Trilobot Challenge

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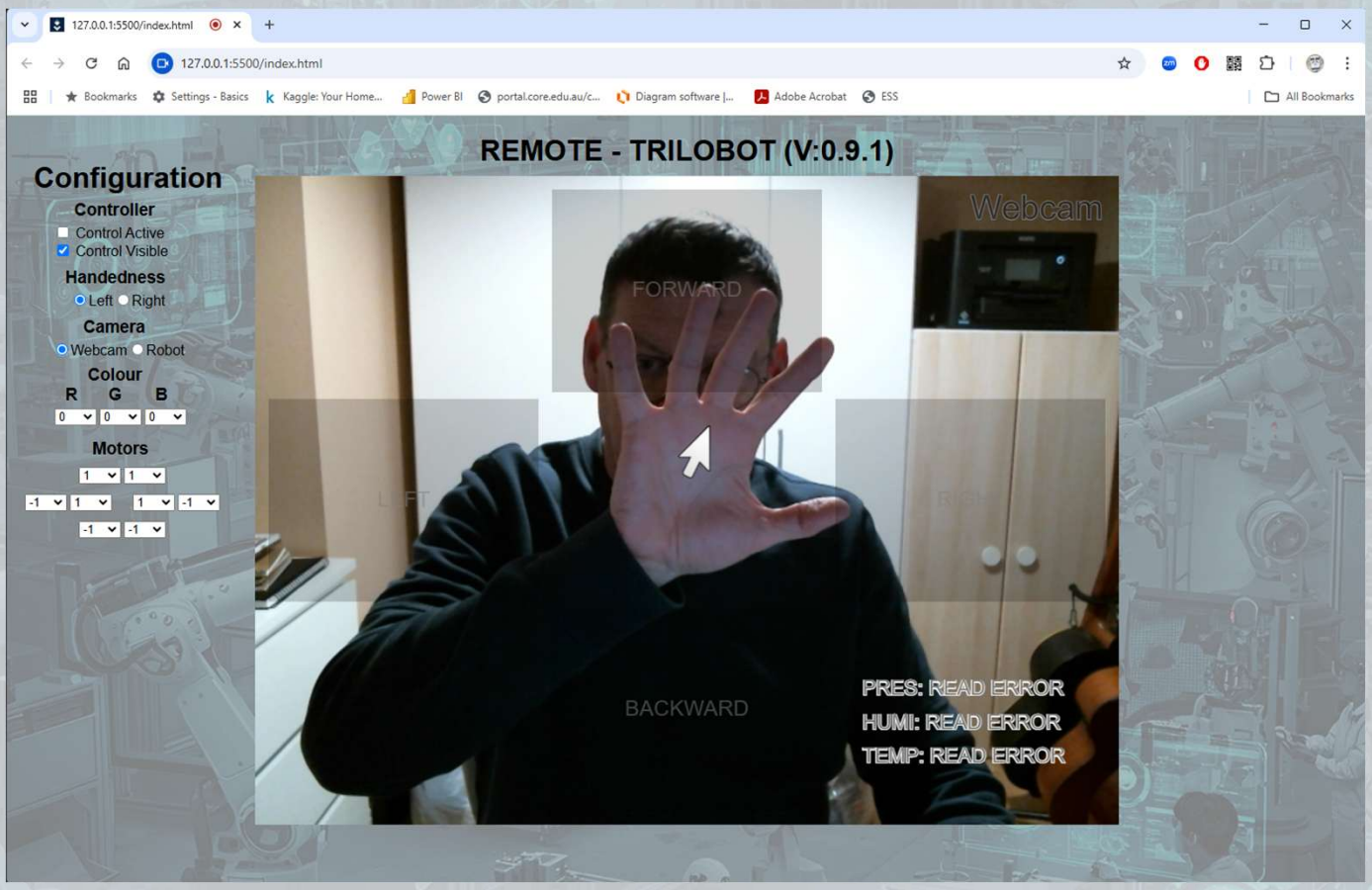
In this activity you will drive a Trilobot using Google's **`MediaPipe`** AI Models to recognise hand movements from a webcam feed.



The basic idea is you will complete a set of challenges as quickly as possible. But there's a catch, you need to tailor the power to the motors to make the movements as controllable as possible but at the same time fast enough to allow complete the challenges using only hand movements in front of the webcam.

Let's get going!

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What do we need!

For this activity we need the following:

- A **web browser** (we recommend you use Chrome).
- The **VS Code** Editor
- A **webcam** connected to the computer.
- A **Trilobot** (Obviously!)
- **Your hand.**

The lab computers should already be setup, but if you get stuck at any point, ask for help. We are here to help you.

Oh, you also need your cunning plan!

Source files: https://github.com/neliot/Trilobot

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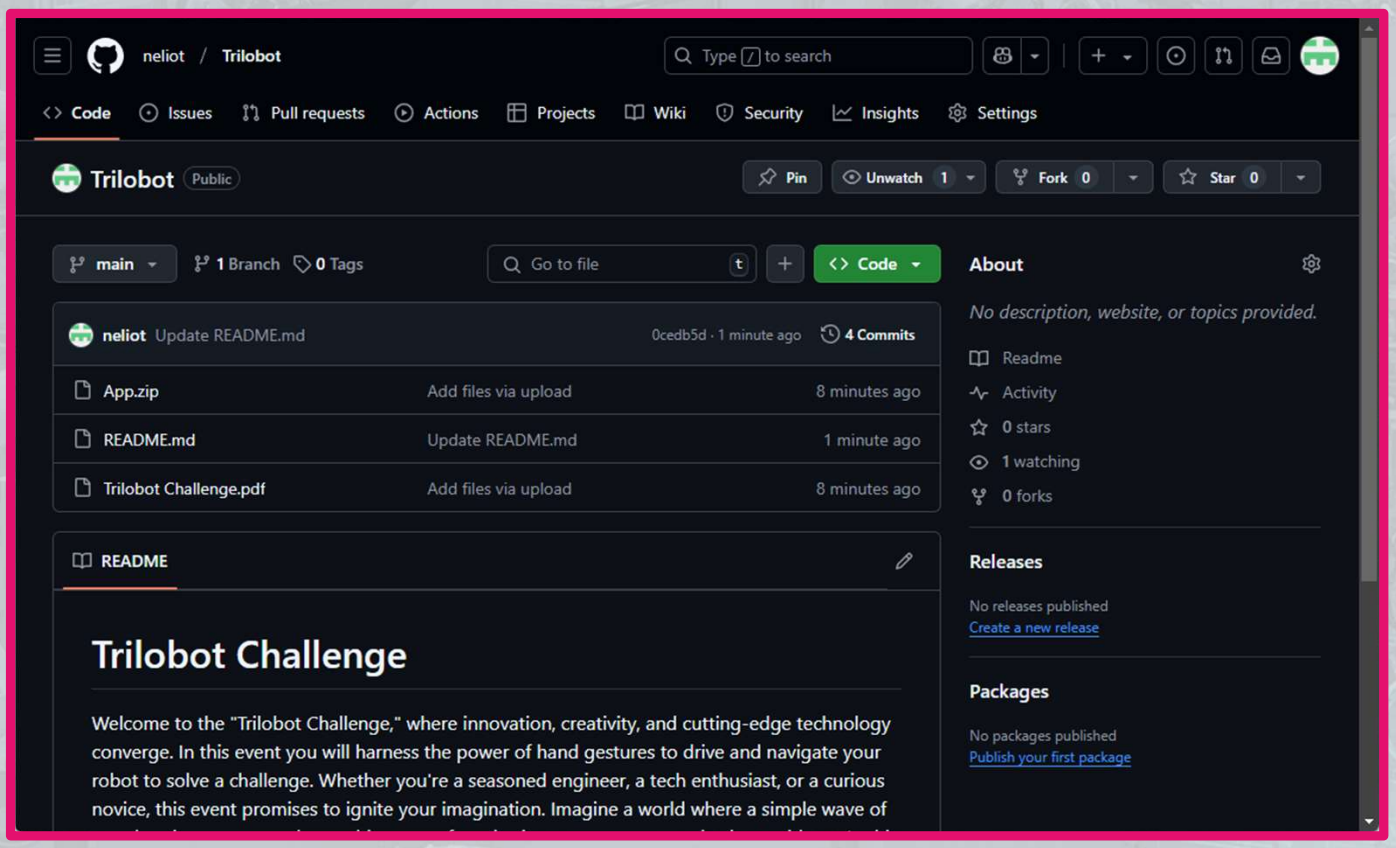
Download the application!

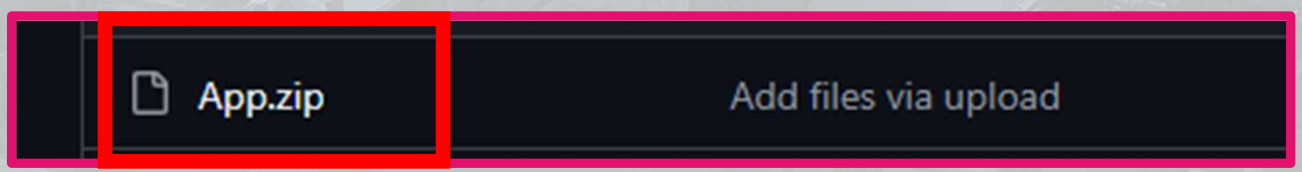
In your browser enter the URL below:

https://github.com/neliot/Trilobot

You should see a page similar to the one below:



Click on the App.zip file:



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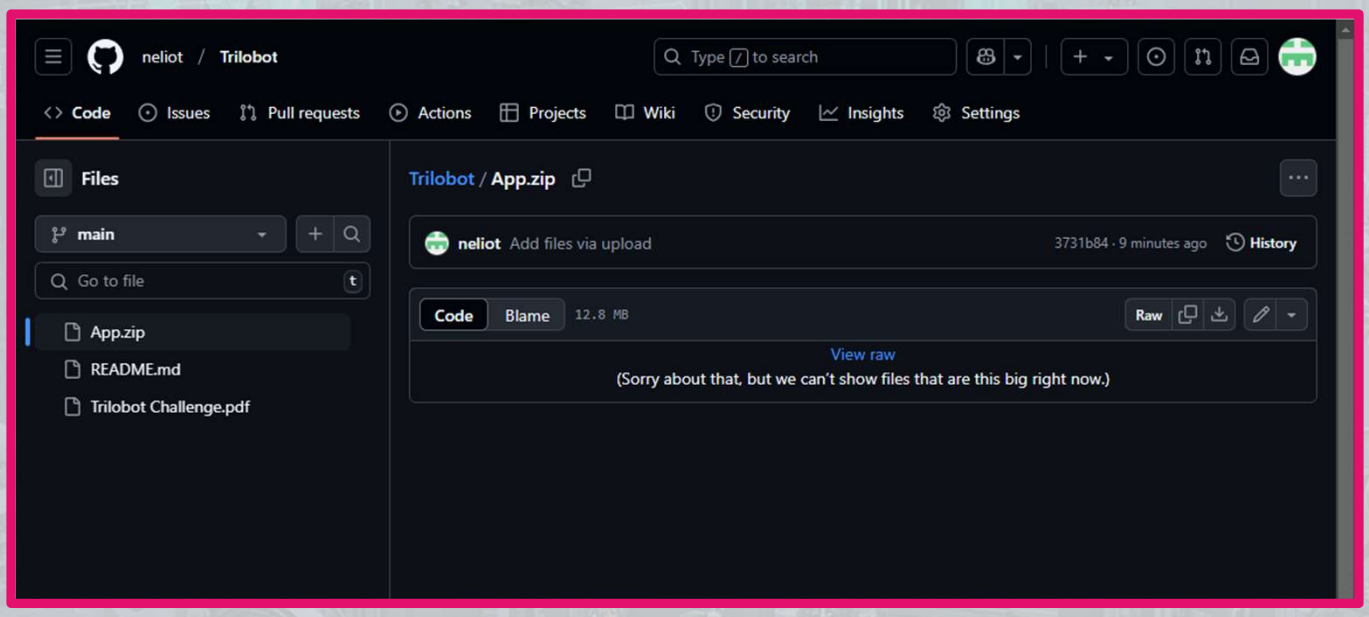
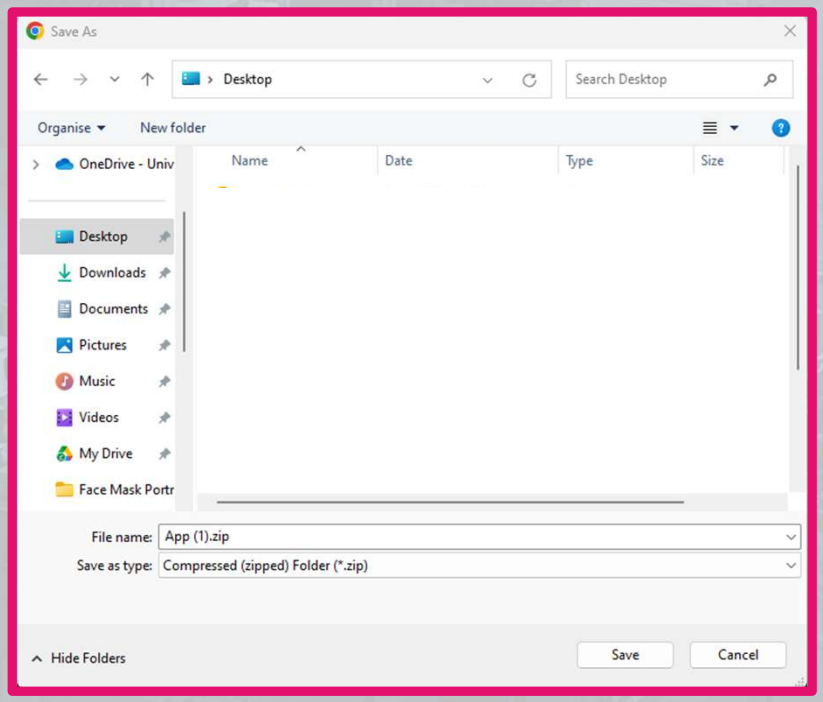
Download the application!

You will now be presented with the following screen:



Click on the download icon and save the file to the Desktop.



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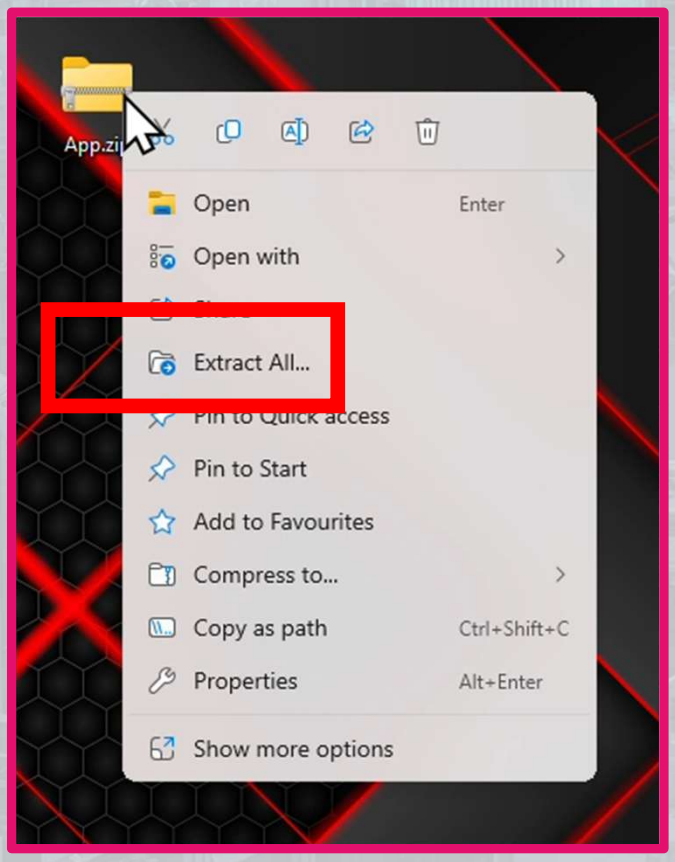
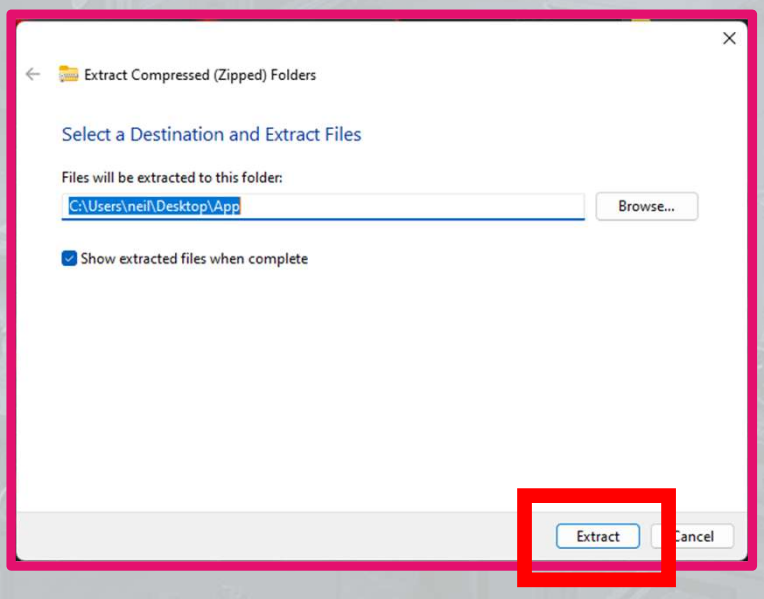
Extract the application!

Go to the desktop and find the file you just downloaded and right click on it.



Select **`Extract All`** and then **`Extract.`**



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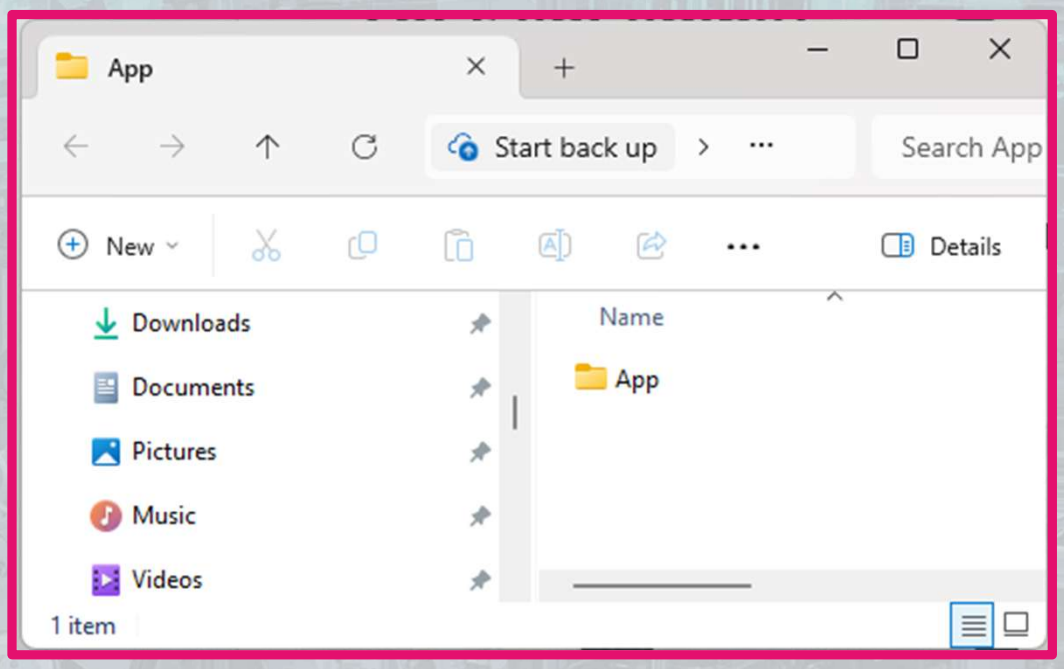
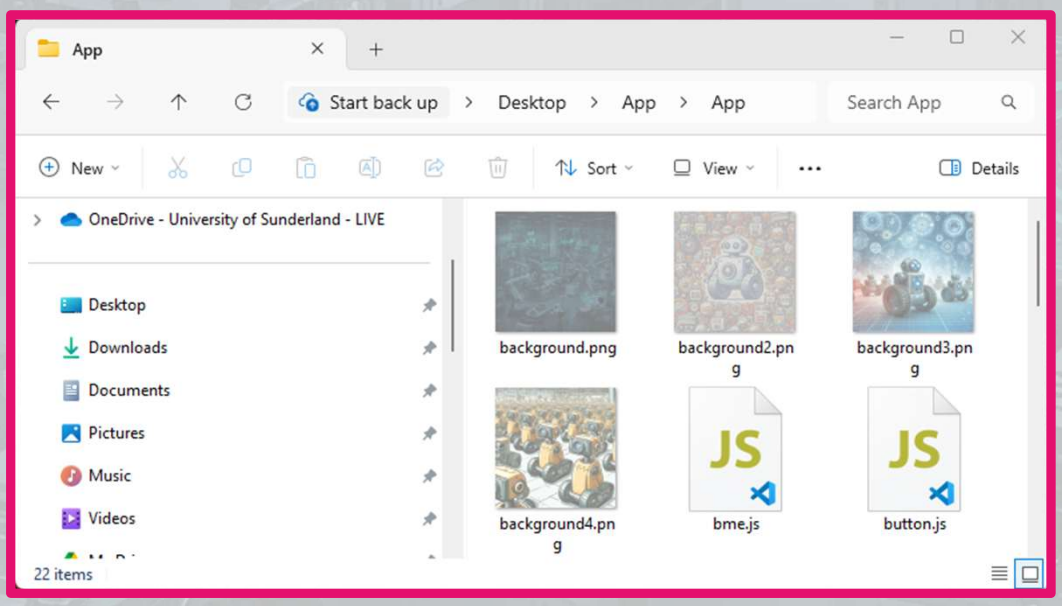
Setup the application!

You can now see the Extracted application folder.



Go into the **App** folder by double clicking on it.



And now the Editor

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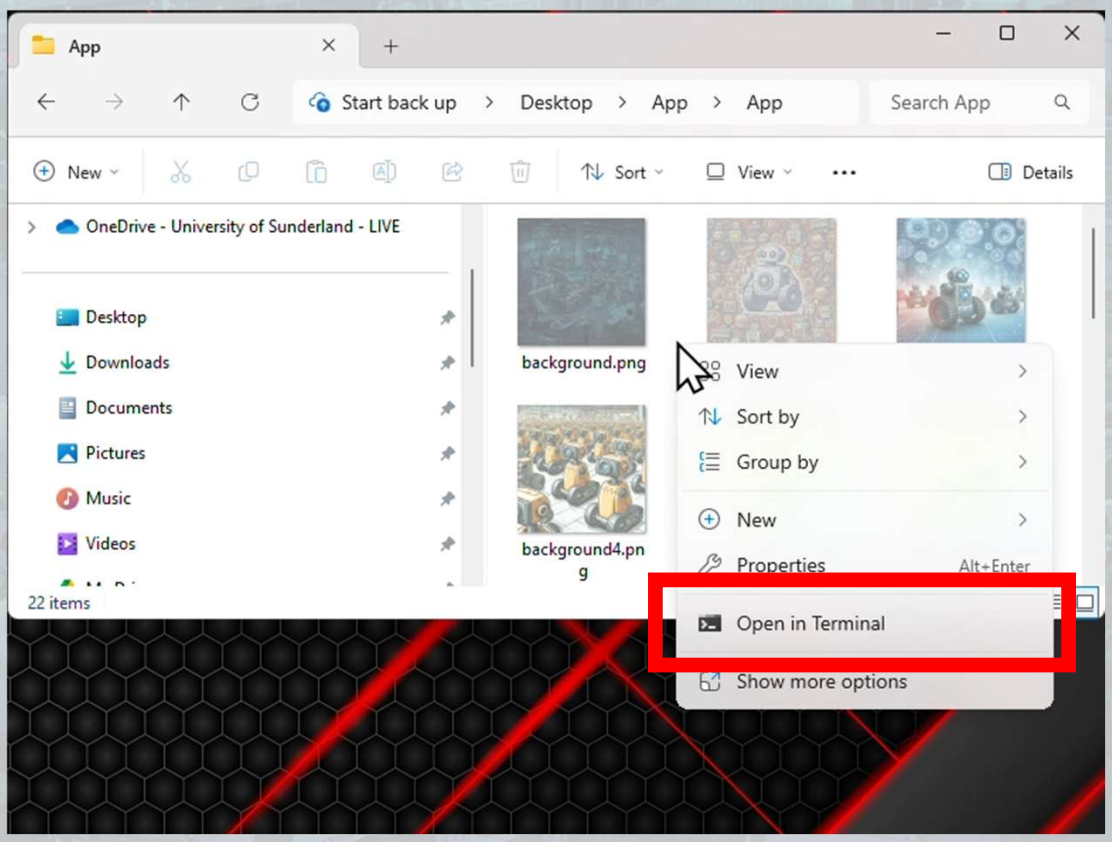
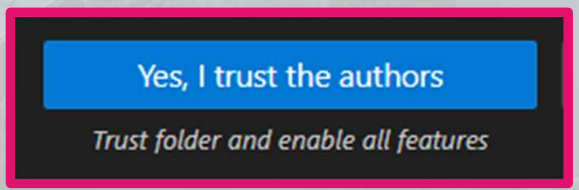
Setup the application!

`Right Click` in the white space for the **`action menu`** as below:



Select the **`Open in Terminal`** option. When the terminal window opens go to it and type in "**`code .`**" (without the quotes, yes, a dot is required after **`code`**!). Press the **`RETURN`** key. You should now have **`VS Code`** running with the **`App`** folder showing the files. If you get a message asking if you Trust this folder select **`Yes.`**



And now the Editor

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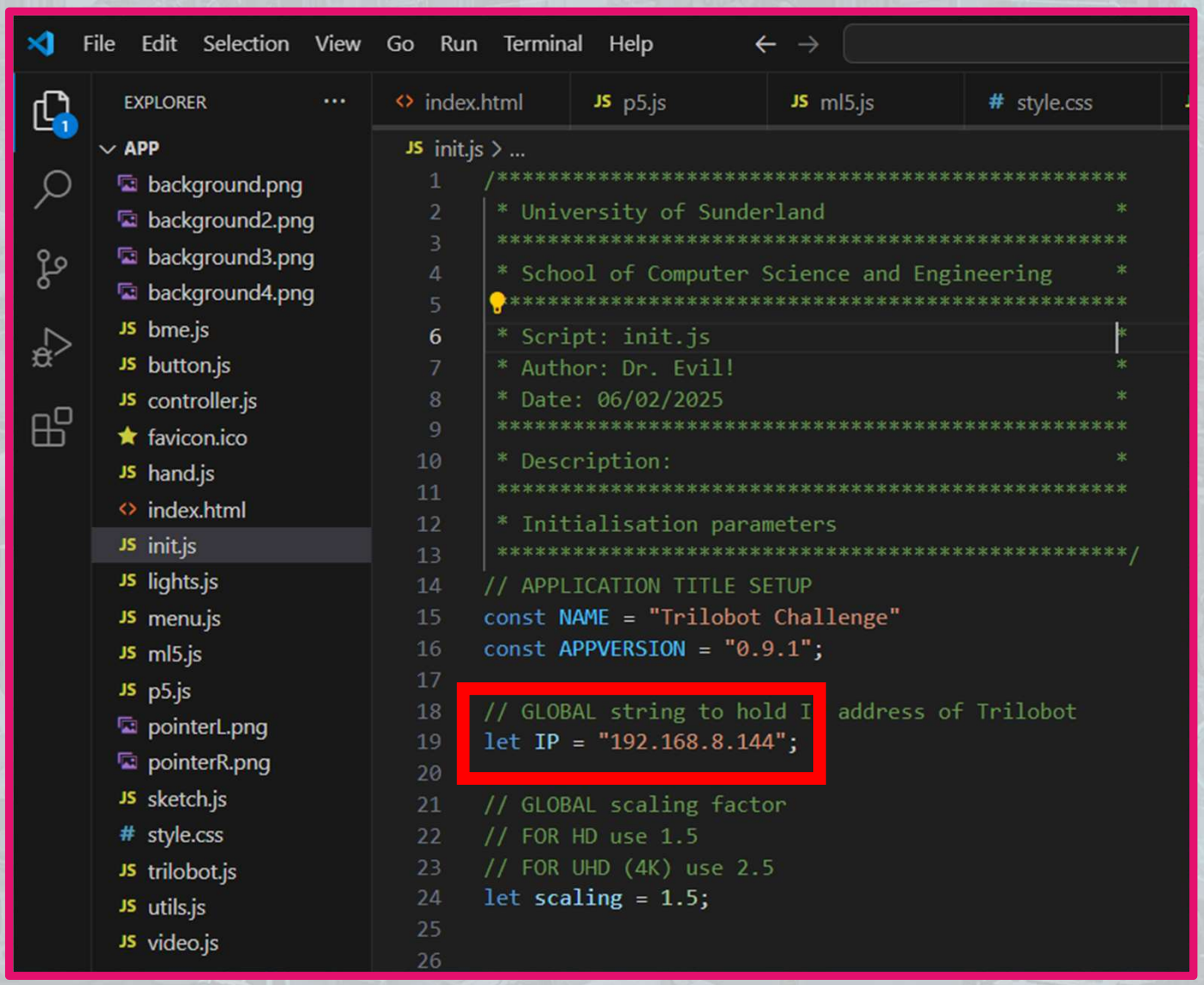
Setup the application!

Within the list of files (there are quite a few) there is a file named **`init.js`** This file contains needs to have the IP address of the root you will control added to it. Select the file and the code will appear in the editor.



You will be given the address of the robot you are going to control by the person running the event. You need to change the address to the one you are given.

```
IP = "192.168.8.144";
```

And now the Editor

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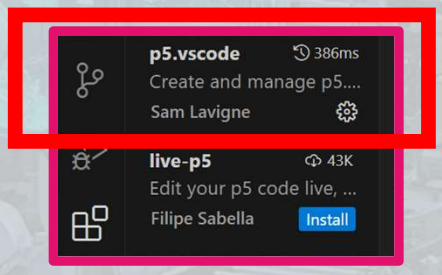
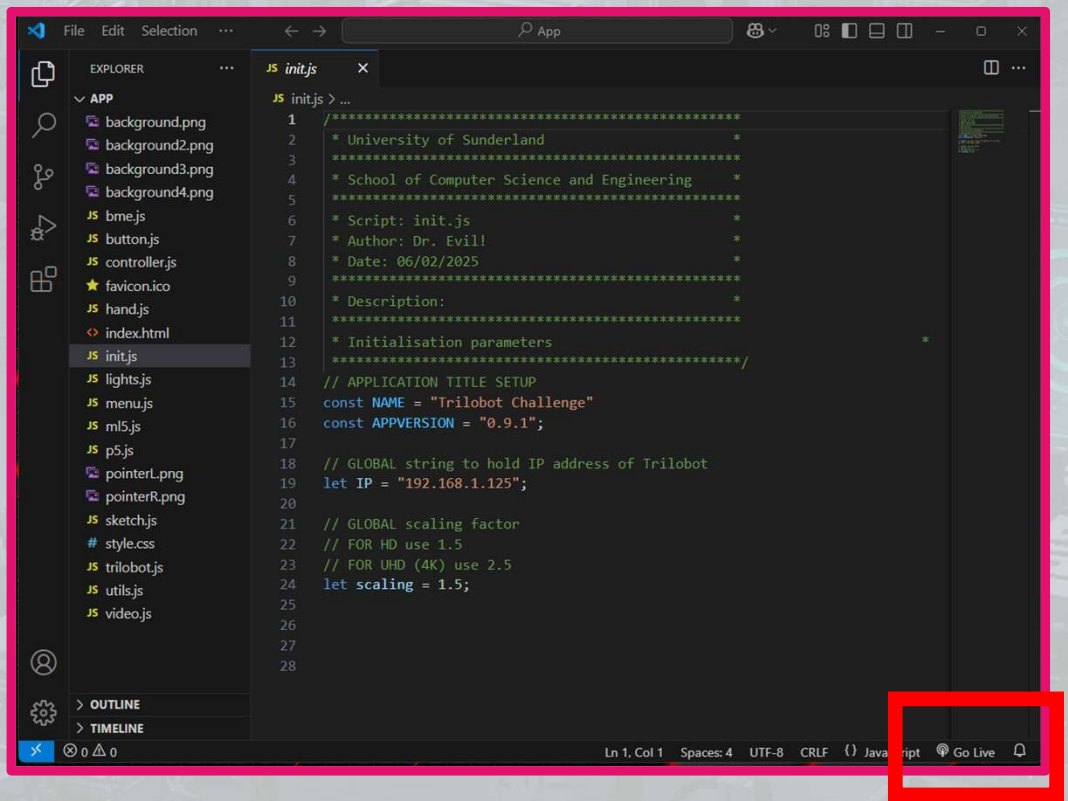
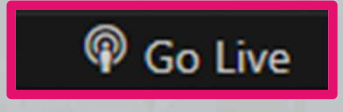
Running the application!

Now you can launch the application. At the bottom of the screen is an option "**`Go Live`**". This is the built in **`Live Server`** which is a local web server which runs the application.

If the "Go Live" option isn't displayed call the academic over, they may need to install the `p5.vscode` extension for you!







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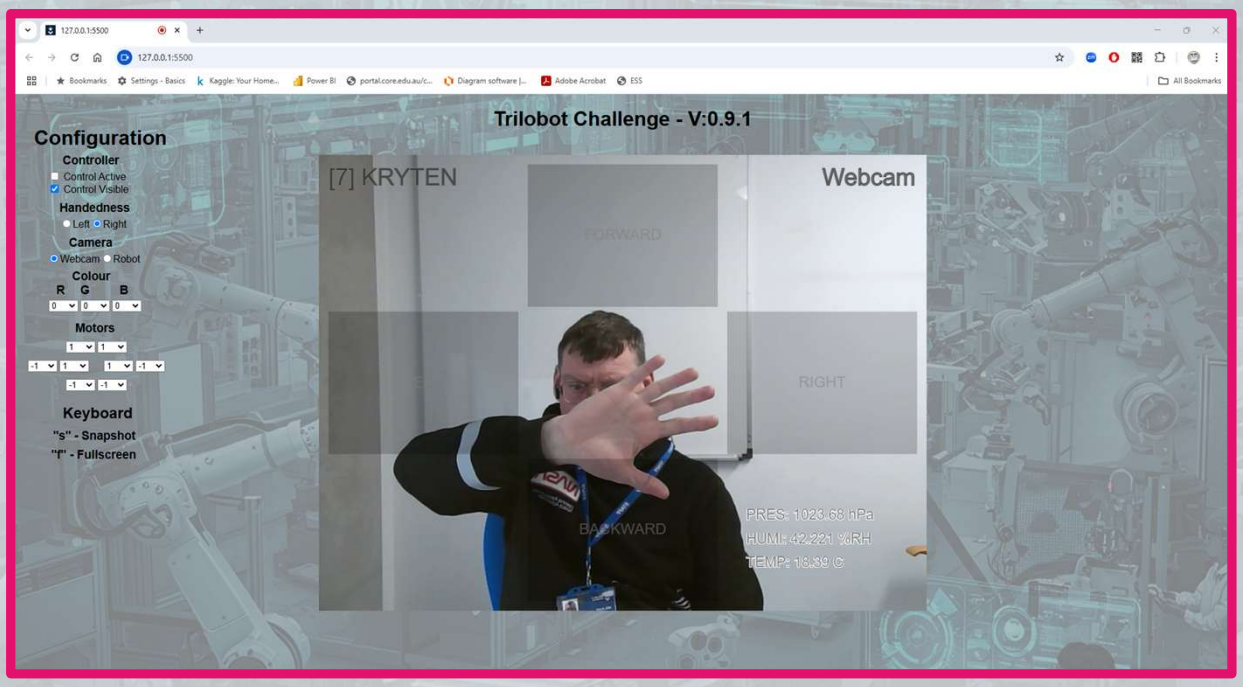
Running the application!

This application will now be launched in the default browser and should look similar to the image below.



The “Configuration” panel is where you can manipulate the main “video feed” and overlaid on the video feed is the main “application” interface.

The next two pages will go over the interface.

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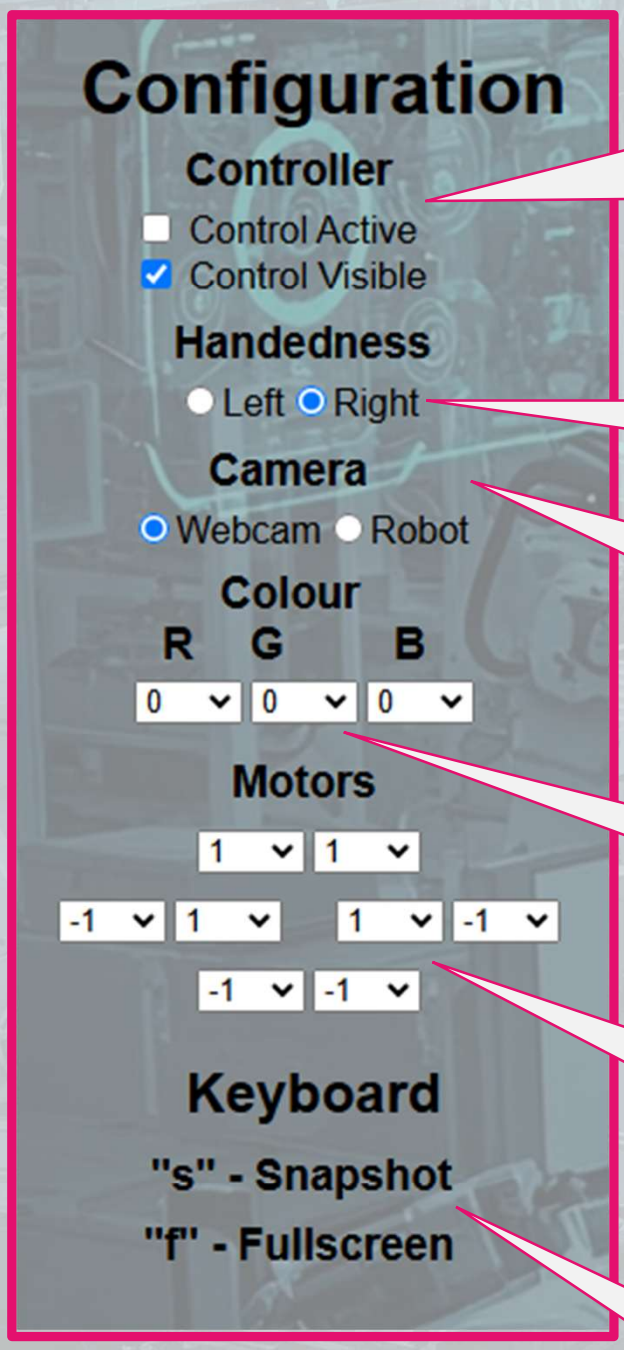
Using the interface!

The “configuration” panel operations are detailed below:



The main hand gesture “buttons” can be made inactive so the robot doesn’t respond and can also be hidden.

This allows the system to recognise either your left or right hand.

This changes the overall video panel between the webcam and the robot mounted camera.

Selecting the RGB colours (0-255) changes the underlighting of the robot.

These values determine the motor power to each wheel allowing you to “calibrate” the movement.

s – Takes a snapshot of the current video view.
f – Expands the web browser to full screen.

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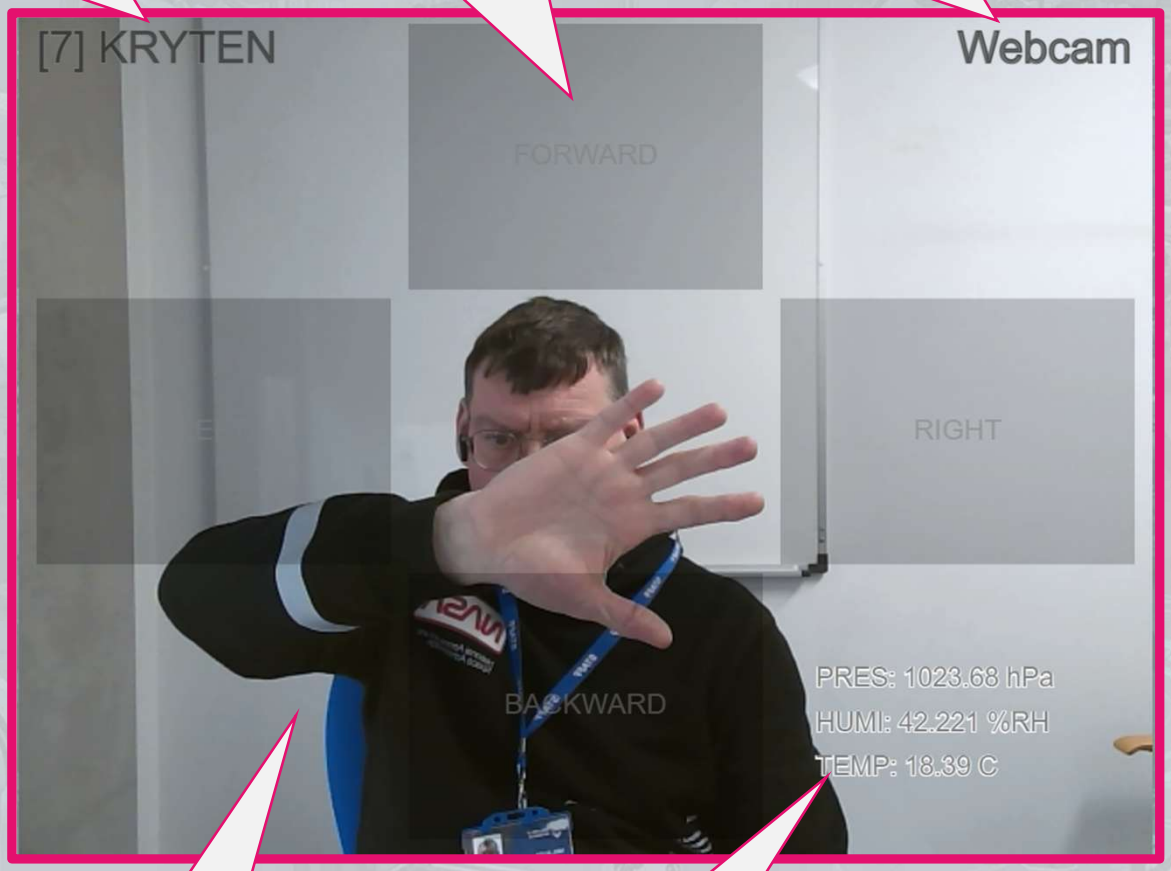
Using the interface!

The “configuration” panel operations are detailed below:

Trilobot name and number

Hand gesture “buttons” for FORWARDS etc.

Current video feed.



Video feed.

Environmental data.

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Hazardous pipe inspection challenge!

Introduction

There are many hazardous environments out there where regular inspections of industrial installations are required. It could be noxious/poisonous gas, radiation, or just small inaccessible spaces. It could even be a disaster area where a building has collapsed.

The main issue here is: How can you “see” what is going on without physically entering the space yourself?

Use a remote inspection robot.

Your Challenge

You are now the operator of the Trilobot inspection robot system, and you are required to carry out an inspection of the pipework in a hazardous area to identify if any remedial works are required.

You must collect photos of the specific areas and identify the environmental conditions around the area (Temperature, Humidity and ambient air pressure).

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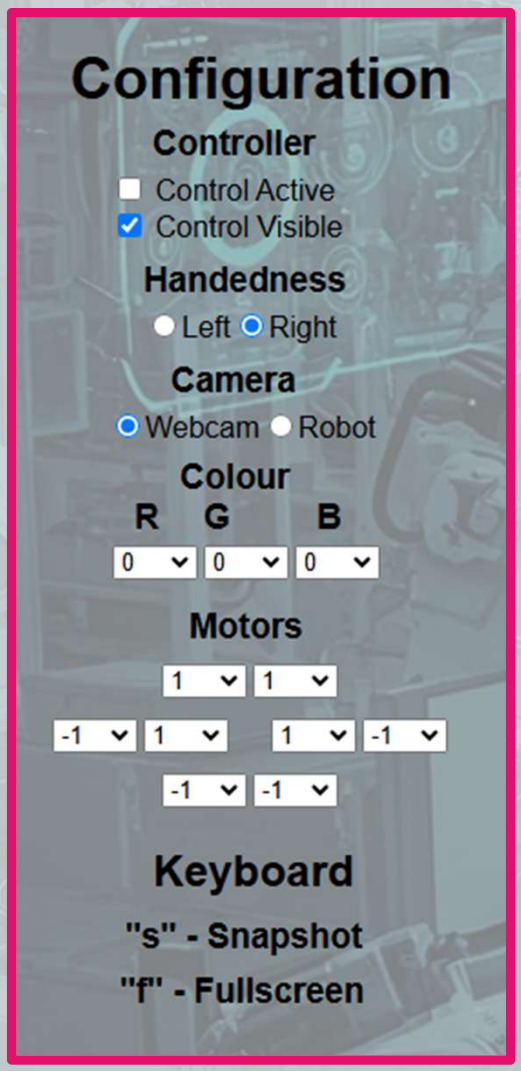
Hazardous pipe inspection challenge!

Stage 1

Before you carry out the inspection you need to consider how your Trilobot moves.

We know the terrain is flat and easy to manoeuvre in but let every robotic system needs to be calibrated so it move as you want it to or, more importantly, how you as the operator will feel most comfortable.



Calibration

The Configuration panel allows you to change camera views etc. to tailor the interface. Spend some time (about 15 mins) using the **Configuration** section and get the robot setup so you are comfortable driving it around. You will need to adjust the motor speeds and handedness.

The “Webcam” view will allow you to see how the motion is triggered. You can then switch back to the robot view.

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Stage 2

Once you are comfortable with controlling the robot you can move onto the inspection stage.

Drive the robot around the hazardous area and find the pipes that need to be inspected. When you find a pipe remove the controller buttons from the display and take a snapshot of the pipework.

Continue navigating around the area until you have found all 5 inspection points and have taken an unobscured photo of them. The environmental data will be in the bottom righthand corner of each of the photos.

Once you have all the photos navigate back out to the starting point. Once at that the exit inspect the photos and grade the condition of the pipes. Also, foreach pipe identify the environmental conditions it is being subjected too.

And Finally!

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Creating basic applications with AI is just the tip of the iceberg.

AI now empowers us to revolutionize industries, enhance everyday life, and solve complex problems in ways we never thought possible.

What we have seen here is just a simple AI power robotic control system.

Future possibilities are vast and exciting, and you can be a part of it!

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On the **BSc Computer Science** Programme at the **University of Sunderland** you'll study AI and Machine Learning in more detail, which means you'll be able to create some amazing things and have a good grasp on this important emerging technology.

BSc Computer Science

Other Programmes that may be of interested

BSc Cybersecurity and Digital Forensics

BSc Games Development