Graphical user interface, application

Description automatically generated

**Lab Report 2**

EEEE1002 – Applied Electrical and Electronic Engineering Construction Project

Mohamed Ghali

Student ID: 20381397

# Abstract (~1 page)

## Group involvement

Contents

[Abstract (~1 page) 2](#_Toc96945061)

[Group involvement 2](#_Toc96945062)

[1 Introduction to Report and System Overview (~1 page) 4](#_Toc96945063)

[2 Background to Line Following (~2 pages) 5](#_Toc96945064)

[2.1 Approaches to line following 5](#_Toc96945065)

[2.2 Real-world Applications Applicable to Transport 5](#_Toc96945066)

[3 Background to Internet of Things (~2 pages) 6](#_Toc96945067)

[3.1 What is it? 6](#_Toc96945068)

[3.2 What is it used for? 6](#_Toc96945069)

[4 Line Following System (~5 pages) 7](#_Toc96945070)

[4.1 Hardware 7](#_Toc96945071)

[4.2 Software 7](#_Toc96945072)

[4.2.1 Weighted Average 7](#_Toc96945073)

[4.2.2 PID 7](#_Toc96945074)

[5 V2X Communications (~5 pages) 8](#_Toc96945075)

[5.1 Hardware 8](#_Toc96945076)

[5.2 Software 8](#_Toc96945077)

[6 Node-RED dashboard (~4 pages) 9](#_Toc96945078)

[7 Conclusion (~1 page) 10](#_Toc96945079)

[References 11](#_Toc96945080)

[Table of Figures 12](#_Toc96945081)

[Appendices 13](#_Toc96945082)

[Appendix 1 13](#_Toc96945083)

# Introduction to Report and System Overview (~1 page)

# Background to Line Following (~2 pages)

## Approaches to line following

## Real-world Applications Applicable to Transport

# Background to Internet of Things (~2 pages)

## What is it?

## What is it used for?

# Line Following System (~5 pages)

## Hardware

## Software

### Weighted Average

### PID

# V2X Communications (~5 pages)

## Hardware

## Software

# Node-RED dashboard (~4 pages)

# Conclusion (~1 page)

This has been a rather successful laboratory, where sensors were used to control the manoeuvring of an autonomous vehicle. Despite the microcontrollers not being able to communicate with each other in the end, the final manoeuvre challenge could still work as expected if the circumstances were slightly different. This has been confirmed by the success of the sensor, trial run. This communication problem will be fixed as soon as possible.

We have seen how sensor data could be implemented in the code, and how such data can be processed to calibrate the data entered to better represent real-world dimensions.

However, techniques on how to improve the accuracy of the existing sensors could have been employed, so that the sensors are more sensitive to changes, and are less likely to cause a collision. This is vital, due to the nature of any vehicle in a real-world situation, where a collision could be fatal. The lack of precision demonstrated by the IMU (in the manoeuvre video), where the given angle was quite different to what was visually expected is an example of this.

An example of a source of problems is how the ultrasonic sensor is not perfectly perpendicular to the car surface, as can be seen in **Error! Reference source not found.**. This could mean that the returning ultrasonic waves are not returned at their fastest time, creating a false impression that the distance is greater than it is.

Another reason for the lack of accuracy could be the weak connections that the sensors have with their female pin headers. Due to this, the sensors can pivot about the pin headers, and this may distort the readings from the sensors.

Also, some research could be done to find more robust sensors that can measure data more accurately, and measure more samples of data, with more precision.

Considering the rate of change of momentum, the abrupt stops which the vehicle is made to make, as a reaction to the sensor readings, can cause a lot of force, which can damage the autonomous vehicle in the long run. Ideally, the vehicle should be made to decelerate slowly as it approaches a stop so that this force can be greatly reduced, as the momentum decreases gradually.

# References

**There are no sources in the current document.**

# Table of Figures

**No table of figures entries found.**

# Appendices

## Appendix 1