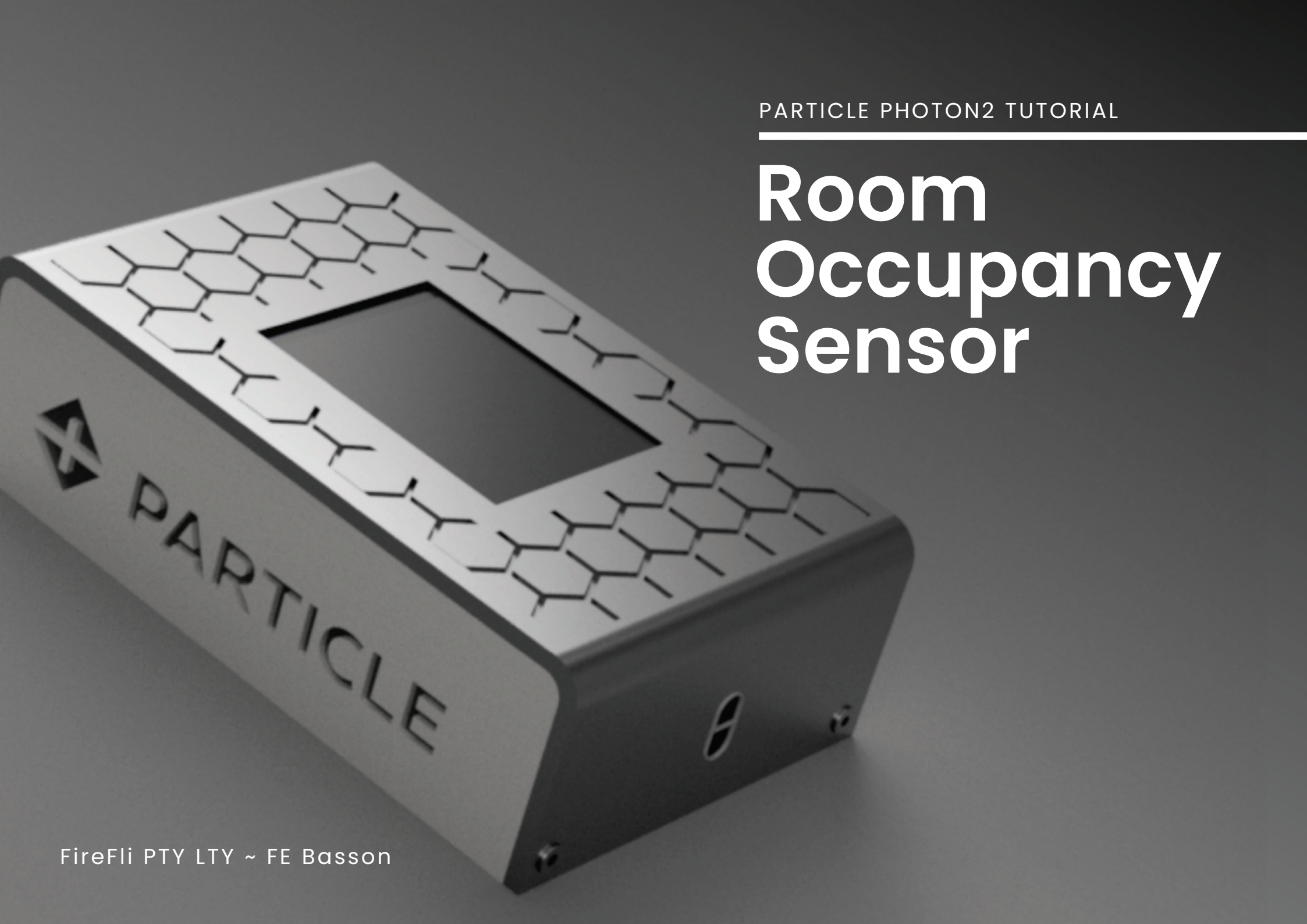


PARTICLE PHOTON2 TUTORIAL

Room Occupancy Sensor

FireFli PTY LTY ~ FE Basson

Introduction

The purpose of this project is to construct a battery powered room occupancy sensor from a single ToF sensor from readily available evaluation boards to ensure easy assembly. Of course two sensors could be used which would simplify the code, but installing the second sensor could be difficult as you would have to drill through the door frame for cabling. The single sensor placement ensures easy installation.

The sensor us mounted above the door frame and will count the number of people entering and exiting the room, displaying to total number of people inside the room. In addition to the simplified installation, the sensor automatically calibrates the installation hight, so no need to set this for each application.

We will first construct the BASIC working sensor in case you would prefer publishing the information to Particle Cloud only. We will then add a WAVE 2" TFT display and mount the breadboard, sensor and display inside a 3D printed enclosure for a more complete prototype

Prerequisites

You should have a basic understanding of Particle WebIDE or Visual Studio Code and how to import libraries.

You should have a Particle Photon2 and a Particle account. If you do not have an account, visit https://www.particle.io and register and account.

You should have at least one Particle Photon2 claimed and active on your account.

Bill of materials

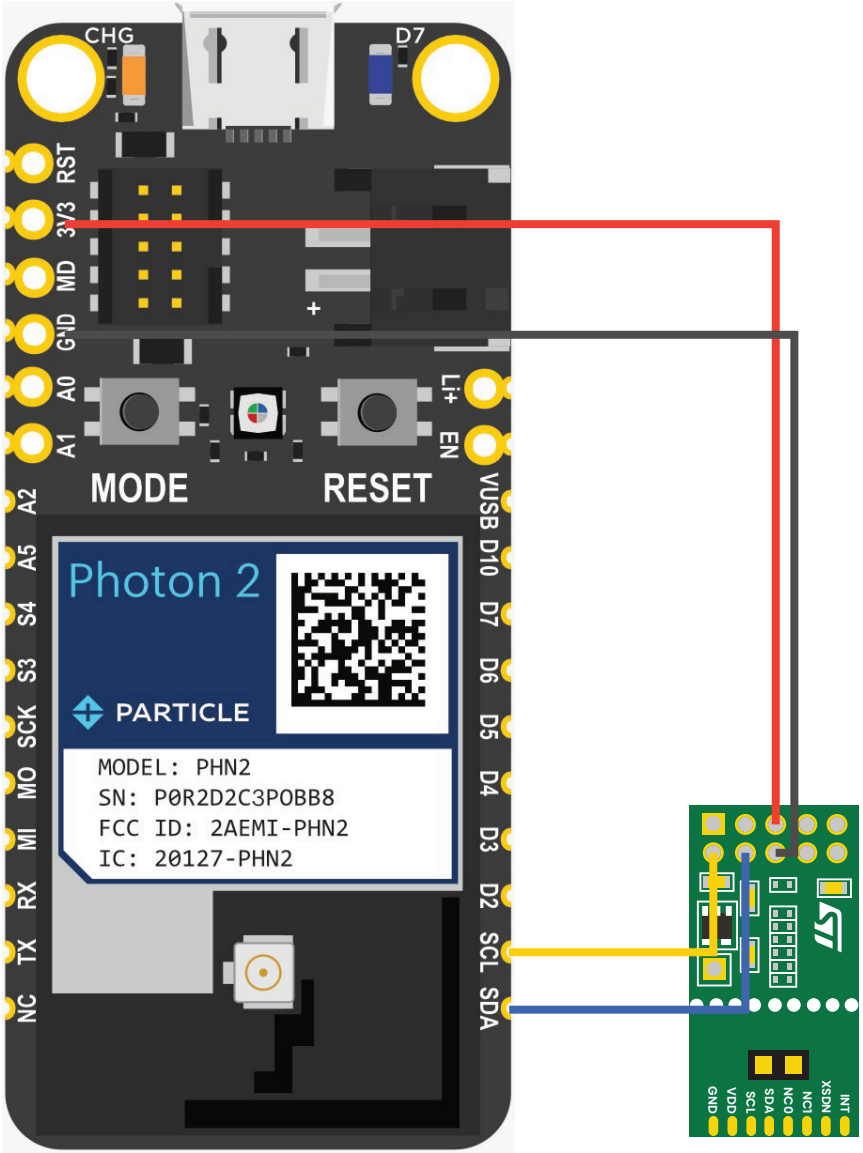
Items you will need to complete this turorial

1	x	Particle Photon2
1	x	Breadboard
1	x	USB cable
1	x	VL53L1X-SATEL development board
1	x	3.7V LiPo battery (or suitable power supply)
1	x	Jumper Wires (male2-male and male-2-female)
1	x	2” WAVE TFT Display
8	x	2 x 6mm Machine Screws (optional ~ only for enclosure)
8	x	2 x 3.4mm Heat Inserts (optional ~ only for enclosure)
1	x	3D printed enclosure (optional ~ STL’s provided)

Software used

Visual Studio Code

Cura Slicer



Step 1

Connecting the ToF Sensor

Place your Particle Photon2 on the breadboard and ensure there are exposed holes on either side as we will be connecting wired on both sides of the Photon2.

Make the necessary connections between die Photon2 and the VL53L1X-SATEL

Photon 2		VL53L1
3V3	→	VIN
GND	→	GND
SDA	→	SDA
SCL	→	SCL

NOTE

The VL53L1X sensor does have optional INT and XSHUT pins but they can be left NC for the purpose of this tutorial.

Step 2

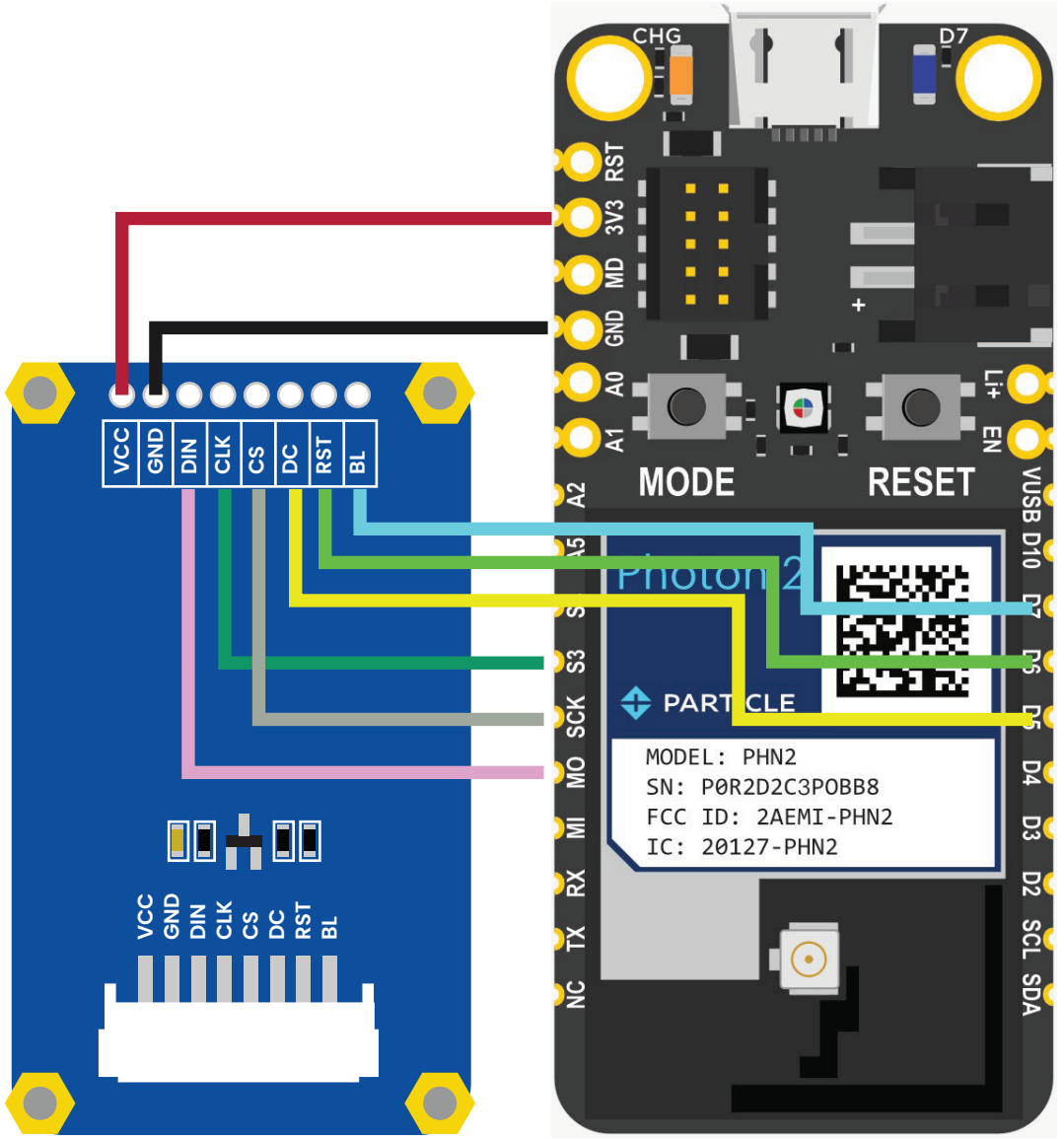
Connecting the ToF Sensor

This part can be a little more involved so pay careful attention to the wiring.

Photon 2		WAVE 2”
3V3	→	VCC
GND	→	GND
DIN	→	MO
CLK	→	SCK
CS	→	S3
DC	→	D5
RST	→	D6
BL	→	D7

NOTE

You can use either the connector and wire harness that came with the screen, or solder headers onto board depending on you connection preference



Step 3

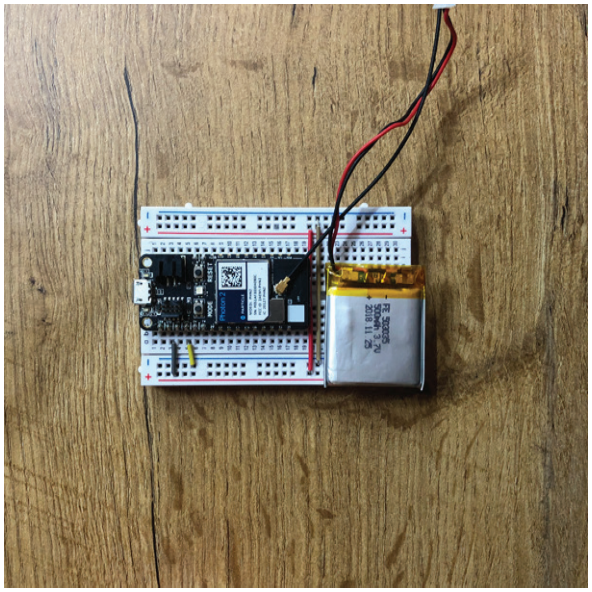
Recap

Place your Particle Photon2 on the breadboard and ensure there are exposed holes on either side as we will be connecting wired on both sides of the Photon2.

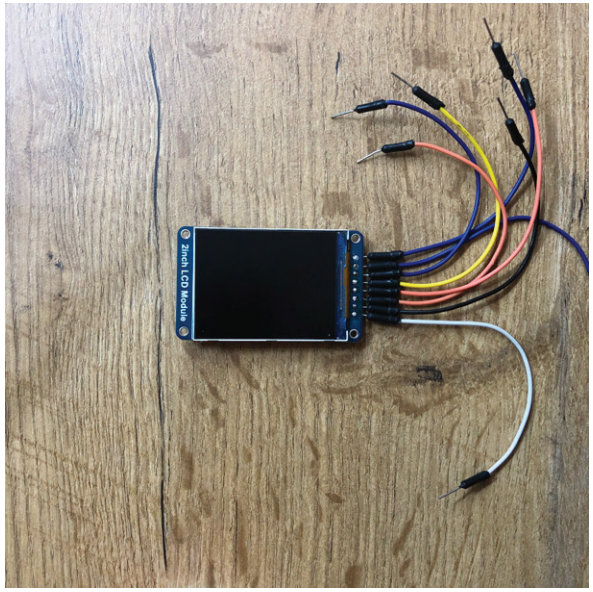
Make the necessary connections between die Photon2 and the VL53L1X-SATEL

NOTE

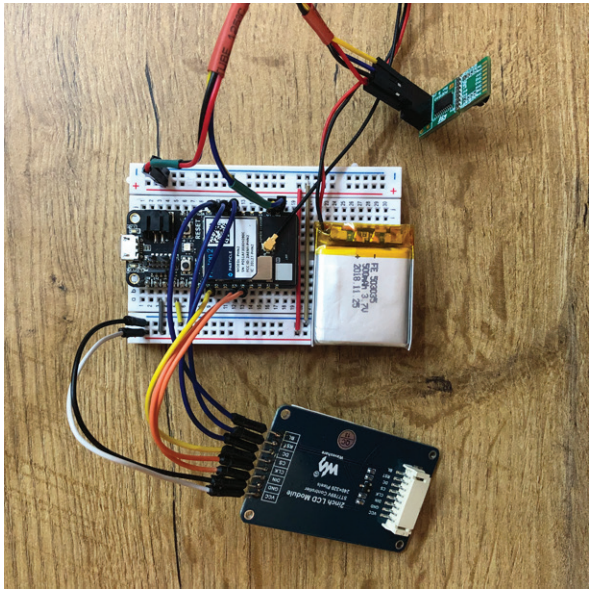
:Depending on the jumper wires you selected, it might look a little different but as long as the pin outs match all should be good.



Step 1



Step 2



Step 3

Step 4

Installing into the enclosure

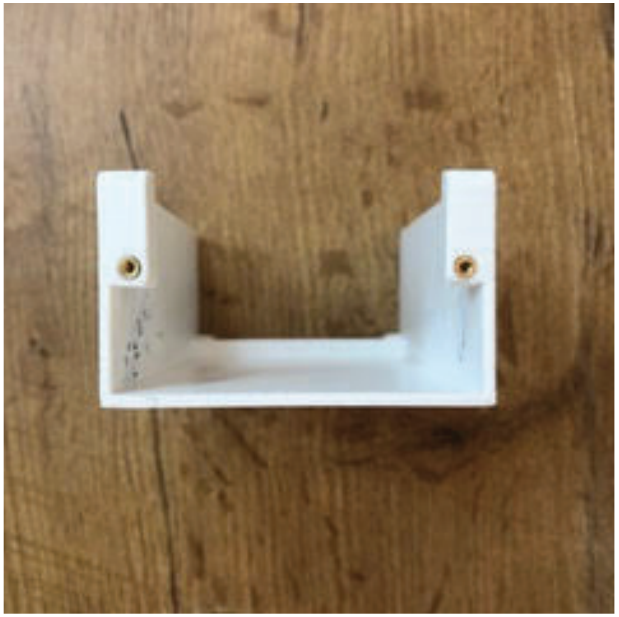
Using you soldering iron, install the heat inserts into the designated areas as per the images on the right.

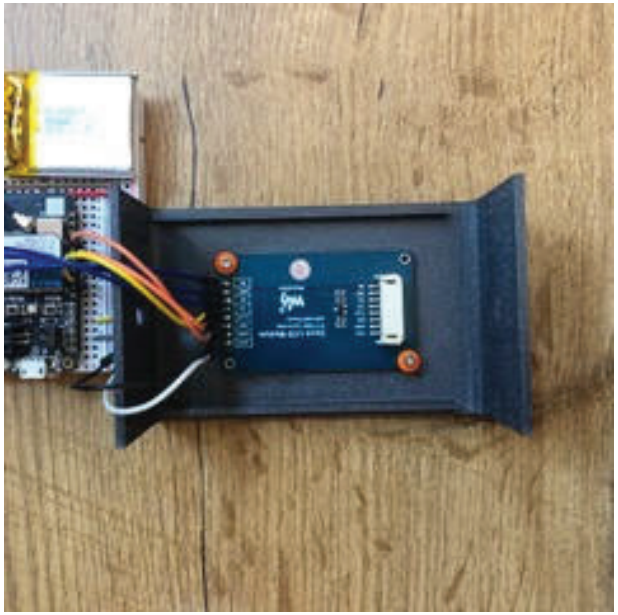
Two inserts for the screen should suffice but I would recommend all four to keep the lid in place.

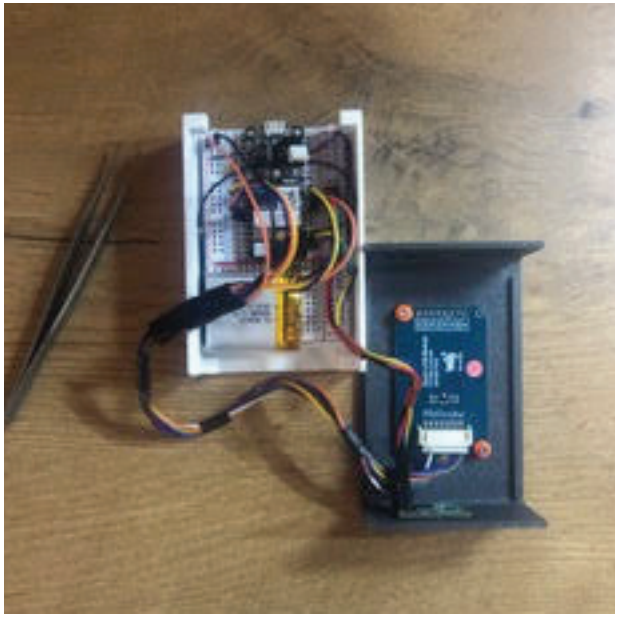
Next fix the TFT screen in place as indicated.

Then mount the breadboard in place.

Lastly mount the VL53L1 sensor in place. If you added the cross-talk lens the sensor should friction fit in place, else you might need to use some double sided tape to keep in it in place.







Step 5

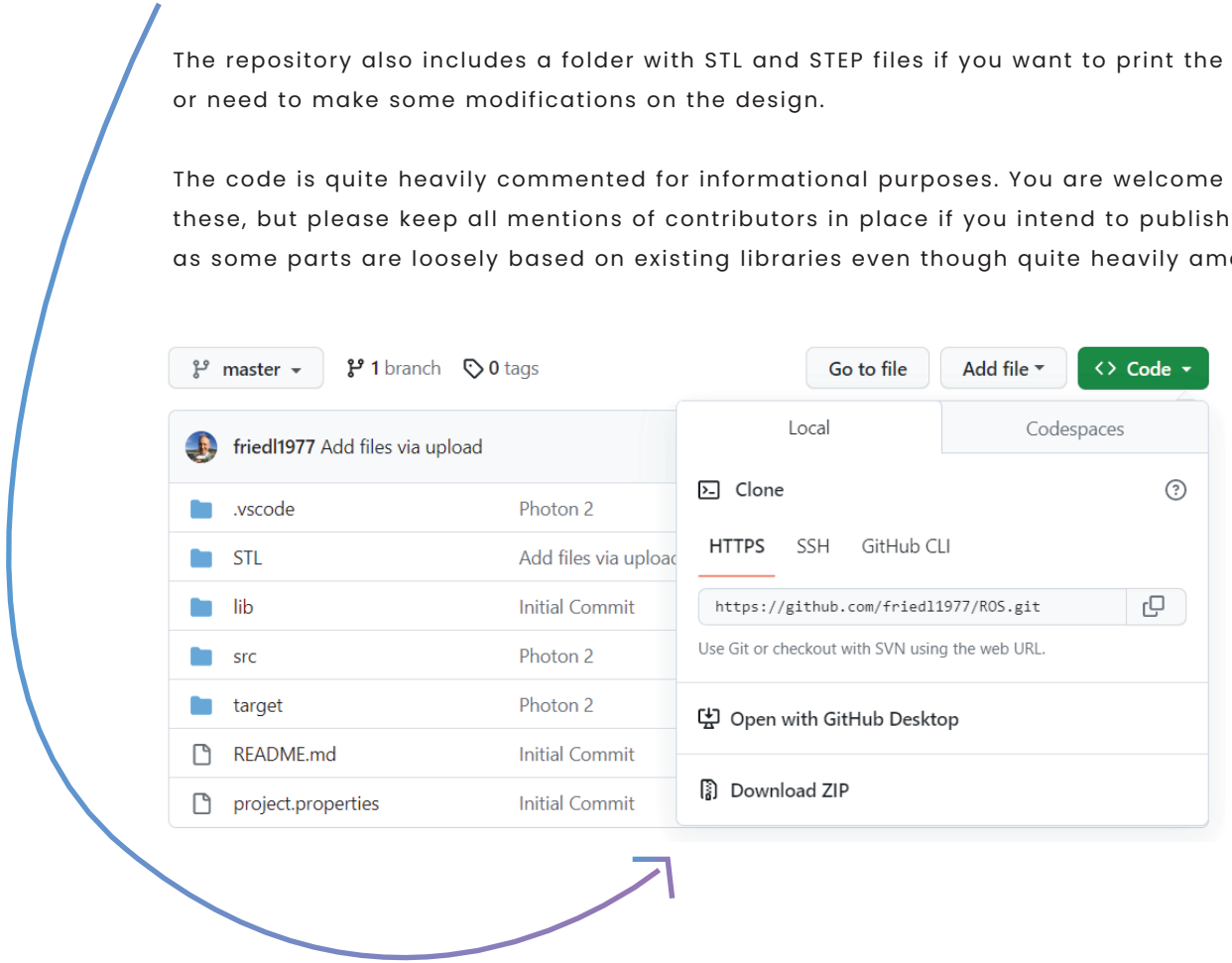
Code

Everything has been done for you. Simply follow the link below and download the entire project from the Github repository.

https://github.com/friedl1977/ROS

The repository also includes a folder with STL and STEP files if you want to print the enclosure or need to make some modifications on the design.

The code is quite heavily commented for informational purposes. You are welcome to remove these, but please keep all mentions of contributors in place if you intend to publish this code as some parts are loosely based on existing libraries even though quite heavily amended.



NOTE

If you are using Visual Studio Code, make sure to use a USB cable to flash. If you use cloud flash, the libraries hosted on the sever will be used and your display will not function as intended.

The library in this project has been amended to accommodate the 2" display

Step 6

Working principal

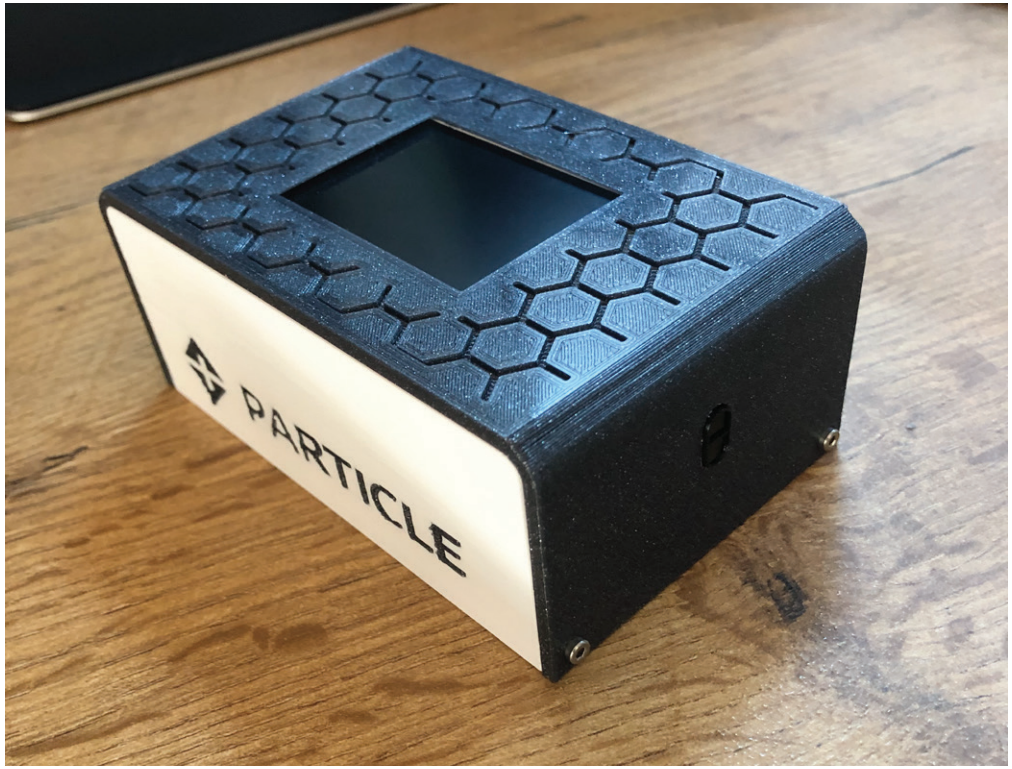
The sensor is intended to be mounted above the door frame.

During setup, the sensor runs the calibration function which determines the distance between the sensor and the floor. It is crucial that the sensor be in place at the time of the calibration process.

When ready the sensor will display “0” in the screen. As people passes under it, the sensor will determine the direction the person is travelling in and either add/subtract.

The sensor displays the total number of people current in the room.

To ZERO the sensor, simply hold you hand (or something) within 100mm from the sensor until it resets to “0”



Room for imporovement

this is NOT a production ready design :)

Add a power switch (simple ON/OFF) in case you want to use an internal battery

Refine the code - A LOT. There is definitely room for improvement on the algorithm that determines the direction of the person travelling.

The VL53L1X sensor has it's limitations in terms of reading speed. Increasing the scan speed to much will reduce the accuracy and cause false readings.

Two sensors would be more accurate in my opinion, but installation would be more challenging as you would need to install on sensor each side of the door. The there is no physical door, this would be easy enough.

If you intend to use this product , DESIGN A PCB instead of using a breadboard. While breadboards are acceptable means for rapid prototyping, the present many challenges.

Enjoy the project!!