PSLab Docs

Release 1.0

Oct 31, 2019

Introduction to PSLab

CHAPTER 1

Introduction

Here you find step by step instructions for Pocket Science Lab (PSLab) using the PSLab hardware and Android app. Please help by building up this website.

1.1 What's PSLab

CHAPTER 2

Hardware description

CHAPTER 3

The Android APP

3.1 How to use the Android APP

- **To use any feature of the PSLab Android application first follow these 2 steps**:
  1. Connect PSLab board with your Android smartphone using OTG cable
  2. Open PSLab Android application

3.2 Overview of the Android app

3.3 Save Configs in the Android app wave generator

3.4 How to use Robotic Arm controller in the Android app

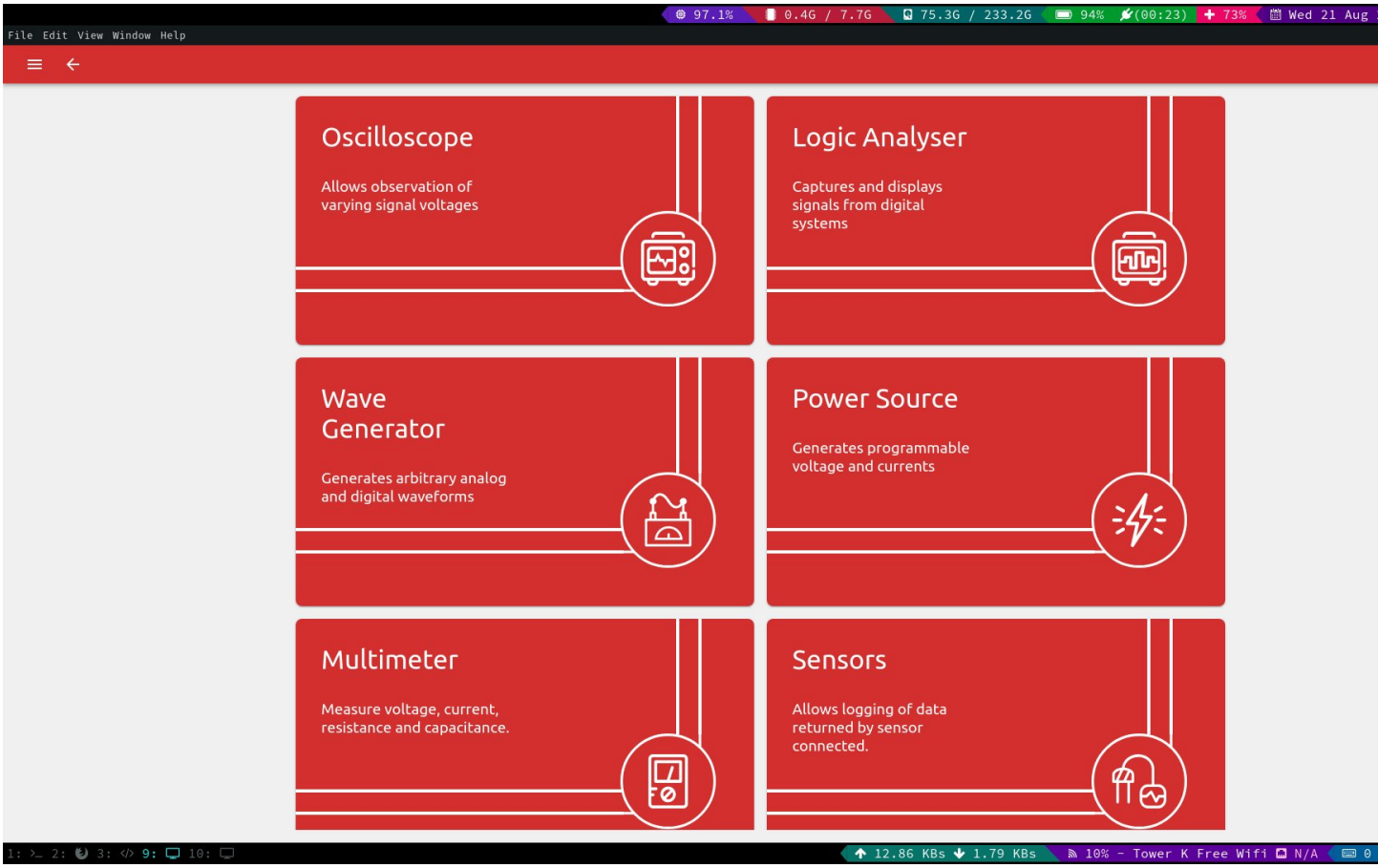
CHAPTER 4

Desktop APP

4.1 How to use the desktop APP

- To use any feature of the PSLab Desktop application first follow these 2 steps:
    1. Connect PSLab board with your Desktop using USB cable
    2. Open PSLab Desktop application

You will be presented with a home screen like this.



Click on the instrument you would like to use.

CHAPTER 5

PSLab Python Library

5.1 Intro to the Python Library

5.2 How to install the Python Library

5.3 How to use the library: examples

CHAPTER 6

Power Source

6.1 What's a Power Source

6.2 Experiment: power your LED with PSLab

CHAPTER 7

Using the Multimeter

7.1 What's a Multimiter

7.2 How to use it

1. To measure volatage, connect PV1, PV2, PV3 to CH1, CH2, CH3 pins on PSLab board respectively and turn knob to either of the channel labels in the Multimeter instrument in PSLab Android application to see the volatage at corresponding PV pins.
2. To measure resistance, connect desired resistor between RES and GND pin on PSLab board and then turn the knob to resistance symbol in PSLab Android application Multimeter instrument.
3. To measure capacitance, connect desired capacitor between CAP and GND pin on PSLab board and then turn the knob to resistance symbol in PSLab Android application Multimeter instrument.
4. Frequency and count pulse can be measured by connecting any desired element between ID (or LA) and GND pins on PSLab board and turning knob to respective label in PSLab Android application Multimeter instrument.

7.3 Experiment: Measuring Voltage (check your battery)

7.4 Experiment: Measuring Resistance

7.5 Experiment: Measuring Capacitance

CHAPTER 8

Using the Oscilloscope

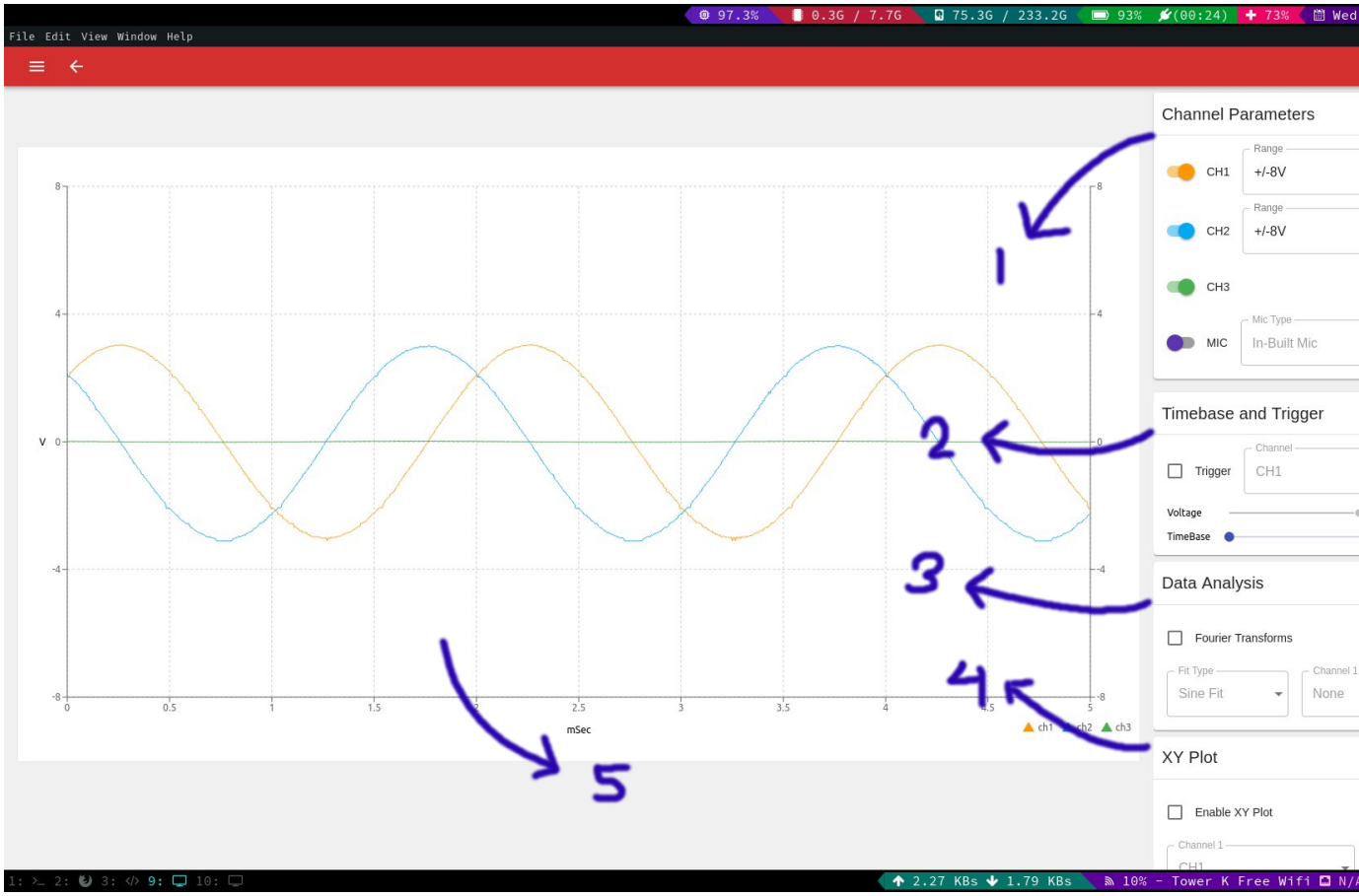
8.1 What is an oscilloscope

An instrument used to measure voltage changes over a period of time in real time.

8.2 How to use it

1. Connect SI1 and SI2 pins on PSLab board to CH1 and CH2 pins respectively for Analog mode or connect SQ1,SQ2,SQ3 pins to CH1, CH2, CH3 pins respectively for Digital mode.
2. Go to Wave Generator instrument in the PSLab Android application.
3. Select either Digital or Analog mode.
4. Set desired frequency, phase and duty(in case of Digital mode) values for Wave1 and Wave2 (Analog mode) or SQ1,SQ2,SQ3 (Digital mode).
5. Exit from Wave Generator instrument and got to Oscilloscope instrument in PSLab Android application.
6. Select either or all from the CH1, CH2, CH3 checkbox to see waves generated at each channel.
7. Change timebase of the waves from the Trigger and Timebase section on the left control panel.
8. Plot waves against each other from the XY-Plot section on the left control panel.
9. View results of Fourier transform or curve fitting from the Data Analysis section on the left control panel.
10. Use in built microphone of the smartphone as input select IN-BUILT MIC option on the bottom panel on the main screen.
11. Use record button to record currently generated waves and store the data in a CSV file and play it back at will.

In the desktop app you will see something like this:



1. Options used to select the active channels and the range of measurement.
2. Timebase adjustments and trigger options.
3. Fourier analysis and sin/squre fitting options.
4. XY plotting settings.
5. Graph area.
6. Record button.

8.3 Experiment: Measure Sound

CHAPTER 9

Wave Generator

9.1 Introduction to Waves

9.2 How to use the Wave Generator

1. Connect SI1 and SI2 pins on PSLab board to CH1 and CH2 pins respectively for Analog mode or connect SQ1,SQ2,SQ3 pins to CH1, CH2, CH3 pins respectively for Digital mode.
2. Go to Wave Generator instrument in the PSLab Android application.
3. Select either Digital or Analog mode.
4. Set desired frequency, phase and duty(in case of Digital mode) values for Wave1 and Wave2 (Analog mode) or SQ1,SQ2,SQ3 (Digital mode).
5. Select either sine or triangular wave shape for SI1 and SI2 in analog mode.
6. Use Play button to directly view set waves in Oscilloscope or Logical Analyzer
7. Use Save button to save the set wave configs and use these configs later.

9.3 Experiment: Generate Sounds with Waves

9.4 Experiment: Blinking LEDs with the wave generator

CHAPTER 10

Digital Sensors

CHAPTER 11

Analog Sensors

11.1 What are Analog Sensors

11.2 Experiment: Motion Sensor, turn on music

11.3 Experiment: Dust Sensor

CHAPTER 12

Logic Analyzer

12.1 What's a Logic Analyzer

12.2 Experiment: Digital Circuit Analysis

12.3 Experiment: Analyse signals received by an i2c sensor

1. Measure four signals at the same time

CHAPTER 13

Servos

CHAPTER 14

Collaborate with PSLab!

14.1 Pocket Science Lab Experiments

The PSLab repository allow contributors from anyone. This is how to create experiments for Pocket Science Lab..

14.1.1 Instructions

1. Fork the repo
2. Go to the ‘ notex <https://www.notex.ch>‘_, an ‘open-source
   <https://github.com/hsk81/notex-v2.0>‘_ ReST editor.

CHAPTER 15

Template for expermients

15.1 <Title / Question of Experiment>

15.1.1 Learning Objective

1. Lorem ipsum dolor sit amet, consectetur adipiscing elit.
2. Cras porttitor tortor pharetra, faucibus diam a, elementum velit.
3. Vivamus id est tristique, mattis nisl nec, porttitor ligula.
4. Morbi non justo dignissim, ultrices dui nec, ultrices ex.

15.1.2 Required Components

	Component Name	Amount Needed
1	Lorem	1
2	Ipsum	5
3	Dolor	10
4	Sit	15
5	Amet	20

15.1.3 Required Instruments

Oscilloscope, Multimeter, Logic Analyzer

15.1.4 Schematics

Circuit Diagram

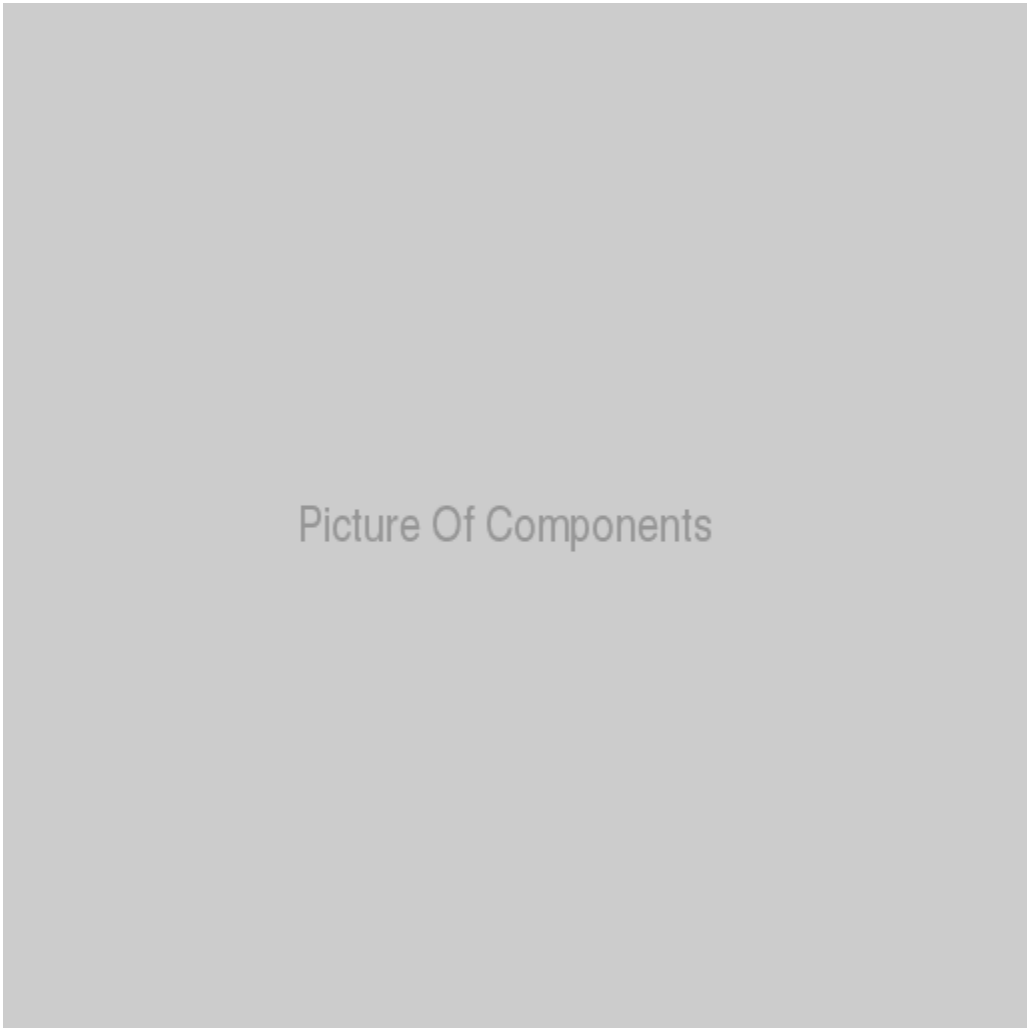


Fig. 1: Picture of Components

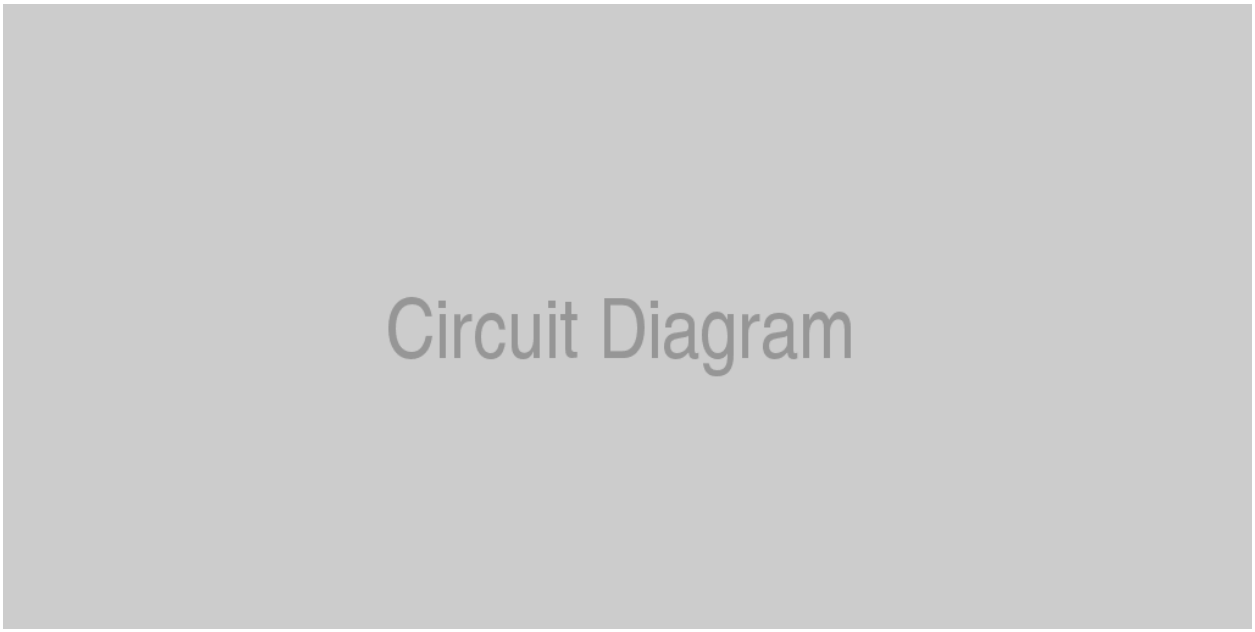
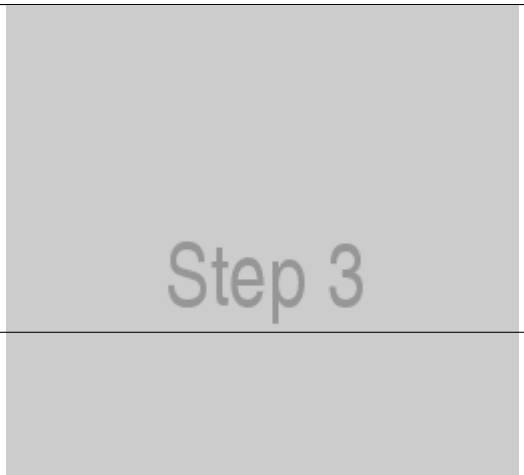


Fig. 2: Circuit Diagram

Breadboard Diagram

15.1.5 Step-By-Step Tutorial

Step	Instruction	Picture Instruction
1	Ut convallis nec libero ut tempor.	
		

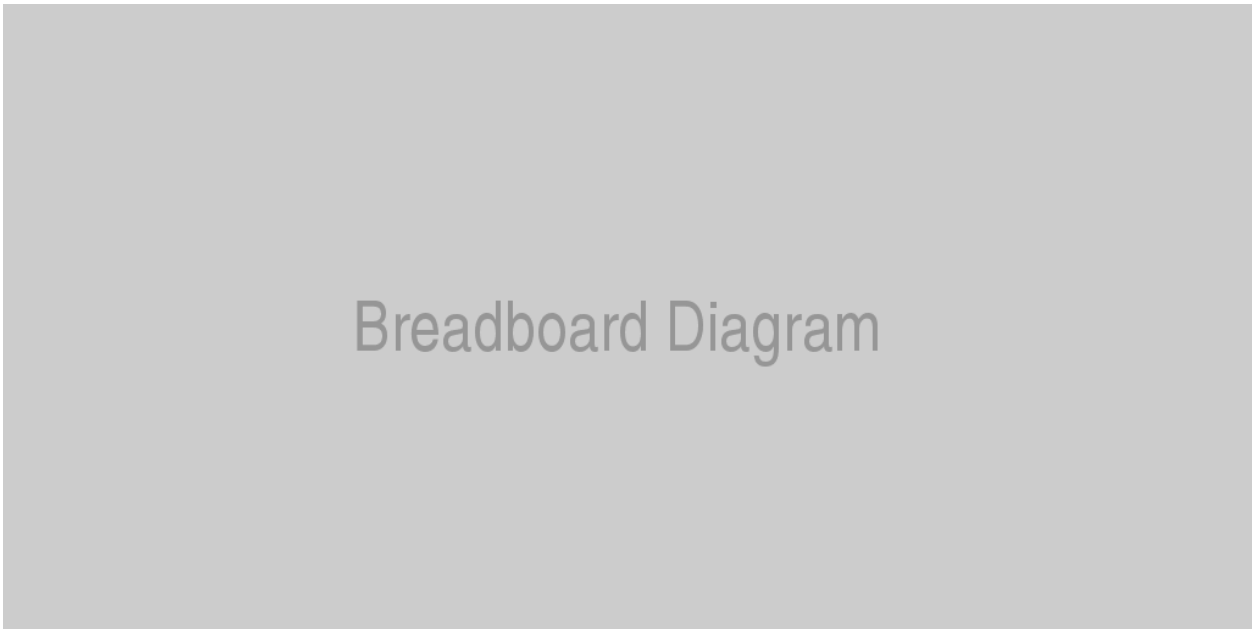


Fig. 3: Breadboard Diagram

15.1.6 Expected Result

|Expected_Result.gif| ### What to observe - Curabitur eu felis interdum metus finibus auctor. - Quisque et nunc nec ligula dictum porttitor vitae ut magna. - Duis hendrerit neque quis sollicitudin pellentesque. - Maecenas in erat ac justo sollicitudin volutpat. - Sed lacinia ipsum eu quam dignissim, a tristique neque molestie.

15.1.7 Videos

PSLab - http://pslab.io

15.1.8 Troubleshoot

Common Problems

- *Suspendisse cursus sem vitae risus mollis laoreet.*
- *Morbi a quam et ex pretium lobortis.*
- *Mauris lacinia neque nec interdum feugiat.*

Suspendisse cursus sem vitae risus mollis laoreet.

1. Nulla condimentum mi eu ullamcorper lobortis.
2. In nec urna tristique, efficitur justo non, pellentesque velit.
3. Aenean sit amet odio volutpat velit pharetra elementum non ut tortor.
4. Duis a velit a leo vestibulum faucibus.
5. Morbi quis nibh at nibh pharetra ultricies sagittis vitae libero. ###### *Back to troubleshoot*

Morbi a quam et ex pretium lobortis.

1. Nulla condimentum mi eu ullamcorper lobortis.
2. In nec urna tristique, efficitur justo non, pellentesque velit.
3. Aenean sit amet odio volutpat velit pharetra elementum non ut tortor.
4. Duis a velit a leo vestibulum faucibus.
5. Morbi quis nibh at nibh pharetra ultricies sagittis vitae libero. ###### *Back to troubleshoot*

Mauris lacinia neque nec interdum feugiat.

1. Nulla condimentum mi eu ullamcorper lobortis.
2. In nec urna tristique, efficitur justo non, pellentesque velit.
3. Aenean sit amet odio volutpat velit pharetra elementum non ut tortor.
4. Duis a velit a leo vestibulum faucibus.
5. Morbi quis nibh at nibh pharetra ultricies sagittis vitae libero. ###### *Back to troubleshoot*

15.1.9 Integrated Project Ideas

- Create Flying bird link

15.1.10 References

reStructuredText quick reference guide

CHAPTER 16

Inertial Measurement Unit (IMU)

16.1 What's an IMU

16.2 Experiment: Get the data out of an IMU

CHAPTER 17

Universal Asynchronous Receiver-Transmitter (UART)

17.1 What's UART

17.2 Experiment: Using UART based sensors, GPS

CHAPTER 18

Communications

18.1 How to add WiFi to PSLab

18.2 How to add Bluetooth to PSLab

CHAPTER 19

Programming PSLab

19.1 Customize the Firmware

19.2 Create your own embedded rules

1. If/Else example with sensor light