

Team Ate

Deliverable H - Prototype III and Customer Feedback

GNG1103 C – Introduction to Engineering Design

Lab Section CO2 – Group 8

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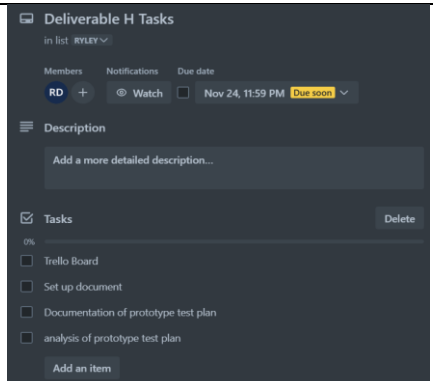
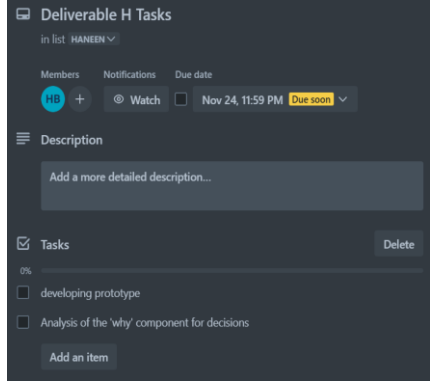
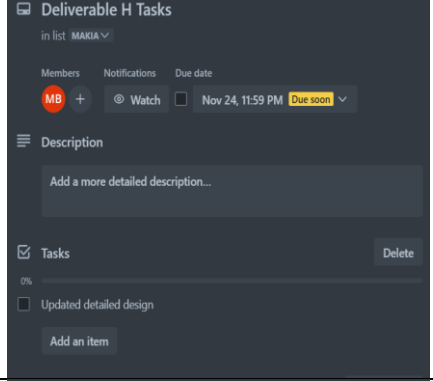
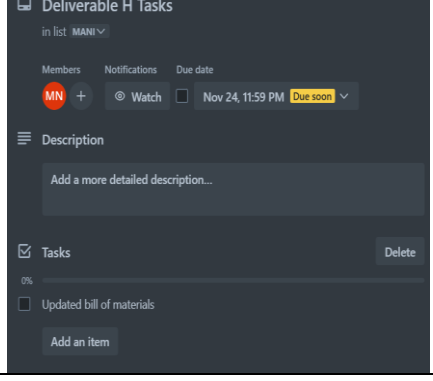
Abstract

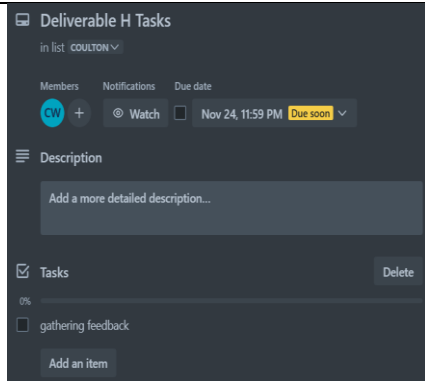
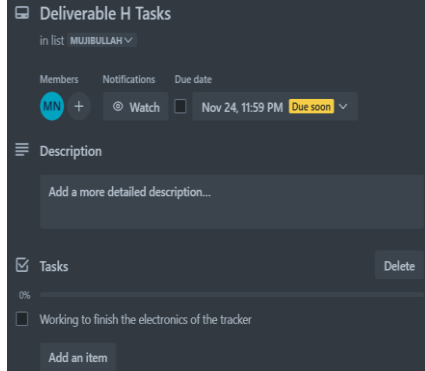
In this stage prototype 3 is developed based on user and peer feedback. Client feedback is obtained and used to improve the prototype.

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Trello Board Updates

Person	Tasks	Trello Board
Ryley	<ul style="list-style-type: none"> - Trello Board - Set up document - Documentation of prototype test plan - Analysis of prototype test plan 	 <p>The screenshot shows a Trello card titled 'Deliverable H Tasks' for Ryley. It lists four tasks: 'Trello Board', 'Set up document', 'Documentation of prototype test plan', and 'analysis of prototype test plan'. The card has a 'Watch' button and a 'Due soon' label.</p>
Haneen	<ul style="list-style-type: none"> - Developing prototype - Analysis of the 'why' component for decisions 	 <p>The screenshot shows a Trello card titled 'Deliverable H Tasks' for Haneen. It lists two tasks: 'developing prototype' and 'Analysis of the 'why' component for decisions'. The card has a 'Watch' button and a 'Due soon' label.</p>
Makia	<ul style="list-style-type: none"> - Updated detailed design 	 <p>The screenshot shows a Trello card titled 'Deliverable H Tasks' for Makia. It lists one task: 'Updated detailed design'. The card has a 'Watch' button and a 'Due soon' label.</p>
Mani	<ul style="list-style-type: none"> - Updated bill of materials 	 <p>The screenshot shows a Trello card titled 'Deliverable H Tasks' for Mani. It lists one task: 'Updated bill of materials'. The card has a 'Watch' button and a 'Due soon' label.</p>

Coulton	- Gathering feedback	
Mujibullah	- Finishing electronics component of tracker	

Prototype III Analysis

For this last prototype, adjustments and improvements were made to finalize the design. The box was painted in black acrylic paint and tested in various temperatures then compared to results obtained before it was painted. The dedicated electronics compartment was completed with a hinged door to ensure easy access when data is collected monthly. Weatherproofing around the compartment was also added to protect the wires and Arduino board. The sensor itself includes an SD card for data storage. Holes were drilled for the lasers and photoresistors as well as for wiring. Holes were also added for ventilation on the opposite side of the box. These features ensure the final prototype is user-friendly and meets the client's needs.

Prototype III Testing Plan Results

Temperature testing

Before paint

Location	Temperature of location (°C)	Temperature inside box 1 (°C)	Temperature inside box 2 (°C)
Room	20.1	22.1	21.6
Outside	4.8	15.7	15.9
Heated conditions	29.3	27.8	27.4

After paint

Location	Temperature of location (°C)	Temperature inside box 1 (°C)	Temperature inside box 2 (°C)
Room	18.8	19.9	20.0
Outside	4.4	19.5	19.9
Heated conditions	29.3	22.4	22.5

In this test, the temperature inside the box was taken at different surrounding temperatures to compare the effects with and without the box being painted black. The highest recorded temperature in Ontario since 2000 is 38 degrees Celsius, through following trendline in this recorded data without paint if the surround temperature was 40 degrees, the internal temperature should be 32.4 degrees. At zero degrees the temperature inside the box without paint should be 13.3 degrees. However, with paint at 40 degrees the inside temperature of the box should be 23.1 degrees and at zero degrees the temperature inside the box should be 18.8 degrees. Since with paint the bat box internal temperature has less fluctuation it provides a more stable environment for the bats to live in. Since temperature inside provides conditions that the bats can live in this test did not need to go to failure. Although following the trend line on the graph from the points above the point of failure can be calculated but not simulated, this value changes from different species of bats.

Feedback

For the current bat box prototype, feedback was gathered to reduce potential areas of failure. The first piece of feedback focused on the waterproofing of the component housing. This compartment has yet to be tested against water, and it is crucial that no water enters. It was suggested that we perform more testing to test the waterproofness of the compartment and add additional waterproofing measures if necessary. The next piece of feedback focuses on longevity of the bat box. The current bat box was painted using black acrylic paint. This type of paint will likely begin to peel after some time outdoors. To ensure the longevity of the paint, a paint sealer was recommended.

Updated Target Specifications, BOM, & Detailed Design

Target Specifications

	Design Specification	Relation	Value	Units
1	Capacity	>	50 (Original: 100)	Bats
2	Dimensions	=	10.5x 28 x 47 (Original: 47x104.1x17.8)	cm
3	Multiple chambers	=	1 (Original: 2)	Chambers

Bill of Materials

Items Added	Cost	Source
VIPMOON 50pcs small Hinges with screws, retro jewelry box Hinges, 18 * 15mm Mini Hinges for wooden box	8.79 \$	https://www.amazon.ca/VIPMOON-50-Decorative-High-Quality-Hardware/dp/B09KGLTZ52?th=1
Acrylic paint	1.50 \$	https://www.dollarama.com/en-ca/p-black-acrylic-paint/0201773
SD card	19.20 \$	Lexar 128GB Micro SD Card

Detailed Design

For prototype III, there were some additions to the final prototype. Hinges, acrylic paint, and an SD card were purchased for this prototype. Locks were also acquired from a small wooden box that was already owned by a group member. Small black hinges were screwed and added to one side of the bat box while a lock was added to the opposite side. The addition of the hinges and lock allowed for the doors of the bat box to open and close. Black acrylic paint was painted on to the bat box to absorb exterior heat and create warmer temperatures in the box. The SD card was purchased for the data of the sensors.

Conclusion

In this deliverable, we have documented the development of our third and final prototype. Feedback from users/peers was documented, considered, and implemented when finalizing the design. An update to the target specifications was made based on this prototype and the BOM and detailed design were also adjusted accordingly. Temperature testing was the final test performed and documented to analyze the internal temperature conditions in various temperatures and the effectiveness of the added paint. Based on the testing, our bat box and sensor design can meet the key user requirements by providing protection from predators and weather as well as tracking bat movement to promote conservation efforts for these species.

References

https://www.plantmaps.com/en/ca/climate/extremes/c/ontario-record-high-low-temperatures#google_vignette