Indian Institute of Technology, Jodhpur
Lab Manual
Sensors and IoT
LAB - 3
Date: 23 Sept, 2024

Lab Objective
In this lab we will go through the basics of Raspberry Pi 4 and using its on-board GPIO pins

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Part 1 : Setting Up Raspberry Pi

- In order to use the on-board GPIO pins of the Raspberry Pi we need to enable support for interfaces using the configurator. In order to open the configurator run

  ```
  sudo raspi-config
  ```

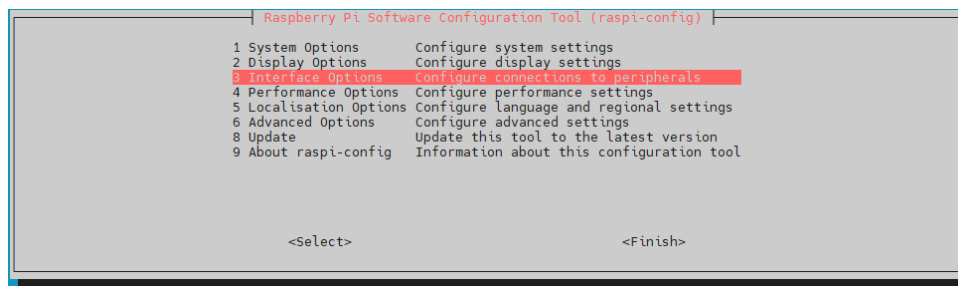- Use arrow keys to select Interface Options

Figure 1: Select Interface Options
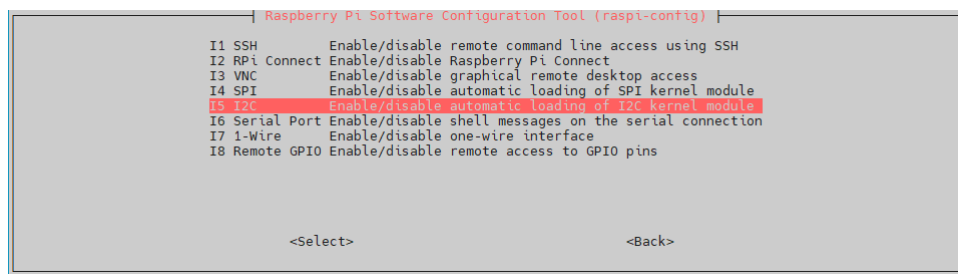
- Select I2C

Figure 2: Select I2C

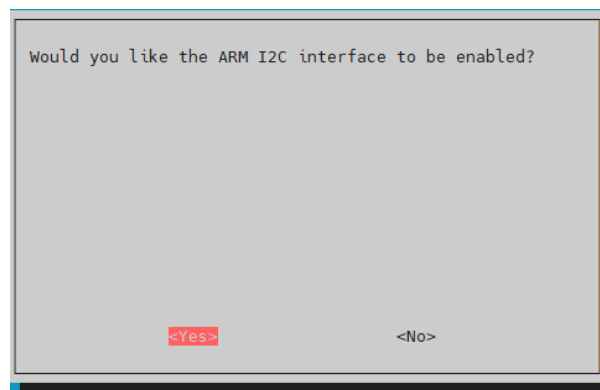- Select Yes to enable I2C interface

Figure 3: Enter Caption

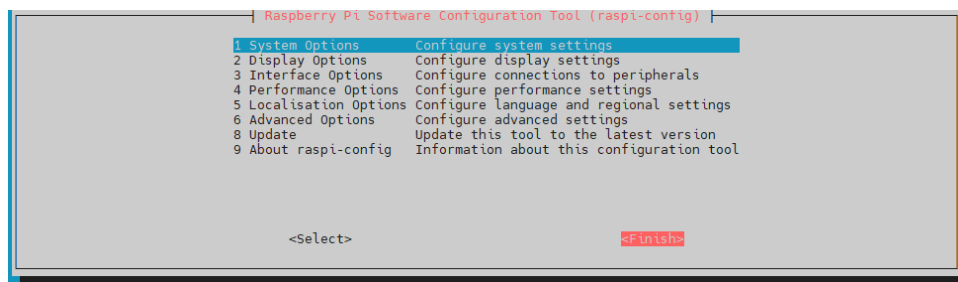- Use Right arrow key to select Finish

Figure 4: Enter Caption

- Open a Terminal window by pressing "CTRL + ALT + T" together or by pressing this icon on top right corner
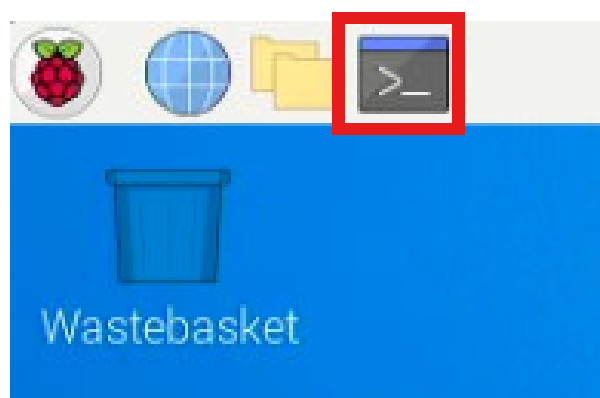

Figure 5: Open Terminal

- Go to Documents directory by entering the following command.

```
cd Documents/
```

- Once in the Documents directory enter the following command to create a virtual environment for Python

```
python -m venv IOT_LAB
```

- To activate the virtual environment run

```
source IOT_LAB/bin/activate
```

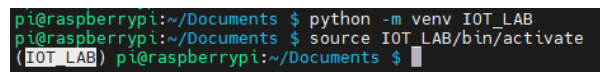(IOT_LAB) should be visible before the username on the terminal prompt

Figure 6: Virtual Environment activation

- Copy the provided files in the Documents directory.
- Check the requirements.txt by entering the following command
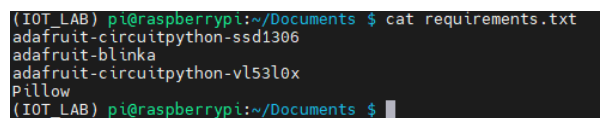
```
cat requirements.txt
```


Figure 7: Check the requirements for the LAB

- Run the following commands to install all the python dependencies.

```
pip install -r requirements.txt
```

Part 2 : Using Lidar Sensor with raspberry pi 4

- In order to use the vl53l0x sensor we will make the connections as per the following diagram :-
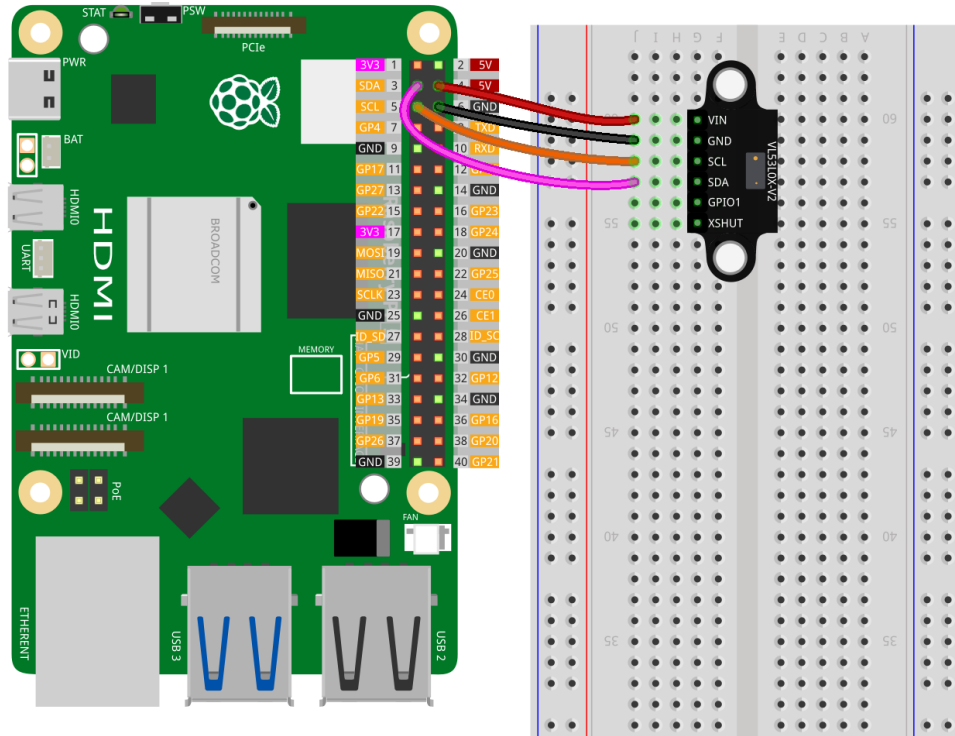

Figure 8: Lidar Connections

- Once the connections are done ensure that the environment is active in the terminal by checking the (IOT_LAB) prefix.

- Run the Lidar program by executing :-

```
python lidar.py
```

- Expected output :-

```
Range: 8190mm
Range: 8190mm
Range: 8190mm
Range: 27mm
Range: 23mm
Range: 23mm
Range: 149mm
Range: 177mm
Range: 8190mm
```

- If the error of device not found comes up, please check the connections and ensure the SDA and SCL connections are not swapped

Figure 9: I2C Error

Part 3 : Using OLED with raspberry pi 4

- In order to use the OLED display we will use the same I2C bus now to send the data. Please make connections as per the following diagram.
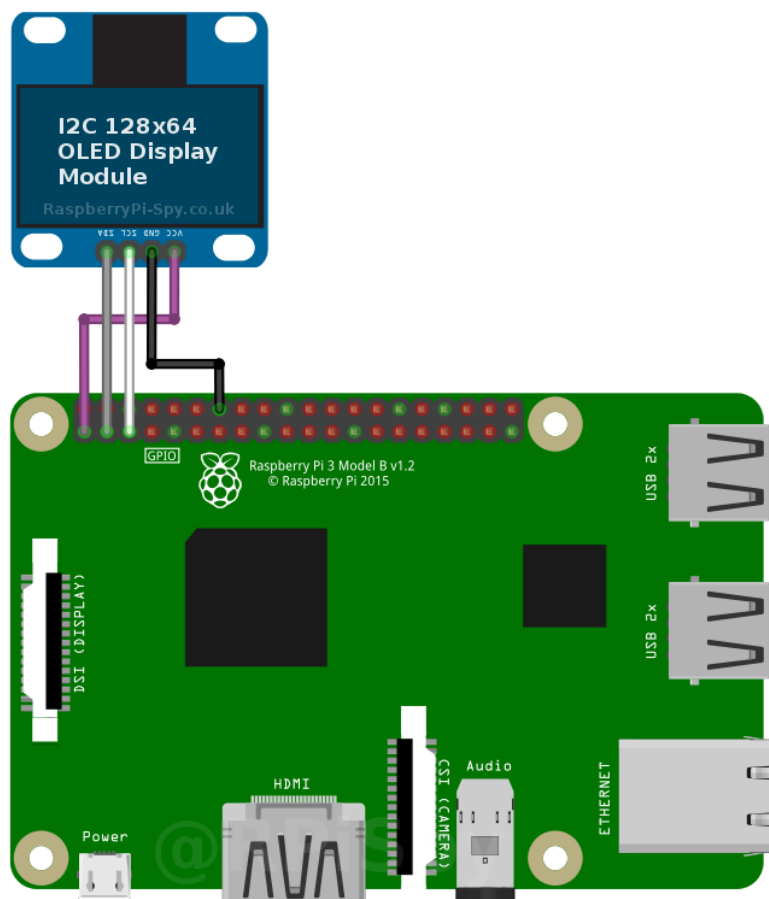

Figure 10: OLED connections

- Run the oled.py to use the display and show output

Figure 11: OLED input

Figure 12: OLED output

- In the LAB submission use the data from the Lidar sensor as the input to the OLED display.

- NOTE:In I2C you can use multiple devices on the same bus.

- In the final submission the display should show your roll number followed by the distance measured. EG :-
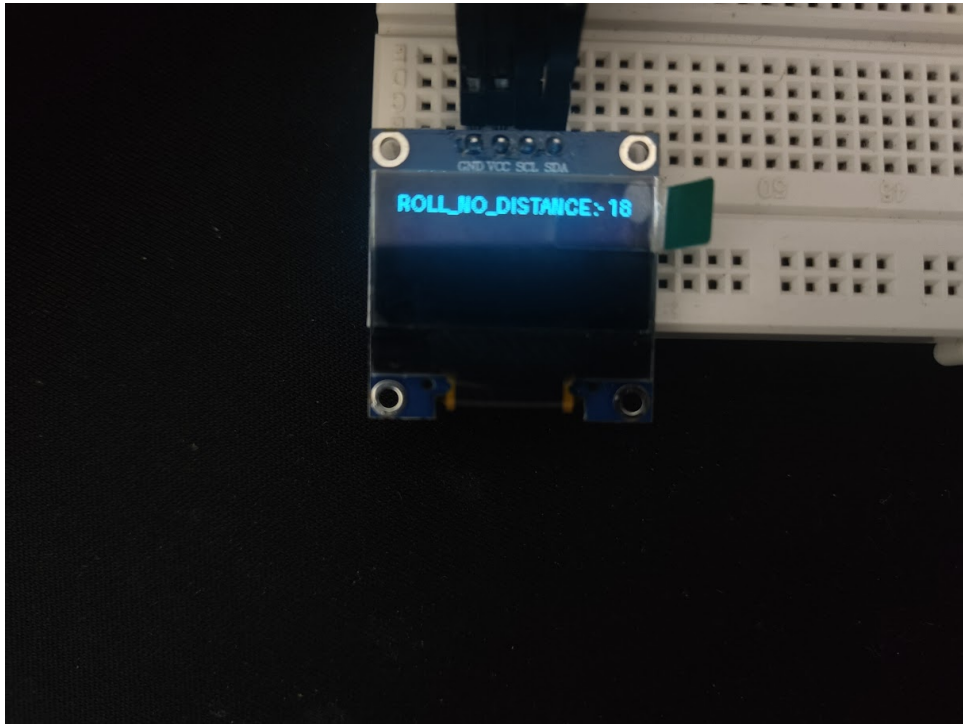

Figure 13: Example output

- In the LAB report please include the output from the provided examples, code written as part of the assignment, output images(if any).

- LAB report can be prepared on ANY platform of your choice.