**4IR sensor node document**

Summary

[I. Introduction 3](#_Toc14096621)

[1. What is it 3](#_Toc14096622)

[2. General functioning 3](#_Toc14096623)

[3. Error code 3](#_Toc14096624)

[4. Use of the node 3](#_Toc14096625)

[II. Performance test 4](#_Toc14096626)

[1. Test protocol 4](#_Toc14096627)

[2. Data explanation 4](#_Toc14096628)

[3. Conclusion 4](#_Toc14096629)

[III. Node abilities 4](#_Toc14096630)

[1. Distance mode 4](#_Toc14096631)

[2. Timing budget 5](#_Toc14096632)

[3. Sensing array optical center 5](#_Toc14096633)

# Introduction

## What is it

The 4IR sensor node is a sensor set mainly composed of a PCB with 4 IR sensors VL53L1X, a microprocessor and a micro USB output. This node is tested to be used in the EDUCAT Project which consists in developing a smart wheelchair for people with reduced mobility.

## General functioning

![Une image contenant texte

Description générée automatiquement]()The node work through an USB connection with his micro USB port. Once the node is supplied by the USB connection, he does not send any data until he receives the string data ‘1’. Then, the node send data as explained below until he receives the string data ‘0’ to come back to the first state. Here is an image of example data received from the node.

Each data is 1 line of string, ending with ‘\r\n’. The letter b at the beginning means that strings are encoded. Each data received from the node contains several data separate by a comma as follow: ‘ID,error\_code,distance,,\r\n’. As the node is composed of 4 IR sensors, the ID allow to know which sensor the data comes from. The error code gives an idea of the relevance of the sensor data (this is explained in a separate part). Finally, the distance is the real data coming from the sensor.

## Error code

-------------------- EMPTY PART ------------------- [GitLab](https://gitlab.com/educat/educanode-v4)

## Use of the node

In order to collect and process data from the node, a python library has been created and is available for download with pip (“pip install irsensors”). If for any reason you can not use it, you also have the possibility of created your own program in any language which allows you to read data from USB port.

# Performance test

## Test protocol

To evaluate the accuracy of the node, several test and comparison had been done on each of the four sensors. For each, once with a splash proof protection and once without, a target is placed to a known distance from the sensor, and 10 values are collected. The data are grouped together in a excel file on the [GitHub](https://github.com/Gillou100/educat_irsensor) (Documentation/Sensors’ precision.xlsx).

## Data explanation

The excel file contains many sheets, they are explained below:

The first sheet, “without protection” regroup data from each sensor without the splash proof protection. For each distance and for each sensor, they are 10 data collected, and the mean, the min, the max, the repeatability error and the error between the mean and the real distance are calculated. Some graphs are made to show data in a better way.

The second sheet, “with protection” is same as the first, but with the splash proof protection on sensors.

The third sheet, “comparisons\_with-out\_protection” contains graphs which use data from the first and the second sheet to compare, for each sensor, their data with and without the splsh proof protection.

The fourth sheet, “comparisons\_each\_sensor” contains two columns of graph. Each of them also uses data from the first and the second column to compare data between sensors with the splash proof protection (for the first column), and without the splash proof protection (for the second column).

We expect to use the node with splash proof protection on each sensor, so the most interesting graph are on the sheet “comparison\_each\_sensors”, on the right column. We notice that data from sensors follow the real distance until 25cm (first graph). Also, data are very reliable from 4cm to 25cm (second graph) and the repeatability definition is less than 50% no matter the distance.

## Conclusion

In view of data in the excel file, we notice that there is no significant difference between the four sensors, with or without the splash proof protection.   
We consider that the node provides enough good data to use them in our system.

# Node abilities

## Distance mode

-------------------- EMPTY PART ------------------- (page 10/35)

## Timing budget

-------------------- EMPTY PART ------------------- (page11/35)

## Sensing array optical center

-------------------- EMPTY PART ------------------- (page 14/35)