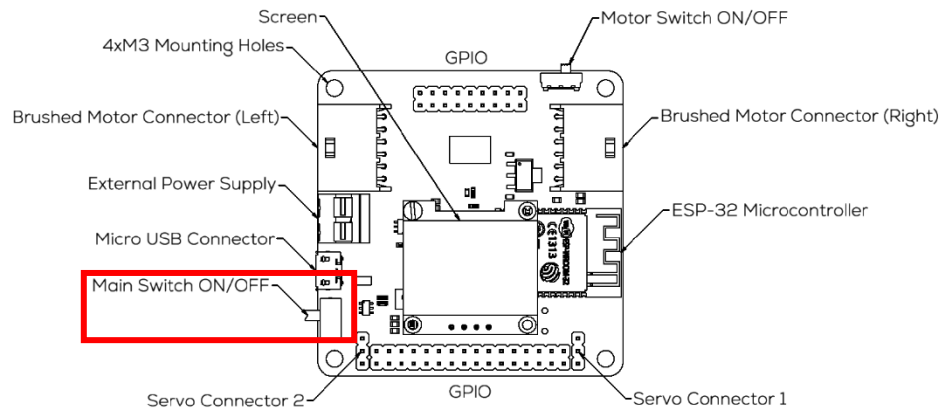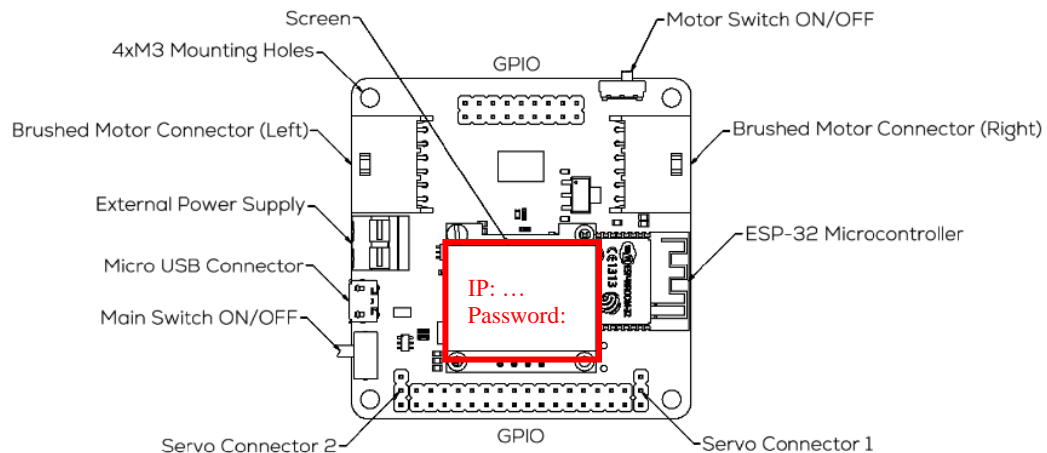# Week 3 Lab Notes

A. Initial configuration and test for functionality of your robot

1. Power **ON** the Hackerboard: Connect the power cable to the battery and turn the **Main Switch** on.


2. If the Hackerboard is functional you should see the **IP Address** and **Password** on the board's screen. You need that information for the first connection and configuration.

3. You can see a wifi network named **"Puzzlebot"** on your WiFi list. Connect to that network using the Password (In the first setup it should be **Puzzlebot72** as displayed on the board's screen).

4. Open a browser and enter the IP address from the board's screen in the address bar. (The default IP address is 192.168.1.1 for all boards. Therefore, you should make sure you are connected to your board). If the connection goes through, you will see a web application as the following image.
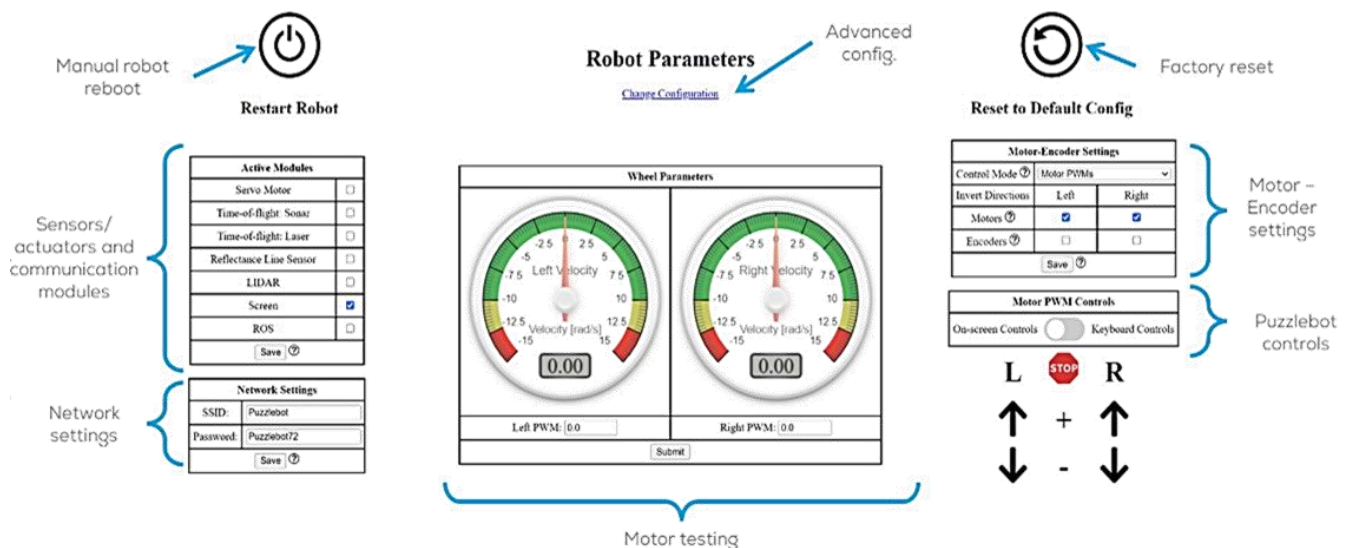
- **Manual robot reboot**: Manually **reboots** the Hackerboard.

- **Factory Reset**: Reset all the configurations to factory configurations.

- **Network settings**: Configuration of the SSID and password of the Puzzlebot. Useful when multiple Puzzlebots are being used.

- **Puzzlebot controls**: Simple Puzzlebot controls for the user to move the robot forward, backwards or turning.

- **Sensor/actuators and comms. modules**: Activation of the sensors/actuators if included. ROS communication must be active to be used with the NVIDIA Jetson Nano. The sensors and actuators in this section can connect to ROS.

- **Advanced configuration**: Manually configure all aspects of the Puzzlebot. Warning! adjusting the parameters of the Puzzlebot could result in significant malfunctions.

5. First step for configuration: Apply the following configuration:

- Change the **SSID** as: **Puzzlebot_<your name>.** This configuration will help you to distinguish your robot's network SSID from others. After changing the configuration, you should press the save button to submit the change. The browser might ask you to give permission. In that case you should use the current password (**Default is Puzzlebot72**) to allow changing the SSID.

| Network Settings	
SSID:	Puzzlebot
Password:	Puzzlebot72
Save ⑦	

- Reconnect to your robot with the new SSID set in the previous step and the password. You can also check the current SSID and if your change is applied successfully on the board's screen.

6. Second step for configuration: Go to "**Motor-Encoder Setting**" and check if the "**Control Mode**" is "**Wheel Velocities (and ωR)**", if not, please change it to "**Wheel Velocities (ωL and ωR)**".

Motor-Encoder Settings		
Control Mode ⑦	Wheel Velicities (ωL and ωR) ⌄	
Invert Directions	Left	Right
Motors ⑦	☑	☑
Encoders ⑦	☐	☐
Save ⑦		

7. Enter a value between 0.05 and 0.2 in the left velocity and right velocity edit box but **DONOT** submit the change.
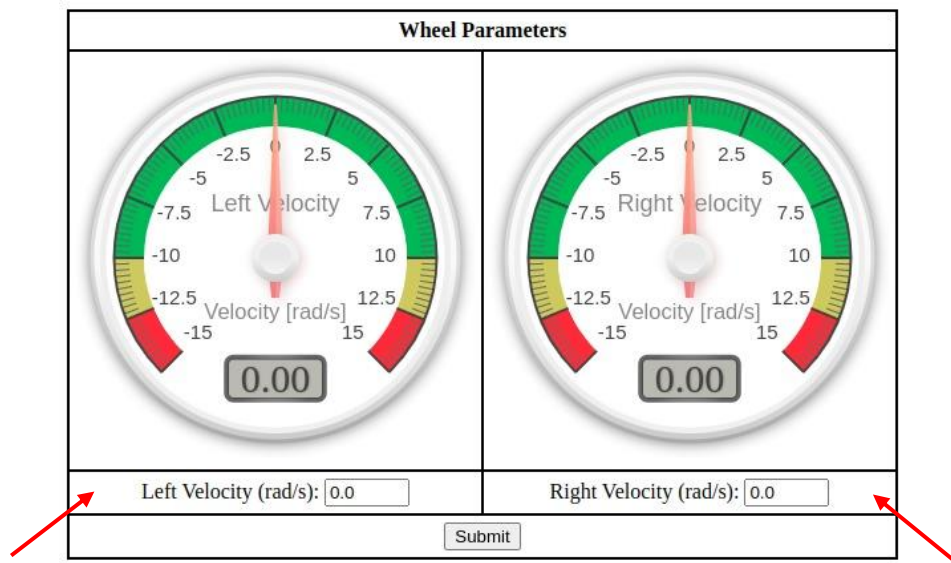
Before submitting the change, hold the robot in your hand and make sure the wheels are free to turn. Also, you should **turn On the "Motor Switch"** before applying any command.
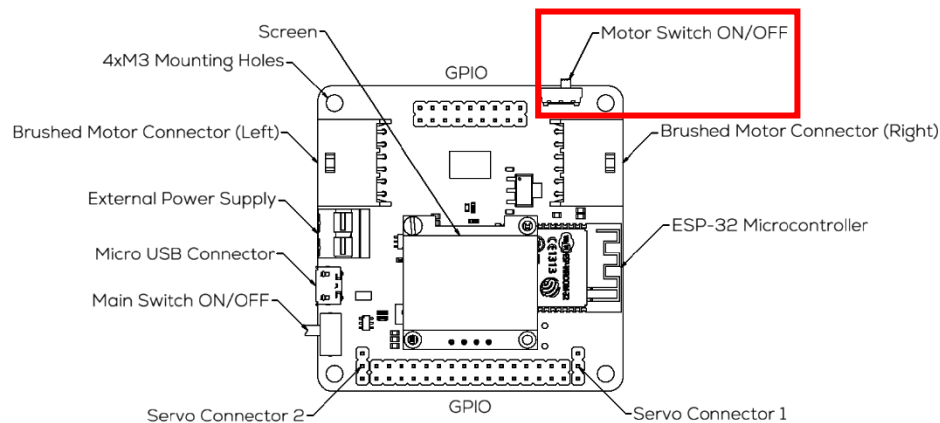
Now, submit the command. The wheels should start turning in the same direction with same velocities. You can see the values on the velocity gauges. After a few seconds set the value to **zero** to stop the wheels from turning.

- It is suggested to turn the **"Motor Switch" OFF** after each test, to prevent the robot moving when you are changing the configurations or sending wrong commands by mistake. Just **Turn ON** the **"Motor Switch"** when you are sure everything is ready for test, and you are cautious about the robot's behaviour.

Well Done

Now you successfully configured your Hackerboard and

make the robot ready for the further tests.

Have Fun!

B. Open-loop motion control of your robot

Task 1 (Simulation)

Run an example following the next steps:

- Open `puzzlebot_python/puzz_gui.py`

- After opening the mobile robot simulator GUI, select '**World**' with '`world_empty.json`'
  first, then '**Robot**' with '`puzzlebot01.json`', finally select '**Module**' with
  'drive_straight.py'.

Robot Ip	192.168.1.1	☐ Connect
World	world_empty.json	📂
Robot	puzzlebot01.json	📂
Init Pose	0.0, 0.0, 0.0	>>
Module	drive_straight	📂

- Run your program using mobile robot simulator GUI by clicking on 'Run' with the icon ▶.

- Show the true path by ticking its associated box:

Robot gui shape	Puzzlebot ∨
☑ Plot robot path	
☐ Plot sensors	

- After 5 seconds, the simulation should finish and you will see the trajectory of the robot.

Task 2 (Real-Robot Experiment)

Apply the algorithm developed in Task 1 to a real robot, Puzzlebot, as shown in the following picture:
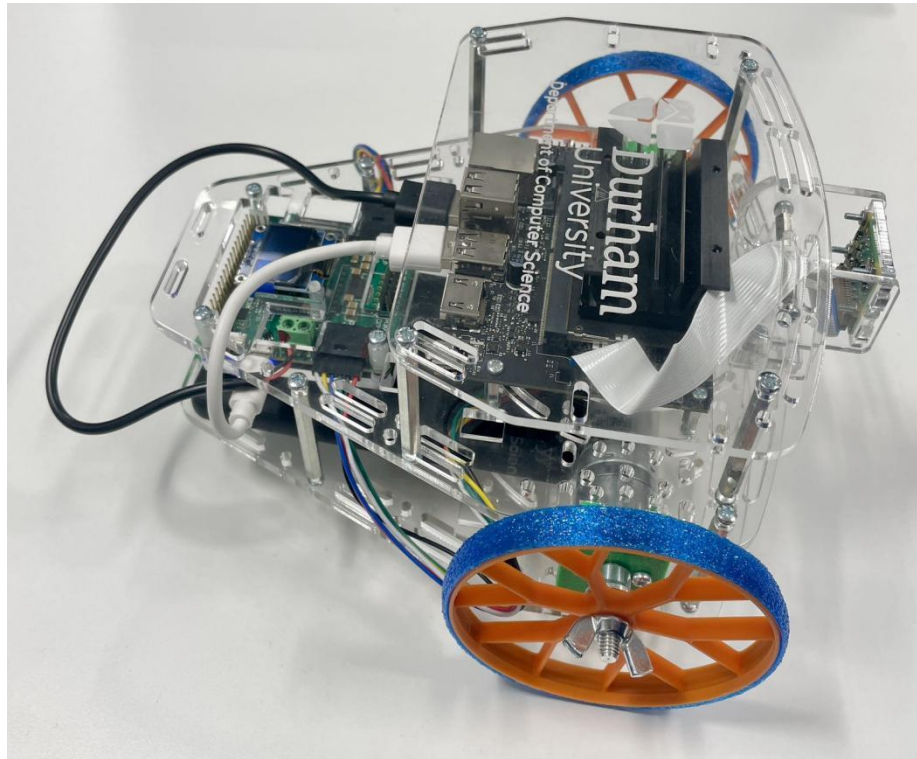

You should follow the next steps to apply your control strategy to the robot:

- Connect your PC with the Wi-Fi from your robot.
- Check the IP address in the GUI and the robot IP address that is shown in the screen of the real robot. If they are different, change the IP address in the GUI to be the same as the one shown on the robot screen.
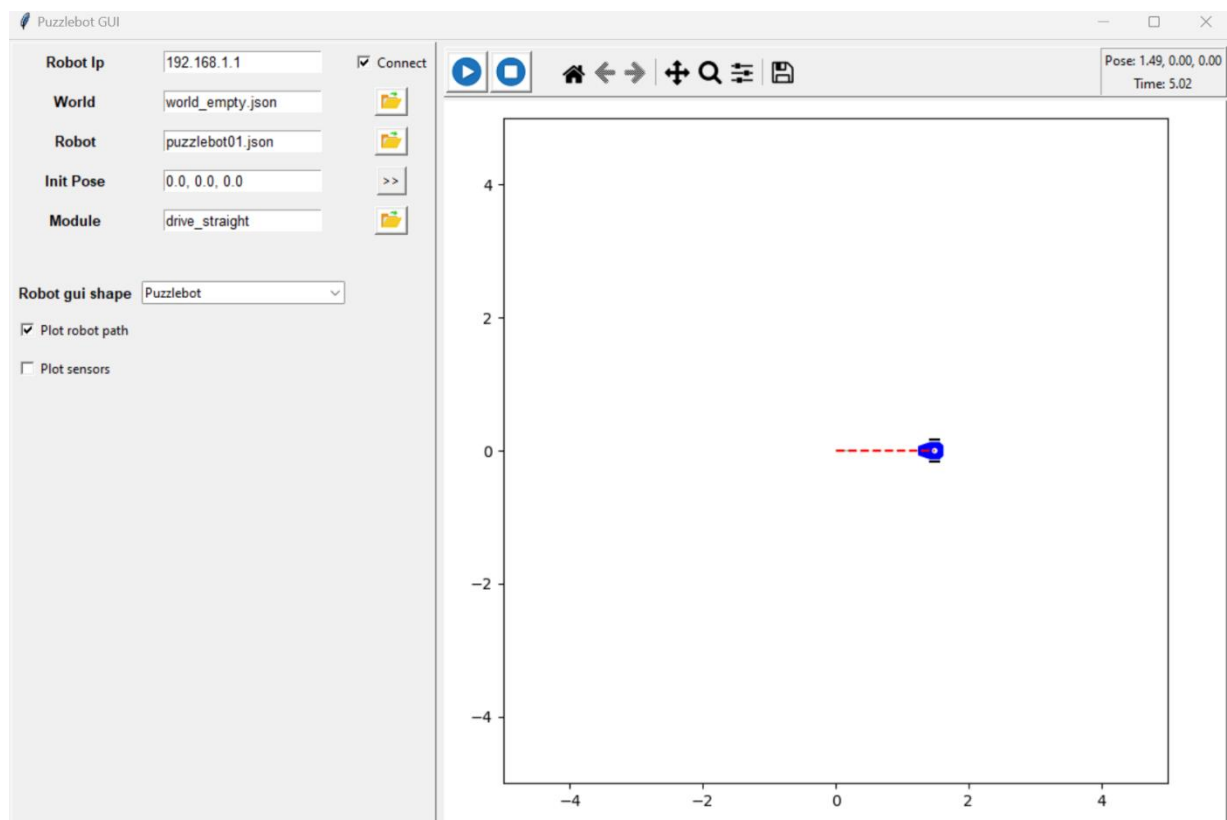
- Then click the checkbox 'Connect'

- Keep the '**Robot**' with '`puzzlebot01.json`' and '**Module**' with '`drive_straight.py`'. Then click on 'Run' with the icon ▶ to run the program.

- Now the robot should move accordingly.

Task 3 (Additional Task)

- Can you edit the 'drive_straight.py' file to let the robot achieve a left-turn behaviour in five seconds?

[End of Lab]