CSC 4120/6120 INTRODUCTION TO ROBOTICS

MODULE 1

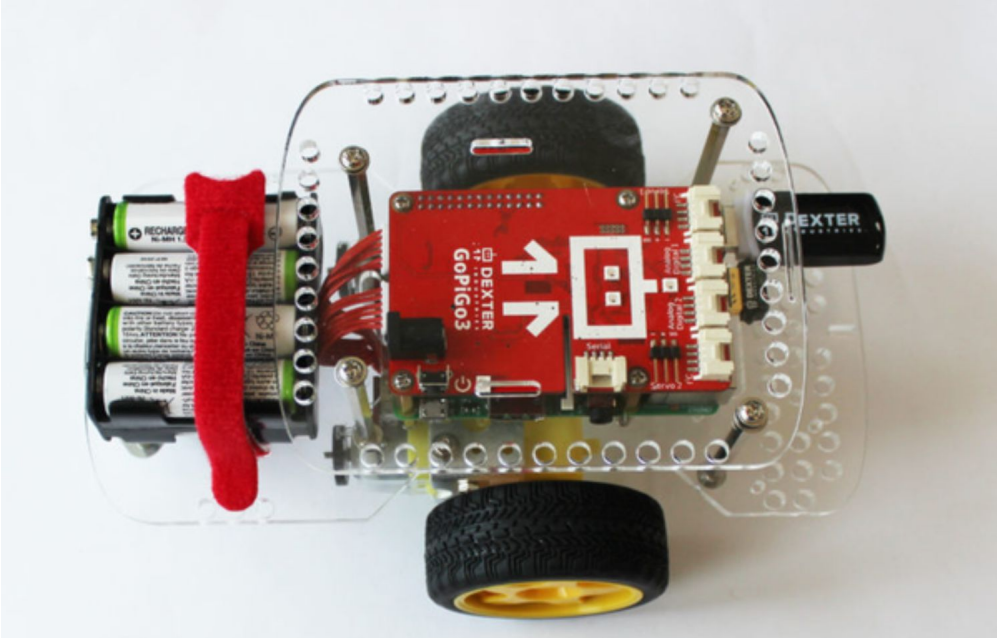
Build and Basic Control of the Robot

Exercise 0:
Create a GitHub page where you will have to upload the exercise files for each module. A google form will follow suit to collect the information about the same. EACH STUDENT needs to have their own page and will be graded accordingly.

Exercise 1: Now that you have received the robotic kit for the robot - GoPiGo, start building it! Go through the below document which details every step of the construction.

https://docs.google.com/document/d/1Ft6MeIbz6ABqd9i3cbdKeDr5ZFugPAwW3ACLToiwYUM/edit?usp=sharing

Result:
The final look after the assembly is as below:



Exercise 2: Now that you are connected to the robo's WiFi and can control the robot, get familiar with JupyterLab which we will use for most of the exercises.
From the Dashboard, go to **Learn > Lessons in Python**

Go through below exercise: **2_The_Environment.ipynb**

Result:
You should know how to use JupyterLab and run jupyter notebooks with ease after this short tutorial.

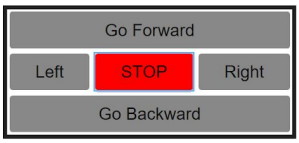
Exercise 3:
Let us get acquainted with python widgets and the library “easygopigo3” and try and how to move the robot.
Go to Home Directory.
Run the Jupyter notebook **First Ride Around.ipynb**

Result:
You should be able to maneuver the robot from the notebook as seen below:

```
buttons = []
descriptions = ["Go Forward", "Left", "STOP", "Right" , "Go Backward"]
callbacks = [on_forward_clicked, on_left_clicked, on_stop_clicked, on_right_clicked, on_back
for i in range(5):
    buttons.append(widgets.Button(description=descriptions[i], layout=items_layout))
    buttons[i].style.button_color = darkgrey
    buttons[i].on_click(callbacks[i])

buttons[2].style.button_color = 'red'  # stop button

mid_row = widgets.HBox([buttons[1], buttons[2], buttons[3] ])
display(widgets.VBox([buttons[0], mid_row, buttons[4]], layout=box_layout))
```



Exercise 4:
Let us see the details of the robot’s battery and manufacture details followed by some basic hardware testing to see if everything from LED to motors are in place.
Go to Home Directory
Run the Jupyter notebook **Hardware Testing.ipynb**

Result:
Battery and Manufacturer details -

```
In [3]: print("Battery voltage : ", GPG.get_voltage_battery() ) # read and display the current battery
```

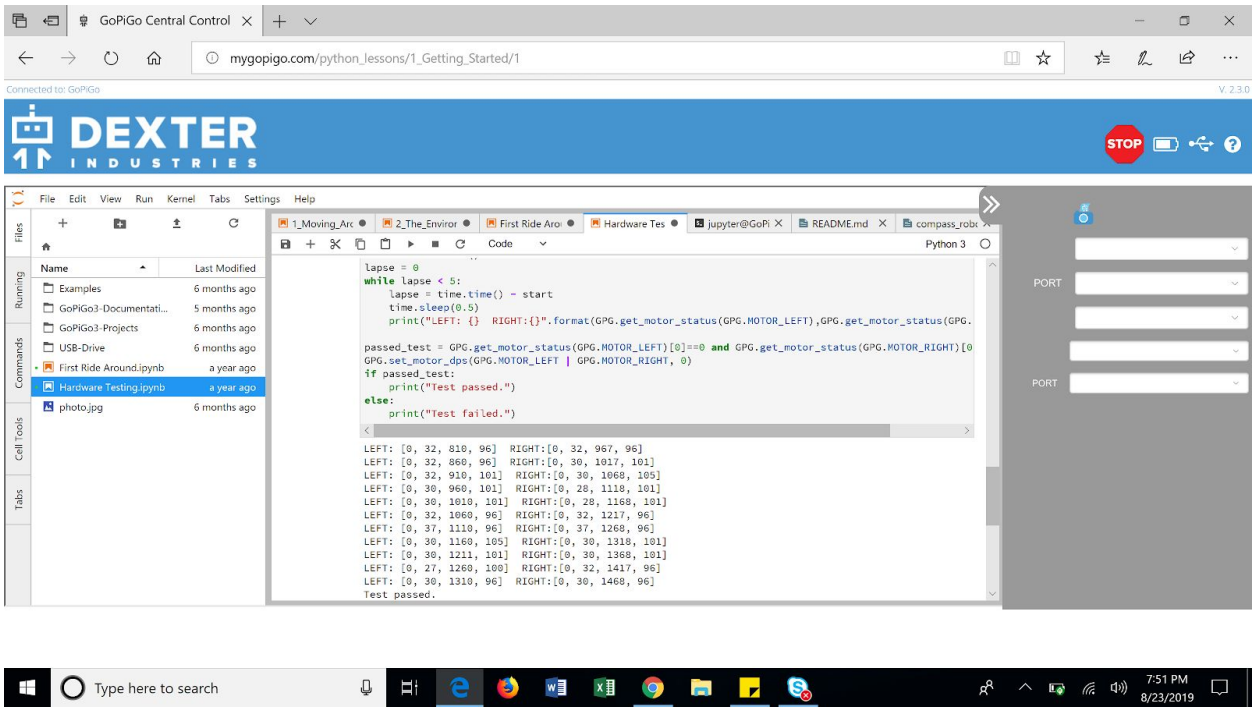
```
Battery voltage :  8.163
```

Then let's get some information from the GoPiGo3 board:

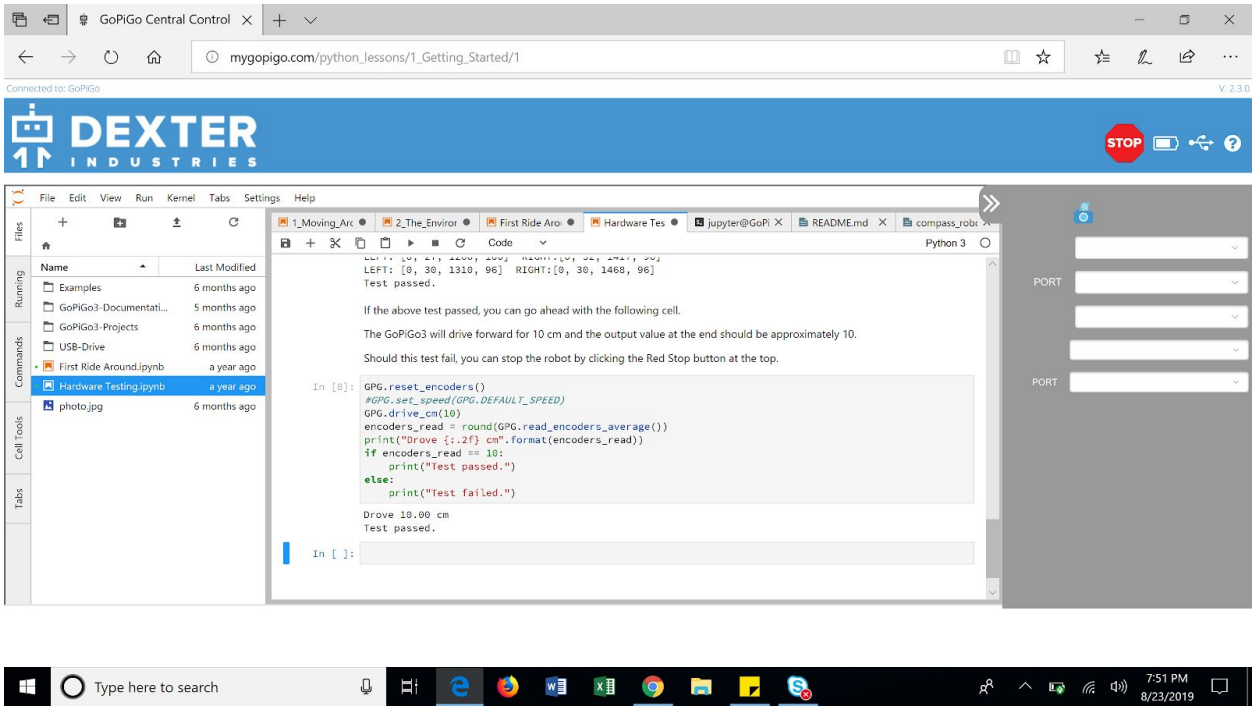
```
In [4]: print("Manufacturer    : ", GPG.get_manufacturer()    ) # read and display the serial number
        print("Board           : ", GPG.get_board()           ) # read and display the serial number
        print("Serial Number   : ", GPG.get_id()              ) # read and display the serial number
        print("Hardware version: ", GPG.get_version_hardware()) # read and display the hardware versio
        print("Firmware version: ", GPG.get_version_firmware()) # read and display the firmware versio
        print("Battery voltage : ", GPG.get_voltage_battery() ) # read and display the current battery
        print("5v voltage      : ", GPG.get_voltage_5v()      ) # read and display the current 5v regu
```

```
Manufacturer    :  Dexter Industries
Board           :  GoPiGo3
Serial Number   :  3B7B2489514E343732202020FF110C25
Hardware version:  3.x.x
Firmware version:  1.0.0
Battery voltage :  8.086
5v voltage      :  4.979
```

LED, Motor test -



Encoder Test-



Exercise 5: Optional Exercise: Try out bloxter lessons. From the dashboard, click on **Code in Bloxter.**

Assignments (implement on the robot and demonstrate in class)

1. **Output of Exercises 1-4**