



Turtlebot3

PC Setup

Firstly, the PC needs to be setup with Ubuntu 22.04 LTS and ROS2 Humble, so that it can be used to control the turtlebot. Ubuntu can either be installed on the SSD or as a virtual machine.

1. Ubuntu Virtual Machine:

The following youtube video shows how to setup Ubuntu using VMWare. (VMWare is better in terms of performance than virutalbox)

<https://www.youtube.com/watch?v=tkXQ AeMYZwA>

2. Setup ROS2 Humble

- Once Ubuntu has been installed, install ROS2 Humble and the Turtlebot3 packages by following the guide in the following link:

<https://emanual.robotis.com/docs/en/platform/turtlebot3/quick-start/#pc-setup>

- The setup is quite straightforward, just copy and paste each command into the Ubuntu CLI sequentially.

3. After step 2, update your environment variable:

- a.

```
nano ~/.bashrc
```

- b. Add the following line to the bottom of the bashrc file. Then press Ctrl + O, then Enter to save, and Ctrl + X to exit.

```
export TURTLEBOT3_MODEL=burger
```

- c. the run

```
source ~/.bashrc
```

Turtlebot Setup

The OpenCR Board and the Raspberry Pi 3 has already been setup with Ubuntu Server 22.04.5 LTS, with all the necessary packages installed.

Login Details

user: turtlebot3

password: 1234

Updating WiFi Credentials

- To be able to use the Turtlebot with the PC, they need to be on the same WiFi network. To setup the WiFi in the turtlebot, follow the below steps:
 - Connect the Turtlebot3 to a screen and keyboard.
 - Login with the credentials above.
 - Enter the following commands:

```
cd /etc/netplan/  
sudo nano 01-netcfg.yaml  
Connecting PC to Turtlebot3
```

- Once the yaml file is open, enter the following details, replacing “YOUR-SSID” and “YOUR_PASSWORD”, with the WiFi SSID and Password. Both SSID and Password

should be under the double quotes.

```
network:  
  version: 2  
  renderer: networkd  
  wifis:  
    wlan0:  
      dhcp4: true  
      access-points:  
        "YOUR_SSID":  
          password: "YOUR_PASSWORD"
```

- Save the yaml file (Ctrl + O, Enter, Ctrl + X). Then:

```
sudo netplan apply  
sudo reboot  
#this will restart the bot and the bot should connect to the wifi if it is nearby
```

Connecting PC to Turtlebot

- Ensure both PC and bot are connected to same WiFi. Check the IP address of the Turtlebot using the WiFi admin interface. If the interface is unavailable, you can check the IP address by connecting the turtlebot to a screen and typing:

```
ip config
```

- Once you have the IP, ssh into the bot using:

```
ssh turtlebot3@<ip_address>
```

- Then login to the bot. After logging in, execute the following command so that the bot can be controlled by the PC from now onwards:

```
ros2 launch turtlebot3_bringup robot.launch.py
```

- The terminal in which this command is run needs to stay up. Open new terminal windows for all further work.

Controlling Turtlebot using Keyboard (Teleoperation)

- After the bringup has been executed, open a new terminal window on your PC and run the command:

```
ros2 run turtlebot3_teleop teleop_keyboard
```

The terminal should show this:

```
Control Your Turtlebot3
Moving around
    w
    a   s   d
    x
w/x : increase/decrease linear velocity (Burger : ~ 0.22, Waffle and Waffle Pi : ~ 0.26)
a/d : increase/decrease angular velocity (Burger : ~ 2.84, Waffle and Waffle Pi : ~ 1.82)
space key, s : force stop
CTRL-C to quit
```

While this terminal is active, the bot can be controlled with the WASDX keys.

SLAM Node

To run the SLAM node, follow the guidelines in the following link:

<https://emanual.robotis.com/docs/en/platform/turtlebot3/slam/#run-slam-node>