



# Autonomous Route and Mapping 2D - 3D Lidar Scanning

DESIGN DOCUMENT

CALIN DORAN

## Table of Contents

1. Introduction .....	2
2. Technologies .....	3
2.1 C++ .....	3
2.2 RPLiDAR SDK .....	3
2.3 Visual Studio 2019.....	3
2.4 Doxygen .....	3
3. Additional Packages .....	4
3.1 Python 3.7 .....	4
3.2 SQL .....	4
3.3 Visual Studio Code .....	4
4. GUI Prototypes.....	5
4.1 Main GUI .....	5
4.2 Warning and Directional UI.....	6
4.3 Mapping GUI .....	7

## 1. Introduction

This document contains an overview of the technologies used to produce the A.R.M Lidar System. The document will also cover the proposed database schema, with some proposed prototype GUI screens.

## 2. Technologies

### 2.1 C++

C++ is a cross-platformed language that can be used to create sophisticated high-performance applications. The language gives programmers a high level of control over system resources and memory.

- This will be the main language of the system and will be developing most if not all of the functionality of the system with this language.

### 2.2 RPLiDAR SDK

This is the library used for the LiDAR scanner, it allows for multiple commands and access to the LiDAR and its capabilities.

- The SDK of the hardware used, RPLiDAR, is an integral part of this project as it allows for the development of the system with the hardware.

### 2.3 Visual Studio 2019

Visual Studio is used to develop apps for Android, iOS, Windows, web, and cloud. It allows you to debug and diagnose with ease, test code, and release stable versions.

- Our IDE, this allows us modern functionality and security while developing our system while allowing full compatibility with new and older systems.

### 2.4 Doxygen

Doxygen is a documentation generator, a tool for writing software reference documentation. Doxygen can cross-reference documentation and code so that the reader of a document can easily refer to the actual code.

- Our documentation generator for the full project report.

### 3. Additional Packages

The packages outlined below will be used later in the project depending on the time and resources allowed, and what additional functionality could be added to the system.

#### 3.1 Python 3.7

Python is a high-level, general-purpose language that places an emphasis on code readability. It is capable of supporting multiple programming paradigms such as object-oriented, imperative, procedural etc.

#### 3.2 SQL

SQL commands allow you to create a host of components such as tables, schemas, stored procedures, indexes, domains, character sets, or even new databases.

#### 3.3 Visual Studio Code

When using multiple languages like Python and C++, or for cross-platform development, it can be a great editor tool. It provides the ability to debug and use version control through a multitude of extensions and addons on many platforms.

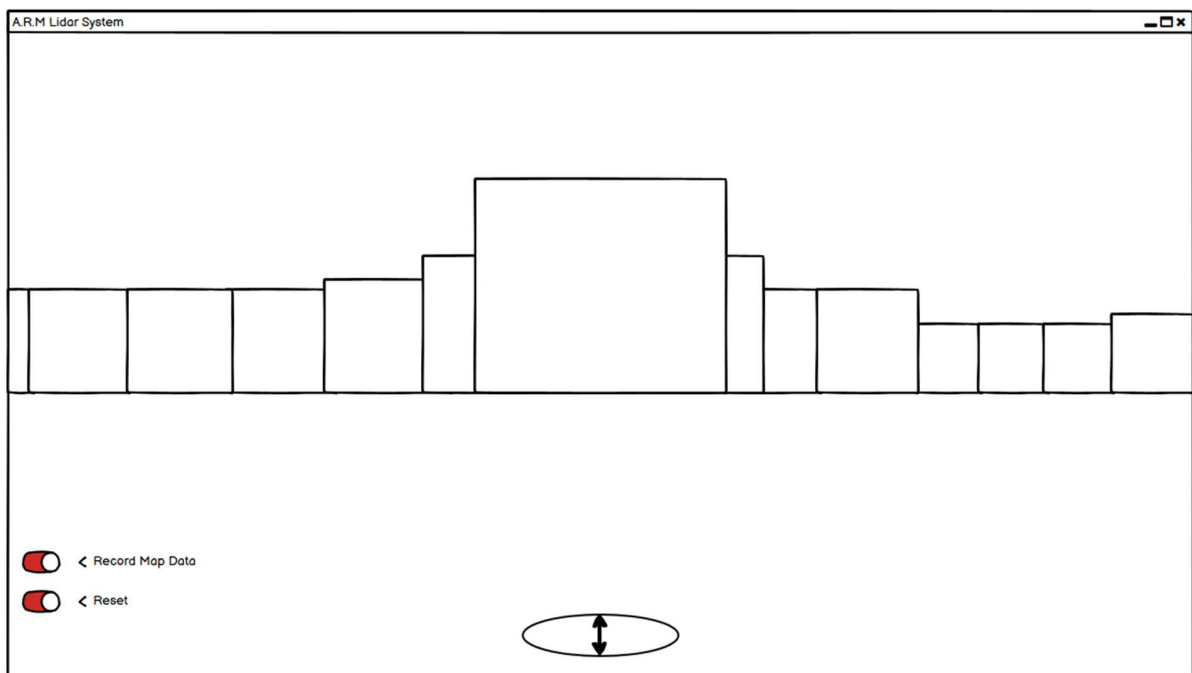
- This will be used for some cross-platform testing to ensure support for the application.

## 4. GUI Prototypes

### 4.1 Main GUI

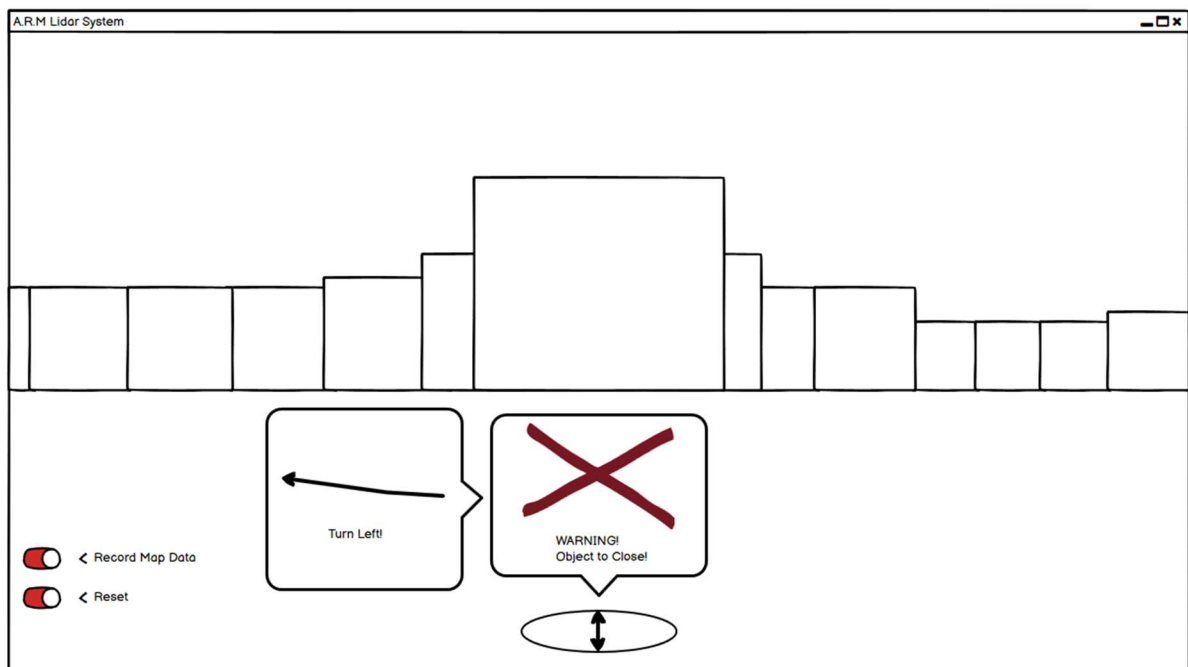
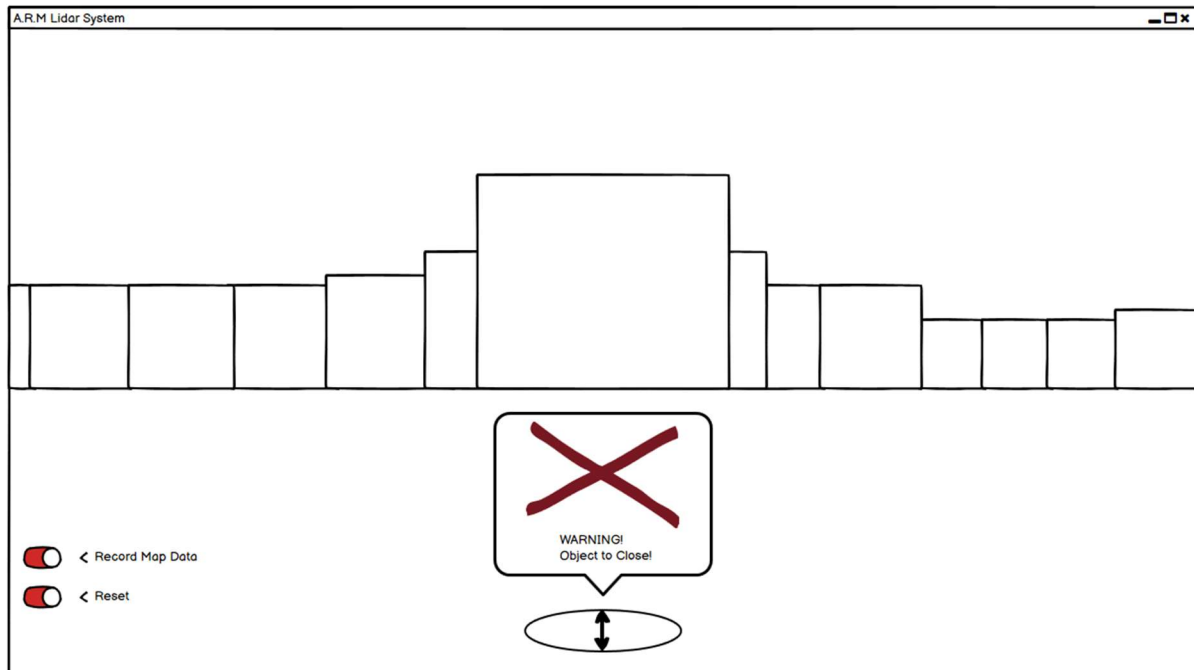
The GUI of the application would be very simple, it needs to be as fast as possible for the user as it gives the field of view of the LiDAR in 3D, from the 2D data captured from the LiDAR scanner. However, because this view is represented in 3D this will allow the user a better understanding of what the data is and how it looks to the LiDAR itself, this also lends itself into the option of mounting the LiDAR to the top of a mobile unit.

Mounting the LiDAR on a mobile unit like an RC car would allow the user the ability to see from the point of view and give commands to the RC car in real-time, or have a set of instructions for the mobile unit itself.



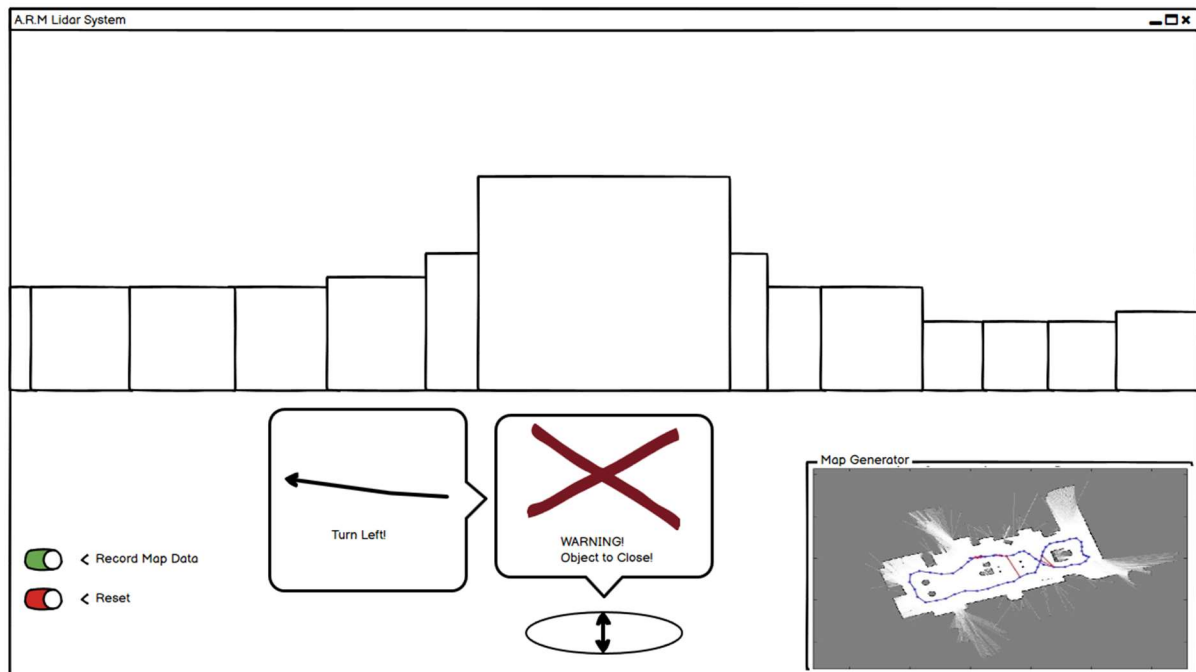
## 4.2 Warning and Directional UI

Within this GUI there could be warnings to show the user that they are getting to close to an object or to stop and move left or right if possible. This in part is the autonomous aspect of the application.



### 4.3 Mapping GUI

The mapping GUI could be an on-screen display that allows the user to capture the data that the LiDAR is showing in its view. This could allow us to generate a map based on what has been seen within the LiDAR's field of view.







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\*I have cited the sources of all quotations, paraphrases, summaries of information, tables, diagrams or other material; including software and other electronic media in which intellectual property rights may reside.

\*I have provided a complete bibliography of all works and sources used in the preparation of this submission.

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Student Name: (Printed)	Calin Doran
Student Number(s):	C00220175
Signature(s):	Calin Doran
Date:	29-11-2019

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