# CAPSTONE Group 062

# List of Deliverables Document

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# 1  Documents

The documents that are given to the client at the conclusion of the project are as follows:

1. Requirements

2. Design

3. Validation

4. Test Data

The Requirements Document includes background information on the problem solved by the system, and outlines what the system must achieve. This includes how the system benefits the client, and how it provides those benefits in the form of minimum requirements. This document is used as the basis for the design decisions and validation of the system.

The Design Document provides both high-level information about the system design, and detailed information about each subsystem. The focus of the document is on how each subsystem is designed, including rationale behind design decisions and verification these decisions meet minimum requirements. Additionally, design describes in detail how the system is constructed.

The Validation Document provides details of tests conducted to ensure the system as a whole meets the requirements set out in the requirements document. Validation tests are designed and performed for each requirement defined for the system. This document includes the methodology and results

of each test conducted, and an overall summary of how the system meets the defined requirements.

Additionally, some of the parts of the Design and Validation documents require test data that is stored in separate files. All of the necessary test data defined in these sections is provided alongside their appropriate documents.

# 2   Source Code

Table 1 presents the source code that is given to the client at the end of the project.

Table 1: Source Code Deliverables

| Code Component | Platform/Device | Subsystem |
|---|---|---|
| Impact Detection and Communication | Arduino Uno Wifi Rev2 | Detection System, Communication System |

The code is provided in the appropriate file format of the platform it is designed for. Code is transferred to the client with the rest of the deliverable documents.

# 3   Schematics

The schematics for construction of the system are part of the deliverable materials provided to the client. The schematics are included for the detec-

tion system (Design Document Section 3). Figure 1 displays the schematics of the detection system detailed in the Design document. It is noted that the ADXL335 is displayed in the schematic, as the software used for the schematic labels all ADXL3XX accelerometers this way. In the construction of the system, the ADXL337 should be used, as specified in the Detection System (Design Document Section 3.1).
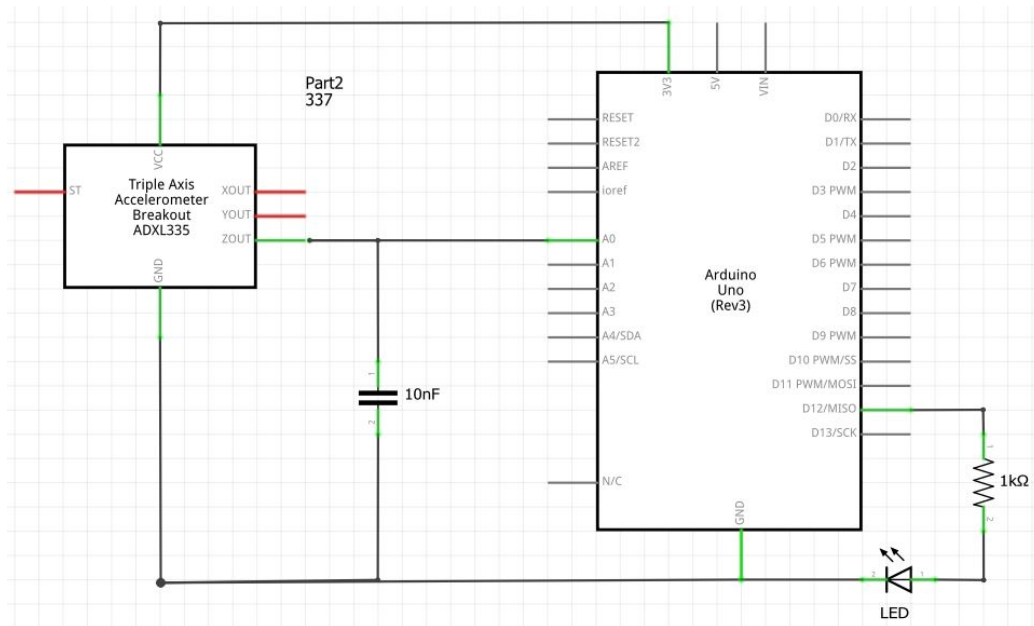


Figure 1: Detection System Wiring Schematic

The components and construction of the detection system are described in detail in the Design Document (Design Document Section 3, Section 7).

# 4 Bill of Materials

Table 2 presents the bill of materials, in table form, associated with a single prototype (Section 5).

# 5 Prototype

Two complete prototypes will be presented to SEEDS. A prototype is defined as the entire device used to detect and record bird impact data, including the data collector and data storage. Each prototype consists of the following physical components:

1. Arduino Uno WiFi Rev2

2. Plastic box enclosure for the Arduino Uno Wifi Rev2

3. ADXL337 Accelerometer with Breakout Board

4. 10nF capacitor

5. Solid-core insulated connecting wires

6. 10g duct seal

7. 10cm double sided mounting tape

8. Power adapter

9. Yellow LED

10. $1k\Omega$ resistor

Table 2: Bill of Materials for the Impact Detection System

| Item | Quantity | Manufacturer | Manufacturer Part Number | Description |
|------|----------|--------------|--------------------------|-------------|
| 1 | 1 | Arduino | ABX00021 | Arduino Uno Wifi Rev2 |
| 2 | 1 | David He | N/A | Plastic Box Enclosure 7.62x7.62x3.81cm |
| 3 | 1 | SparkFun | SEN-12789 | ADXL337 Accelerometer with Breakout Board |
| 4 | 1 | TDK | FA24NP02E-103JNU06 | 10nF Capacitor |
| 5 | 1 | SparkFun | 11367 | Hook-Up Wire |
| 6 | 1 | Gardner Bender | DS-130 | Duct Seal |
| 7 | 1 | Scotch | 11189 | Heavy Duty Mounting Tape |
| 8 | 1 | Lee's Electronics | 14520 | 12V 1A Power Adapter |
| 9 | 1 | Sparkfun | 09594 | Yellow LED 5mm |
| 10 | 1 | Stackpole Electronics Inc. | 0702646255348 | 1kΩ Resistor |

These components are described in further detail in the Design Document (Design Document Section 3). In addition to the physical prototype components, the files necessary for 3D printing the plastic box enclosure (2) are provided to the client. This allows for reproduction of the prototype, as the plastic box enclosure is custom made for the system. Figure 2 displays the Arduino Uno WiFi Rev2, the plastic box enclosure, the ADXL337, and the insulated wires of the prototype.
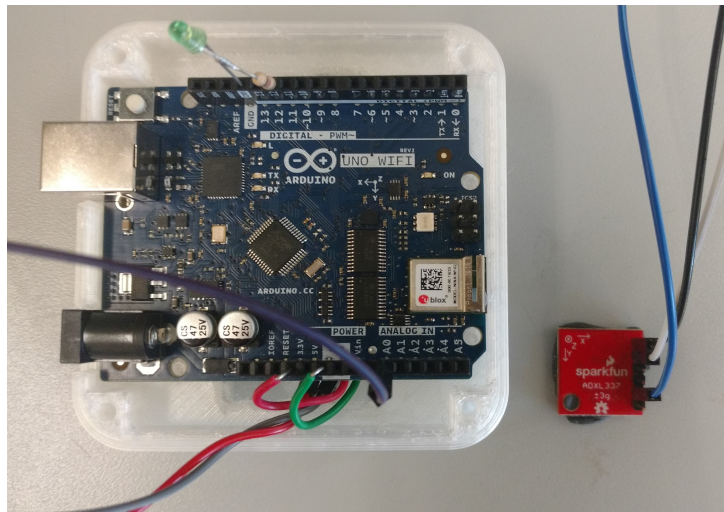


Figure 2: Detection System Arduino and Accelerometer with Plastic Enclosure

In addition to these components, access to the non-physical components of the prototype will be provided to SEEDs. This includes source code (Section 2), data storage (Design Document Section 5), and UI (Design Document Section 8). Due to the online nature of the data storage and UI, they are given to SEEDs securely in the form of the following components:

1. MyDevices Cayenne Username

2. MyDevices Cayenne Password

Due to the sensitive nature of these components they are presented in private, rather than with the rest of the documentation.

# 6   Capstone Video

The 120-second video produced for the capstone course is given to the client. This video focuses on the issue that the bird impact detection system aims to solve (Requirements Document Section 1), and the solution that was designed. The video is in 720p definition, saved in mp4 format. This file will be provided to the client along with the documents (Section 1).