**CES Project Digital Logbook**

**“Using AI and Robotics to Entertain Cats”**

**Student: Jack Storrie**

**Supervisor: Fredrik Nordvall Forsberg**

*7/10/20*

Today an initial meeting was held over Zoom between me and my supervisor. We discussed briefly my intentions for the project, a basic outline of what the project will be, and what the final finished product will do.

We agreed on a second meeting one week from this (Wednesday 14th) to look over my Statement of Intent submission due Friday 16th

*9/10/20*

Have completed most of the Statement of Intent, with a couple of areas I am a bit unsure on, such as project timeline. This should be sorted out in my next meeting with the supervisor.

*14/10/20*

Met with supervisor over Zoom for a second time. Spent some time going over my Statement of Intent submission, with some changes suggested by him. By discussing the project milestones section of the form we managed to come up with a semi-detailed plan on how we want the project to go.

By going through this, the risk assessment considerations were also taken into account with mitigating actions suggested for each technical risk involved.

**Signed: Fredrik Nordvall Forsberg**

*20/10/20*

Supervisor sent the following components to me through mail today:

1 Raspberry Pi Zero W

1 GPS+SIM hat (probably not that useful for you, but still)

1 power bank

1 micro-SD to USB adapter

I then found appropriate components online and purchased the following:

|  |  |  |  |
| --- | --- | --- | --- |
| **Component Name** | **Source** | **Price** | **Link** |
| Pololu Ball Caster with 3/4 inch Metal Ball | Hobbytronics | £2.30 | https://www.hobbytronics.co.uk/robotics/robot-wheels-castors/ball-caster-metal |
| L298N Motor / Stepper Driver | The PiHut | £3.50 | https://thepihut.com/products/l298n-motor-stepper-driver |
| Smart Car Wheel Robot Plastic DC 3V-6V Drive Gear Motor With Tire (x4) | Hobbycomponents.com | £13.76 | https://hobbycomponents.com/motors-and-servos/124-smart-car-wheel-robot-plastic-dc-3v-6v-drive-gear-motor-with-tire- |
| Camera Module Board 5MP Webcam Video 1080p 720p For Raspberry Pi 2 A B B+ Pi 3 | eBay | £6.23 | https://www.ebay.co.uk/itm/271702042292 |

This should mean that I now have everything I need to begin working on the project very shortly, as soon as the Raspberry Pi module arrives for me.

*28/10/20*

Several of the components have now arrived, including the package including the Raspberry Pi. I had some issues setting up the Raspberry Pi with my laptop which has caused a large delay as I didn’t get them resolved today. I did expect it to be a bit more “plug and play” than it actually was.

I found several potential solutions but there turned out to be reasons why I couldn’t do them. Using an ethernet cable wasn’t a viable solution as my laptop does not have a port for ethernet connections just as most modern laptops don’t. Connecting by Wi-Fi turned out to be an issue since I lived in shared accommodation and don’t have access to the physical router.

*29/10/20*

Today I went through the process of connecting the Raspberry Pi to my laptop using USB. Everything was done correctly in accordance with several online tutorials, but the Raspberry Pi was not being picked up by the device manager on Windows. I changed to using a different USB cable, and this solved the issue, and I was able to SSH in to the Raspberry Pi using PuTTy.

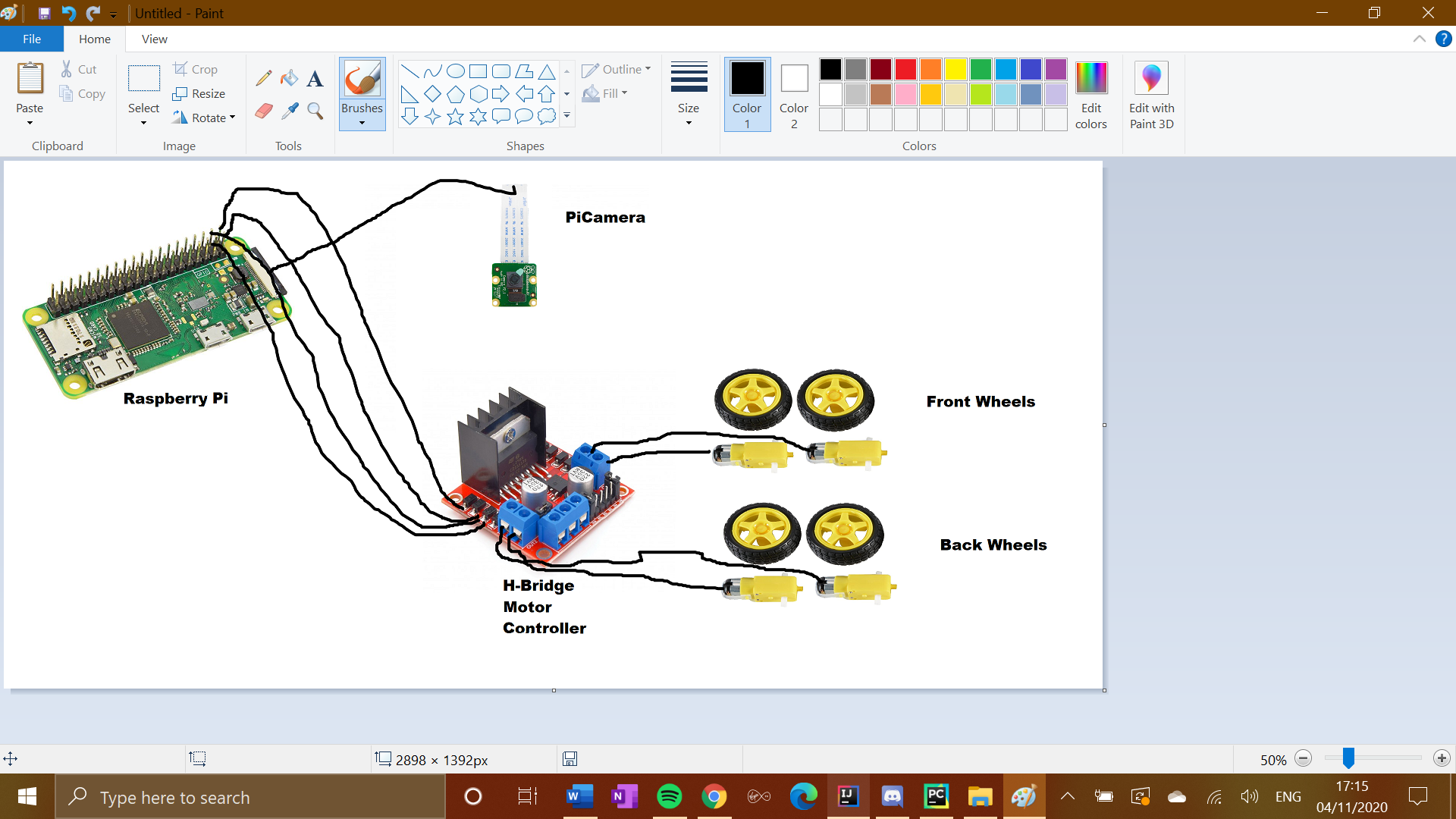
I then configured the Raspberry Pi, ensuring all the latest drivers were installed for all the functions I will need to use, including installing the Python manager and upgrading it from Python 2.7 to Python 3.7.

Getting the hardware set up was an annoying delay that I didn’t account for, but thankfully everything is now ready for coding to start.

*03/11/20*

All components have now arrived except the motors/wheels. This is an error on my part as after ordering the components I received a confirmation email, but also received another email saying my payment had been declined. I didn’t see the second email, so I have now had to re-order the motors, adding a delay to them being useable.

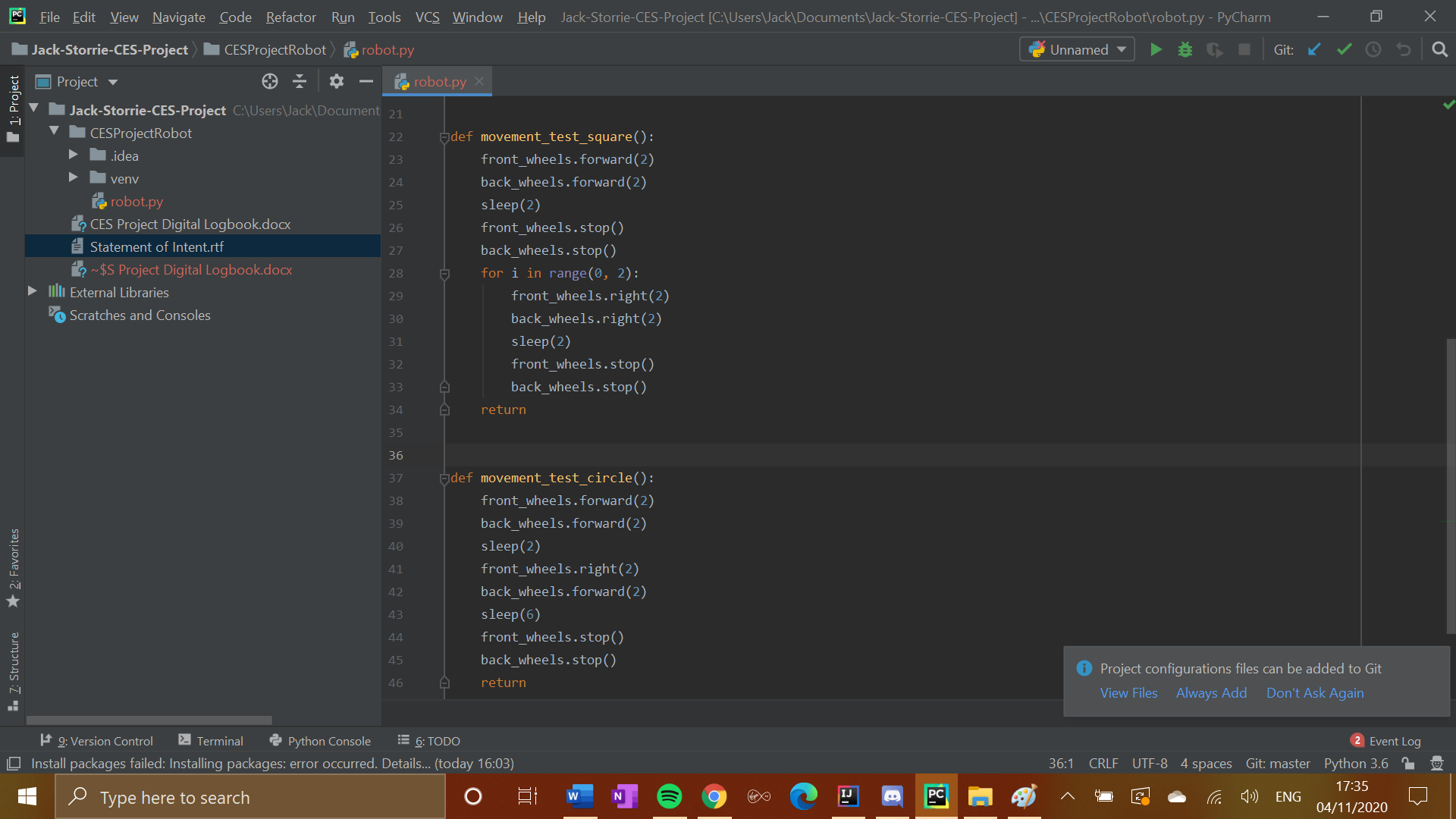
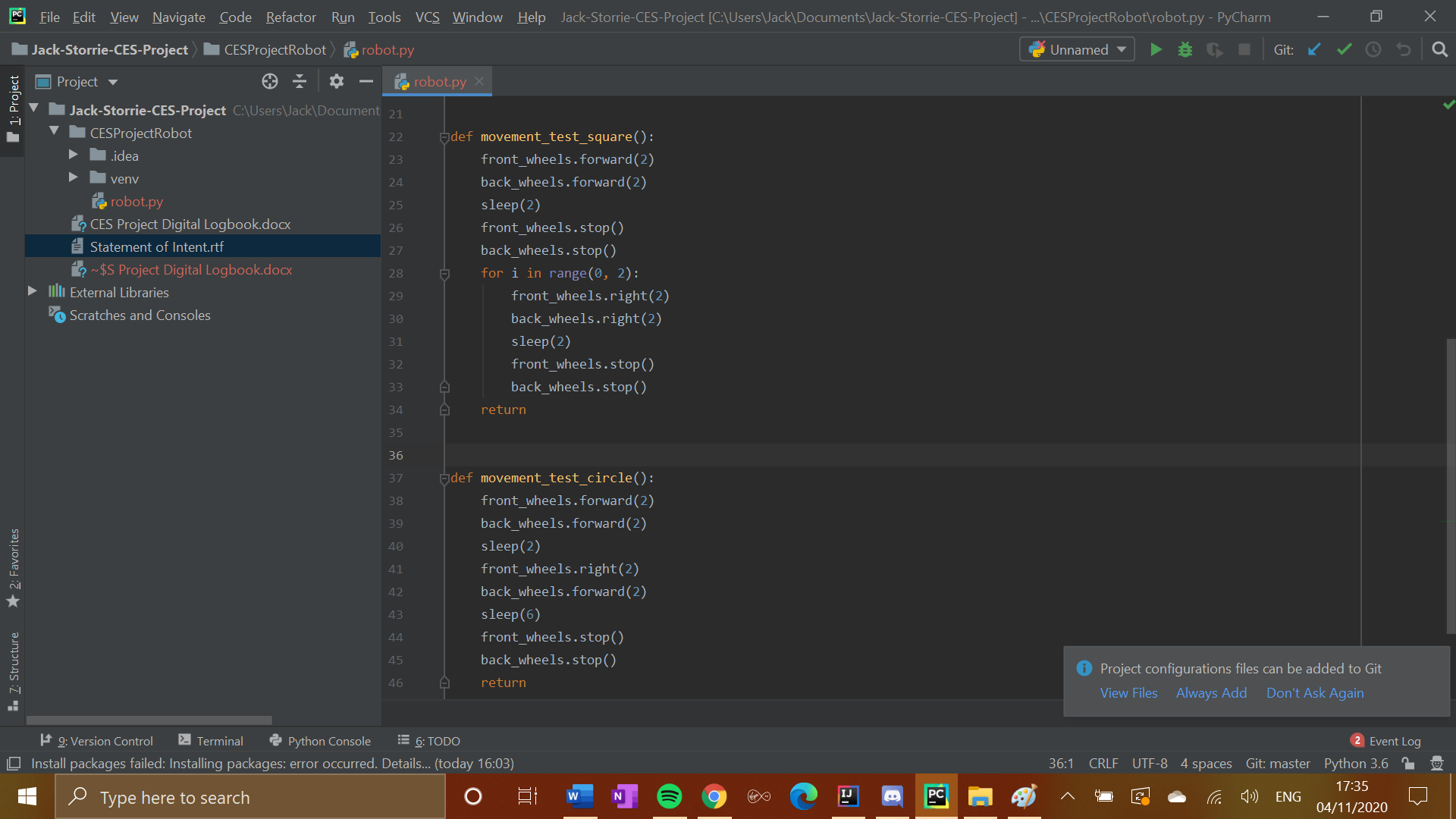
I have now considered the basic structure of the robot itself. The diagram below shows how the main components will be connected together.



The wheels will be connected to the H-Bridge Motor Controller, allowing the 2 sets of wheels to be controlled by the Raspberry Pi separately. The 4 output pins of the H-Bridge will then be connected to 4 GPIO pins of the Pi, with pins 7-10 responsible for the front wheels, and pins 11-14 responsible for the back wheels. The PiCamera is connected via cable to the end of the Pi. There will also be a ball castor between the two front wheels to aid with movement across surfaces.

*04/11/20*

Began to set up the structure of the program in python, including importing all appropriate packages, such as picamera and gpiozero. In anticipation for all components arriving, I created a basic program for basic movement testing to ensure all components are working. This consisted of a square movement test and a circular movement test.



The robot’s main method will start with the camera being switched on, as this is vital to decide what happens next. The camera will record video in a circular stream in order to allow image detection to take place throughout the running of the program. The program will then scan for certain image detection triggers that will inform the movement of the robot.

*05/11/20*

For image detection, I have decided to use the prebuilt deep learning OpenCV image detection database, which is compatible and can be configured with Raspberry Pi, as seen at <https://www.pyimagesearch.com/2017/10/16/raspberry-pi-deep-learning-object-detection-with-opencv/>

This contains within it pre-defined classes of default objects that can be detected when scanning for images (in this case provided by the piCamera). Some of these can be useful towards this project, including ‘chair’, ‘person’ and most vitally ‘cat’. These triggers will be used in order to inform the movement of the robot away from, or towards, a certain area.

Have also been researching other people’s robotics projects using Python and Raspberry Pi in order to gain a perspective of how others have tackled similar challenges.

**Signed: Fredrik Nordvall Forsberg**

*09/11/20*

Had another supervisor meeting over Zoom, after agreeing on regular fortnightly meetings on Mondays from now on. We discussed progress, with a lot of progress expected between this meeting and the next one in 2 weeks time. An issue brought up was gaining clarity on what will happen with access to EEE labs in order to perform soldering. It is possible to test the basic functionality of the robot without this access however so it should not impede on progress too much.

Contrary to what I previously thought, in order to properly secure the wires to the motors, access to a soldering iron will be required, therefore it will be difficult to put together and test the full model until access to labs is allowed. This means I will be shifting more focus on to the programming side (while making sure each key stage can be rolled back and tested individually when the opportunity comes), as well as considering the poster earlier than I might have before.

I tested the picamera by creating 2 simple python files to capture an image, and also a small piece of video