial setting

https://learn2.open.ac.uk/mod/forumng/discuss.php?d=4019174



Robotics Study Week 4 - ...

Joao Dos Santos Calacia
20 Apr 2022, 11:29
Edited by the author on 20 Apr 2022, 11:32

Below are the factors that I think might influence the whether a robot or a human is used for a particular task in an industrial setting:

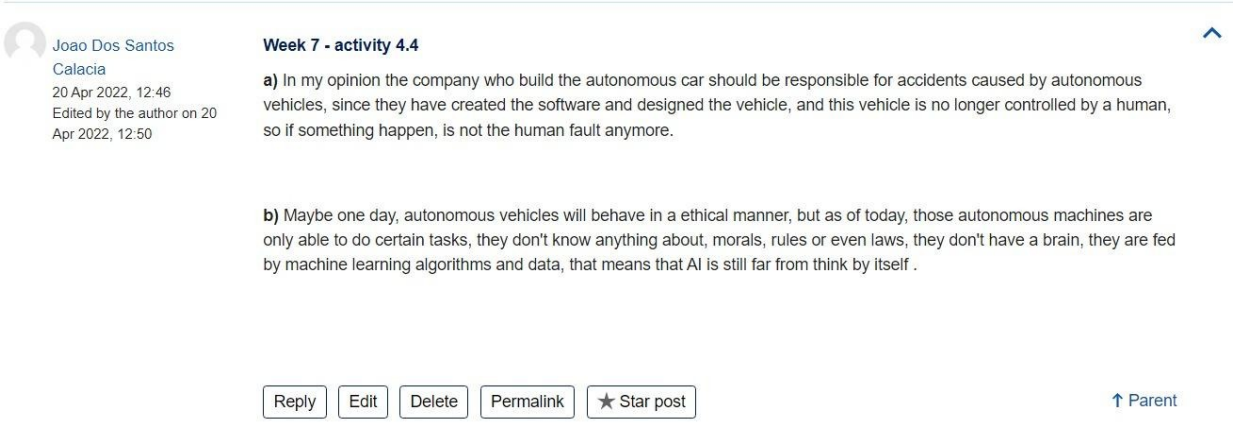
1 commercial availability: since many of the technologies are still confined to the lab conditions, many of these robots/machines are not commercially available yet. and it remains to be seen how successful they will be at scaling up.

2 cost of implementation: when a technology comes to the market, the cost of implementation will remain a factor as the new technology needs to present a suitable robust use case to warrant upgrading from the existing technology.

3 The Market dynamic of Labor: The adoption of technology will be influenced by the labor market dynamics in a region.

Week 7 - activity 4.4 I discussed in the forum the autonomous vehicles and their issues

https://learn2.open.ac.uk/mod/forumng/discuss.php?d=4003256



(b) Activities 4.1 from week 4, and week 7 were very challenging for me, as I am not very comfortable with forum discussions or interactions, and I had to leave my comfort zone. Robotics is a fundamental area of the **I.T,** and automation is reshaping our lives and the way work, and it's here to stay.
The interesting part of this topic was using Jupiter notebooks to run the robot lab.
Jupiter feels like an IDE, I never used docker and I discover that docker is a lightweight Virtual Machine (container) That does not contain a kernel since it shares the host or operating system kernel.

Activity 4.1 of week 4 was the hardest one, in my opinion, the Implementation of robots in Small businesses (i.e., in a coffee shop or a restaurant) will take some time because robots today are more expensive than hiring a human, at least right now. Only big companies can afford to automate their infrastructure on a big scale, and the shortages of silicon chips are other factors to slow the process of automation with robots.

Activity 4.4 of week 7, question a, was interesting to discuss, who should be responsible for an accident that was caused by an autonomous vehicle, then I believe that the company that built the car should be responsible for it since at this point the machine is not controlled by a human, but by software created by its manufacturer.

(244 words)