Project Deliverable E: Project Schedule and Cost

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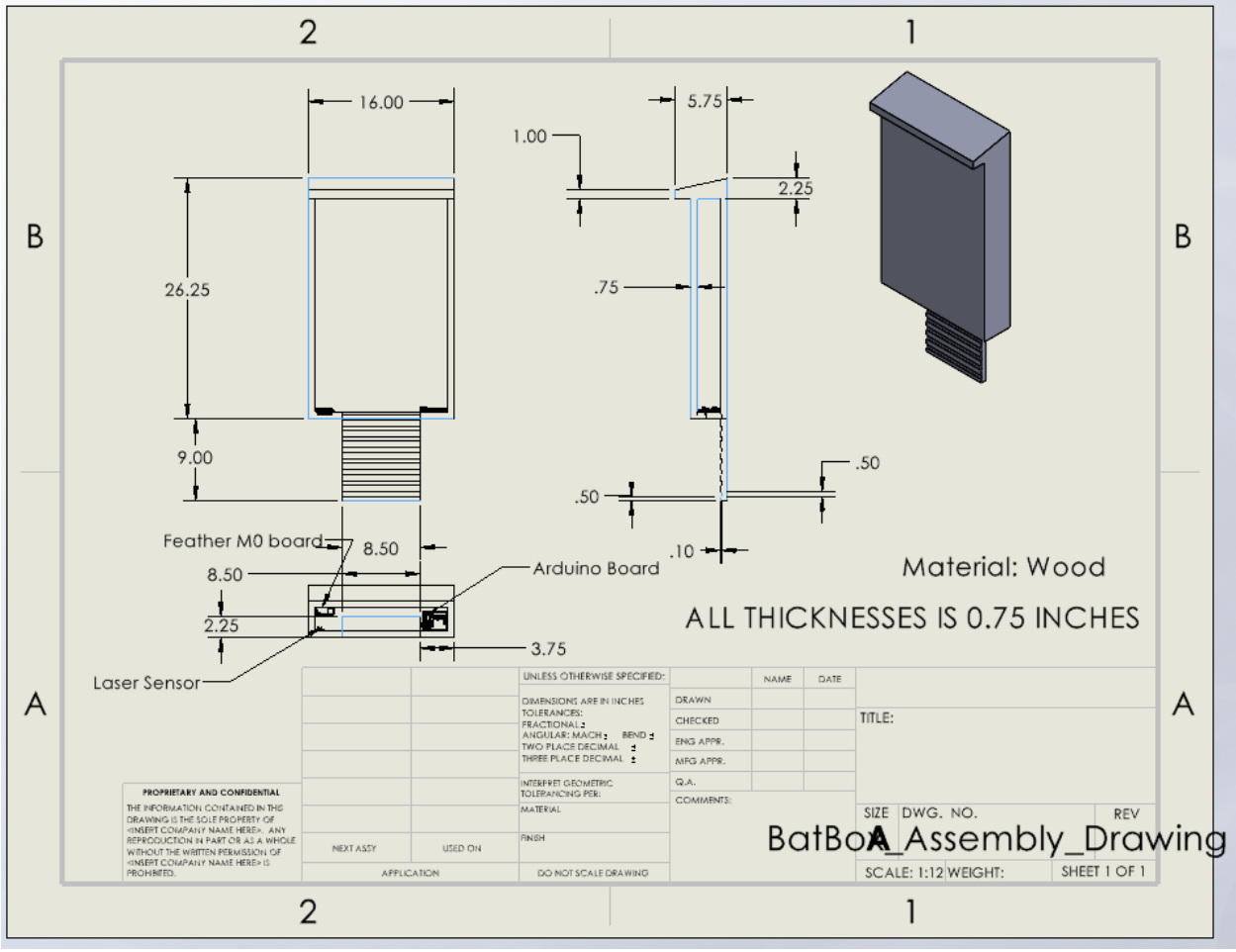
DELIVERABLE E

Introduction: In the previous deliverable we have presented different subsystems and global systems. We have decided to pick a global system including a lithium-ion battery, a box made of wood, and a laser sensor. In this deliverable we will be focusing on the detailed designed in which we have integrated our entire tracking device, the components other than the sensor that will be needed to collect and analyse our data. We will also plan our first prototype which will help be a proof of concept by using it for multiple tests which are paramount to our project.

Concept: As mentioned in the introduction we have chosen a laser sensor which will be triggered by the bats coming in or out of the box. Next the box will be following a simple design of any other bat box as the focus of the project is the sensor and the global concept as whole. The instruction for the sensor will be encoded in an Arduino board that it will be connected to. To be able to encode data and collect it to be used for analysis a data logger will be used, the information can be retrieved via USB drive.

1.Detailed design



2.List of tasks to be completed

Task	Estimate duration/ deadline	Who?
Getting the box supplies	1h (before prototype 2)	Callum
Getting the electronics	24h (order before 30/10)	Khadijetou
Setting up the tracking interface : linking up Arduino, data logger, sensor	1h (on the 31/10)	Mataab +Ana + Miguel
Develop/refine Arduino code	3h (before 31/10)	Miguel + Sean
Prototyping test plan	2h (27/10)	Khadijetou
Preparing/getting a cardboard box (for prototype 1)	1h (31/10)	Callum
Assemble the sensor on the cardboard box	10 min (31/10)	Ana
Testing of prototype	1h40 (before 03/11)	Entire team (more details on step 5)
Noting down results of each test and sharing with team	1h40 (before 03/11)	Entire team (more details on step 5)
Collect feedback from users	20min (before 03/11)	Sean + Miguel
Prepare feedback form	15min (before 31/10)	Mataab
Taking pictures of prototype	10 min (31/10)	Ana

2.1Project risks

Not getting the electronics on time: Represents a major obstacle as the electronics are the nucleus of the _and nothing can replace them for the prototype since we'll be using the specific ones we used for testing. We can still do the testing for the code if we can borrow Arduino boards with a photosensor since it will be very similar to the sensor we are using, and we will be focusing on the code. Some aspects of the sensor could be tested for example with the range it has since it depends on the code but also the sensibility of the sensor.

Extensive testing: It is essential to make sure our different subsystems and our global system interact well together and function optimally individually to do so we must test them which is time consuming but unavoidable; we also have to plan for potential mishaps.
To optimize the time we have, we must define clear stopping criterion and standards we have with % of error so that we know what an acceptable threshold for inaccuracies is. User feedback could help figure out if the stopping criterion are realistic but also fulfill the problem statement.

Inadequate time management: Poor time estimation and allocation as well as team collaboration could be the major project risk as the team has displayed weaknesses.
We will create a deadline before the actual deadline where everyone needs to give a status update on their tasks and a second deadline where the work needs to be completed before the submission date.

Technical issues: The sensor could be impacted my environmental conditions and could be damaged during the testing phase which would be disastrous if it were to happen during design day.
We have ordered four sensors it could constitute backup, so we'd only be using one as to not use up our resources.

3. Bill of materials

Electronics

Material	Link	Cost (Cad$)
Laser Sensor	Sensor	15.99$
Arduino	Link	25.99$
Data Logger	Link	11.39$
Battery	Link	8.99$
Total Cost with taxes		70.47$

Box

Material	Link	Cost (Cad$)
Screws	n/a	0.00$
Wood	n/a	0.00$
Glue	LInk	6.84$

Total Cost with taxes	7.73$

Grand total cost with Box and Electronics is 78.20$

4. List of equipment

- Core components for the prototype: Arduino board, laser sensor module, data logger module, lithium-ion battery, and USB drive.
- Structural and mounting materials/tools: wood, cardboard, screws, hot glue gun, screwdriver set, saw, drill/drill bits.
- Other prototyping materials: Breadboard, jumper wires, Dupont cables, ruler, multimeter, USB cable, resistors, capacitors.
- Testing equipment: object to emulate bat motion, stopwatch, measuring tape
- Software: Arduino IDE, data analysis software: Microsoft Excel, Microsoft Word, laptop/computer

5. Prototyping test plan for Prototype 1

Test	Test objective (why)	Basic Test Method (What)	Results Recorded and how they will be used (How)	Estimated Test duration/ deadline (When)	Stopping criterion
Testing the Arduino code	Verify that the Arduino code functions correctly, ensuring data is accurately collected and logged	Run the prototype with a controlled setup to observe the code's performance, checking for any errors in data logging or sensor activation.	The output data from the Arduino code, including sensor readings and timestamps will be recorded and will be used to determine if the code needs to be modified.	40 min (31/10)	When a response is consistent
Sensitivity of sensor (can be done at the same time as the code testing)	Measure the sensor's responsiveness to bat activity under various conditions.	Conduct tests at different distances and conditions (e.g., varying light levels) to evaluate the sensor's ability to detect bat activity reliably.	The sensor's response to distance, evaluation of detection times and accuracy will be used to determine if the sensor should be recalibrated if we have less 80% of accuracy	40 min (31/10)	80% accuracy within the width of the box
Feedback	Collect feedback from people outside the team	Conduct a demo of the prototype for people outside	Opinion on the threshold we chose for this test	20min (31/10)	Once we have gathered

	and mentors on the prototype's functionality and usability.	the team and mentors. Use a structured feedback form to gather insights on functionality and design.	plan so we can evaluate the quality of our standards		the opinion of 5 people
Disposition	Assess the placement and environmental impact on the prototype's performance and evaluate whether a different disposition would be more convenient	Assess the placement's impact on the performance by simulating bats coming in (hands and object) and whether they bump into the components which could impact them long term	These observations will inform us about the practical feasibility of our design	20 min (31/10)	Once we have a sleek integration that won't obstruct bat movement

Conclusion

In this deliverable we have done a detailed design of our project and established a list of tasks with the specific duration of each as well as assigned them. Then a list of the potential pitfalls of our project in relation to our specific group and general ones were stated with their solution which will help us find alternatives quickly if we ever encounter problems or help prevent them. Next we've established our bill of material to make sure our project was within budget as well as a list of tools that will be needed to make sure everything we could possibly need will be at our disposable. Finally we have planned out the different tests for our first prototype which are the most important ones to ensure that our objective which is bat tracking can be fulfilled along with our stopping criterion. In later prototypes we will be testing the cohesion of our design but also consider the problem statement as a whole for the different tests that need to be later carried out.