

Team Ate

Deliverable E – Project Plan and Cost Estimate

GNG1103 C – Introduction to Engineering Design

Lab Section CO2 – Group 8

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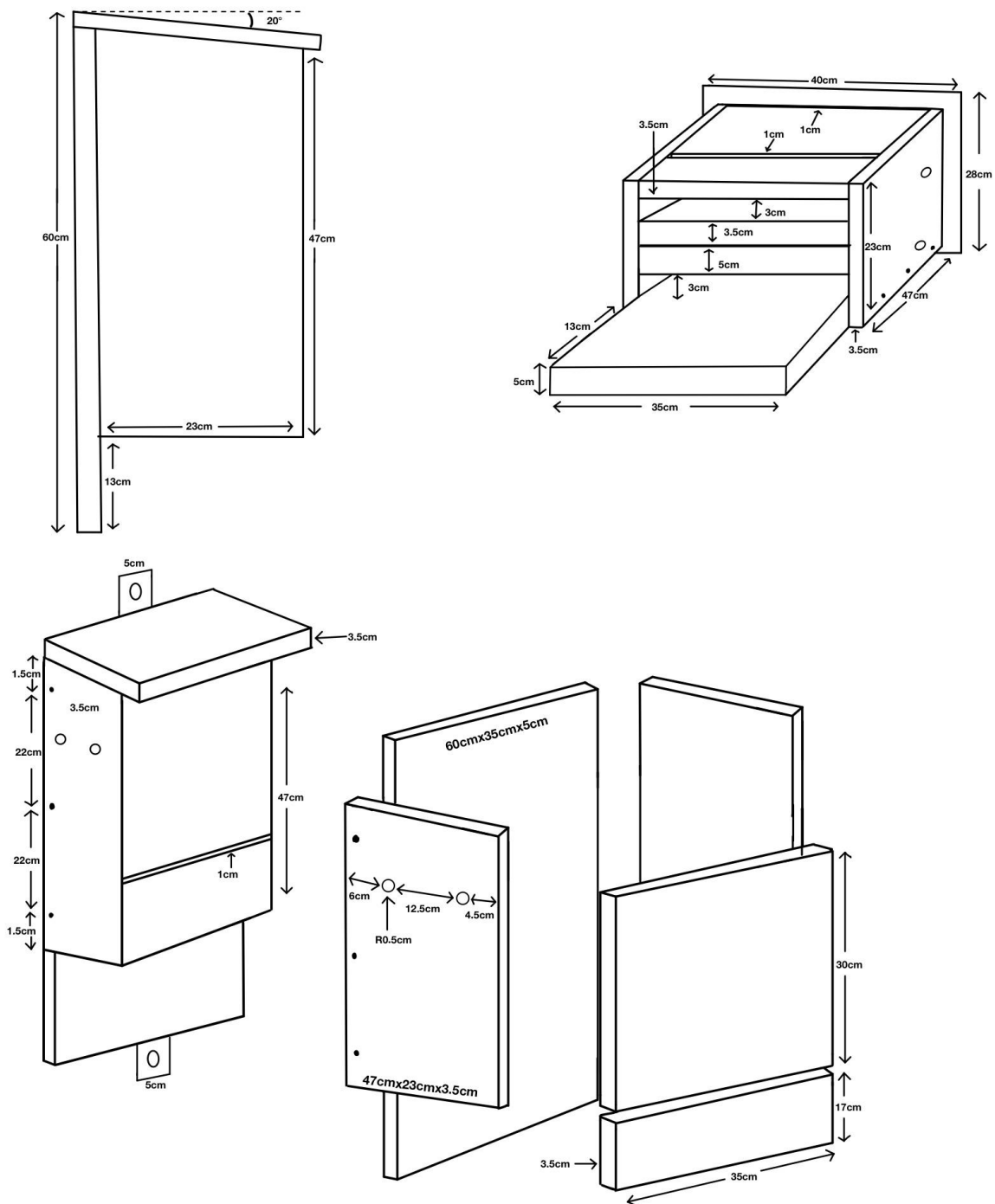
Abstract

Creating a detailed schedule entailing the project tasks and due dates to ensure proper time management and completion of all aspects of the design. Cost and components will also be outlined as well as the schedule for prototype completion.

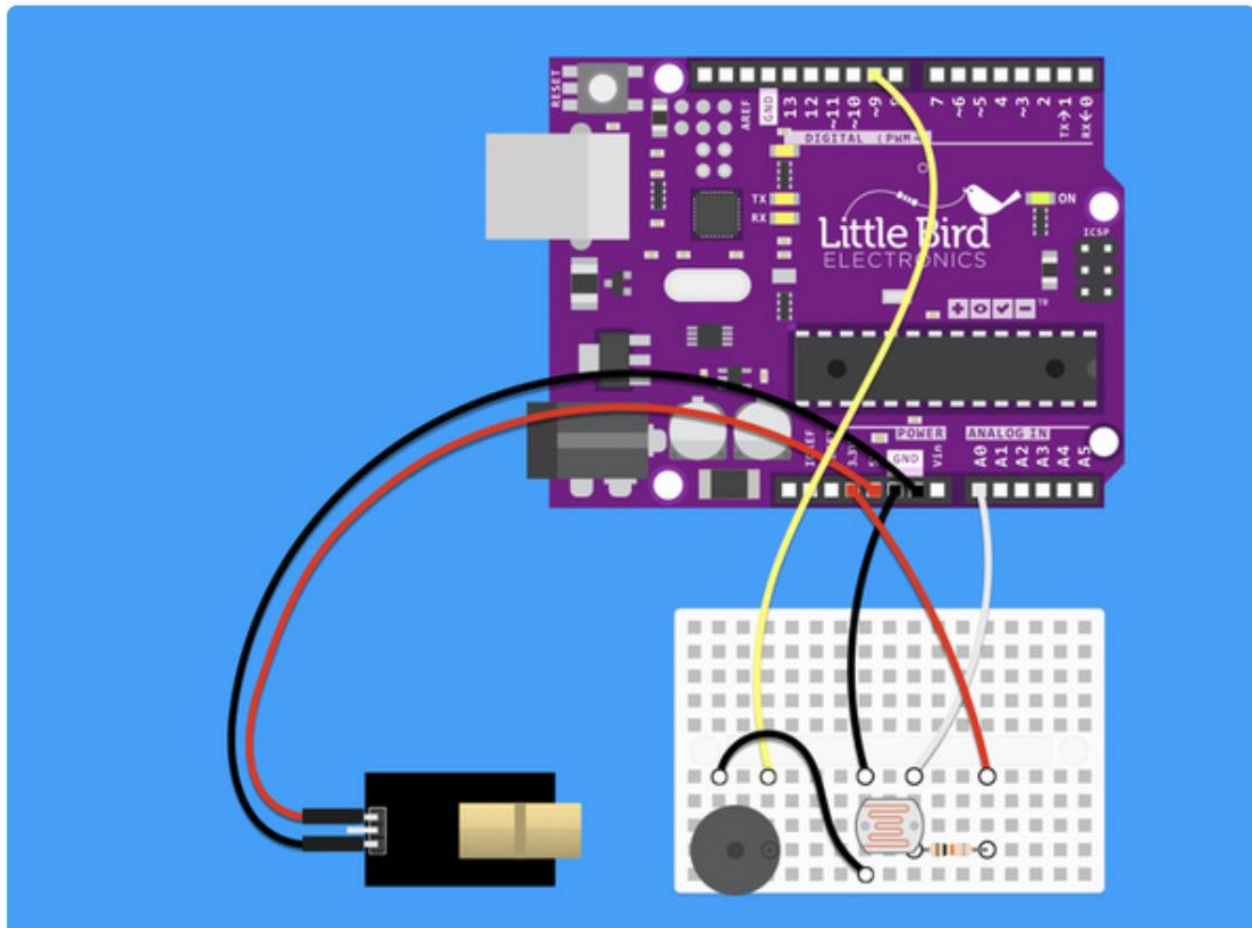
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Bat Box Diagram



Circuit diagram for 1st prototype



- Will be powered by 3.7V batteries connected to power jack of Arduino.
- Same connection setup for laser number 2.
- Buzzer is just used to test if sensor is working, will be removed for final prototype.
- Circuit from: Little Bird Electronics. (2023). Laser sensor for Arduino.
[diagram] <https://learn.littlebirdelectronics.com.au/arduino/laser-sensor-for-arduino>

Code:

```

//works by point laser at photoresistor if the beam gets broken the ldr_value
drops lower than 900.
int ldr = 0; //LDR = photoresistor
int ldr_value = 0; //variable to store LDR values
const int buzzer = 9; // Buzzer is just to test if sensor is working, will be
removed for final prototype
int counter=0; //counts number of bats

void setup() {
  Serial.begin(9600);
}

void loop() {
  ldr_value = analogRead(ldr);
  Serial.println(ldr_value);
  delay(100); //wait

  if (ldr_value < 900) {
    tone(buzzer, 1000);
    counter++; //increases number of bats recorded
    delay(3000); // 3 seconds delay for the bat to clear away from entrance
  } else {
    noTone(buzzer);
  }
}
}

```

Project Plans and Schedule

This section shows a schedule of the upcoming tasks for the project. Each task is numbered, and the dependencies are specified with these numbers. The owner is the individual responsible for getting the work turned in. The duration shows how long the task should take to complete and the due date shows the day the task is finished.

Number	Tasks	Dependencies	Owner	Duration	Due Date
1	Deliverable E – Project Plan and Cost Estimate	None	Mujibullah	One week	10/27/2024
2	Develop Prototype I	None	Everyone	One week	11/03/2024
3	Deliverable F – Prototype I and Customer Feedback	None	Ryley	One week	11/03/2024
4	Develop Prototype II	2	Everyone	One week	11/10/2024
5	Deliverable G – Prototype II and Customer Feedback	None	Makia	One week	11/10/2024
6	Develop Prototype III	4	Everyone	14 days	11/24/2024
7	Deliverable H – Prototype III and Customer Feedback	None	Haneen	14 days	11/24/2024
8	Deliverable I – Design Day Presentation Material	None	Coulton	3 days	11/27/2024
9	Deliverable J – Project Presentations	None	Mujibullah	6 days	-
10	Deliverable K – User and Product Manual	None	Ryley	One week	12/03/2024

Project Risks and Contingency Plans

This section shows the possible risks that can occur while working on this project. The probability of these risks and the effects of them all ranges from low to high. Contingency shows a plan for how these risks can be prevented and/or solved.

Risks	Probability	Effect	Contingency
Group conflicts	Low/Moderate	High	Have a group discussion to solve the problem
Incomplete tasks	Low	High	Encourage group members to get their work done
Lack of communication in group	Moderate	Moderate/High	Schedule more meetings to communicate with one another
Coding difficulties	High	High	Ask the TA's or PM's for help

Estimated Cost

Item	Cost (\$)	Source
Two 2 inches by 10 inches by 10 ft wood material	21.90 x2 =43.80	Home Depot https://www.homedepot.ca/product/-2-inch-x-10-inch-x-10-ft-spf-premium-2btr-grade-lumber/1000167995?eid=PS_GO_140203_ALL_PLA-526641&eid=PS_GOOGLE_D00_Corporate_GGL_Shopping_All-Products_All%20Products_PRODUCT_GROUP_pla-336655210985&pid=1000167995&store=7026&gclsrc=aw.ds&gad_source=1&gclid=CjwKCAjwyfe4BhAWEiwAkIL8sAvKBx5N59AluxxXrZVSWUhrQg5pd9HEhEJnq3a8c5k3uWT42N8pfxoCiEgQAvD_BwE
Two Paulin 5-inch nails for mounting	0.31x2=0.62	Home Depot https://www.homedepot.ca/product/paulin-5-inch-40d-spiral-framing-spike-hot-dipped-galvanized/1001464758?rrec=true
Paulin 1-1/4-inch nails for connecting boards	5.97	Home Depot https://www.homedepot.ca/product/paulin-1-1-4-inch-3d-smooth-finishing-nails-bright-finish-150g-approx-259-pcs-per-package-/1000683602
2 ATmega328P Development Board	8.49x2=16.98	Temu: https://www.temu.com/ul/kuiper/un9.html?subj=good

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Construction Adhesive, 295 ml	9.55	Home Depot: https://www.homedepot.ca/product/lepage-pl-premium-polyurethane-construction-adhesive-interior-exterior-waterproof-295-ml/1000403473
2 Acrylic Latex Caulk 300 mL	3.07 x2 =6.14	Home Depot: https://www.homedepot.ca/product/dap-alex-plus-all-purpose-acrylic-latex-caulk-plus-silicone-white-300-ml/1000158964?eid=PS_GO_140203_ALL_PLA-526641&eid=PS_GOOGLE_D00_Corporate_GGL_Shopping_All-Products_All%20Products_PRODUCT_GROUP_pla-298495632901&pid=1000158964&store=7026&gclsrc=aw.ds&gad_source=1&gclid=CjwKCAjwyfe4BhAWEiwAkIL8sCwrERQpcn0y9kH3yJbYw3KQwLk2rQlnZcOCD9eoKmf6GThq3f1BiBoCHOWQAvD_BwE

Two 18650 3.7V Batteries	10.06x2=20.12	<p>Temu:</p> <p>https://www temu.com/ul/kuiper/un9.html?subj=goods-un&bg_fs=1&p_jump_id=894&x_vst_scene=adg&goods_id=601099581914852&sku_id=17592469896669&adg_ctx=a-e7ccb7ea~c-d0bca71b~f-3055a07f&x_ads_sub_channel=shopping&p_rfs=1&x_ns_prz_type=-1&x_ns_sku_id=17592469896669&x_ns_gid=601099581914852&mrk_rec=1&x_ads_channel=google&x_gmc_account=695390730&x_login_type=Google&x_ads_account=6910707695&x_ads_set=21445363611&x_ads_id=170102327448&x_ads_creative_id=705206038285&x_ns_source=g&x_ns_gclid=CjwKCAjwyfe4BhAWEiwAkIL8sMpK_p8hRGN3peG1cfdNemuLC8v8rSKTprtYcTXvFeCCmbUdlc3pPhoCVolQAvD_BwE&x_ns_placement=&x_ns_match_type=&x_ns_ad_position=&x_ns_product_id=17592469896669&x_ns_target=&x_ns_devicemodel=&x_ns_wbraid=Cj4KCAjwpvK4BhBuEi4AC275K0g3_FJOKcEtTWCafELKmmpEhS6iZrTUWEOa7MaSNfgY5mkvT1nh4-qMGgJCvw&x_ns_gbraid=0AAAAo4mICHzz7uFCllvd2WXEhqdy2DlB&x_ns_targetid=pla-2323199550871&gad_source=1&gclid=CjwKCAjwyfe4B</p>
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		hAWEiwAkIL8sMpK_p8hRG N3peG1cfdNemuLC8v8rSK Tp rtYcTXvFeCCmbUdlc3pP hoCVolQAvD_BwE
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40 male to male jumper wires	2.95	PiShop: https://www.pishop.ca/product/diy-jumper-wires-for-raspberry-pi-30cm/
Two Laser modules for Arduino	5.70x2=11.40	Little bird electronics: https://littlebirdelectronics.com.au/products/laser-module-for-arduino
40 male to female jumper wires	2.95	PiShop: https://www.pishop.ca/product/diy-jumper-wires-for-raspberry-pi-30cm/
Two Female DC Power Jack Plug Adapter	3.39x2=6.78	Prime cables: https://www.primecables.ca/p-311009-ada-2-1mm-dcjack-f-21mm-dc-jack-female-adaptor-21mm-dc-plug-dc14-primecables?from_pla=google&sku=311009&gad_source=1&gclid=CjwKCAjwyfe4BhAWEiwAkIL8sHp2edASW0pn9znXan8MOumX-zfmrDYFYD4jm_vl-oVBIBtFmwUnwhoC4jUQAvD_BwE#sku311009
Two 1-Kohm resistors	0.25x2=0.50	BC robotics: https://bc-robotics.com/shop/1k-ohm-resistor-16w/

20 Photoresistors	1.83	Amazon: https://www.amazon.ca/UK-D-Photoresistor-Resistors-Dependent-Resistor/dp/B09ZNRFT3R/ref=asc_df_B09ZNRFT3R/?tag=googleshopc0c-20&linkCode=df0&hvadid=706747361221&hvpos=&hvetw=g&hvrnd=18034443033829805462&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9000680&hvtargid=pla-2298506415353&psc=1&mcid=09778e4d51f13674be5f3829abd00a27&gad_source=4
2 Buzzers	0.95x2=1.9	KIWI electronics: https://www.kiwi-electronics.com/en/passive-buzzer-12x8-5mm-3664?country=&srsltid=AfmBOorr11PrWGAcNgkn9yUCZ-EbWsh39j51reAZerDK6KWWBAtCRFhp0T8
Total Cost after tax	148.58	

List of Equipment for Prototype

- Breadboard
- Arduino IDE (Software)
- Saw
- Drill
- Tape Measure/ruler

Prototyping Test Plan

Test ID	Test Objective	Description of Prototype Used and Basic Test Method	Description of Results to be Recorded and how these results will be used	Estimated Test duration and planned start date
1. Waterproofing	This test is to ensure the durability of the bat box. If the box is not waterproof the bat will not use the box, and the box will not last long. This test might not give the best results; however, it is the most cost and time efficient.	The test will be on the focused physical prototype of the box. The box will be built with wood and sealed with caulking and waterproof paint. Water will be dumped and sprayed on the box to ensure there is no leakage or damage occurring. This test will need the materials of the box, which has the cost outlined above, as well as water and a hose or bucket which will cost less than 20\$.	The box's weatherproofing will be tested, as the results of how much water can be sprayed on it will be recorded. Before the water is sprayed on the box the measurement is recorded and increased as the test goes on.	The test will end when there is damage or leakage to the box. The box will be adjusted until it can withhold the maximum amount of rainfall in Ontario.
2. Mounting	This test will ensure that the box can be used by the bats without falling. This test	The box will be built and mounted onto a post. Weight will be added to the box by	The mounting will be tested by adding an increasing amount of weight to the	The test will end when the box falls off the post or it can withstand the weight of

	is the most practical to test the construction of the box, especially the mounting system	placing weights on top of the box. The prototype used will be a comprehensive , analytical test that will use a simulation of the box to test the maximum weight applicable. This test will be free of charge.	box in the simulation until the box falls off the post. The weight added will be recorded.	approx. 100 bats.
3. Bat sensor	This test will be used to ensure the reliability of the sensor. This test is a bit more costly, however it is the best test to ensure that the sensor is accurate.	This test will be focused on the physical prototype of the bat sensor. The test will be used will tennis balls and the sensor tracking will be measured. The tennis balls will be thrown by the sensors in varying speeds and direct to ensure that the sensors can accurately count the bats passing by. This testing will use the sensors which will be costly as outlined above as well as tennis balls	The amount of tennis balls thrown by the sensor will be increased and how fast they are thrown will be measured.	The amount and speed of the tennis balls will be measured until the sensor can no longer measure the tennis balls accurately.

		which cost approx. 20\$.		
4. Sensor testing	<p>This test will be used to ensure that the sensors being used will not get in the way and hinder the use of the box by the bats. This test is the best way to ensure that bats will still use the box without using the box.</p>	<p>The prototype being used is a comprehensive , analytical test that will be a simulation of the bat box in the environment it will be used in. The simulation will be the amount of bats the can use the box at any given time and how the size and placement of the sensor hinders the use of the box. The simulation will run by changing the placement of the sensor and letting a fixed number of bats use the box and observing the outcome. This test will be cost-free besides the software being used.</p>	<p>The number of bats that use the box will be measured and reordered as well as being compared to other locations to make sure the chosen location of the sensor will not hinder the use of the box.</p>	<p>The test will end when the simulation has been run with the sensor being in all desirable locations or until the box is not being used by the bats.</p>

Conclusion

This deliverable focuses on the project plan for prototyping and testing the bat box design chosen in deliverable D. A detailed design drawing summarizes the components of our chosen concept which will help in building our bat box and sensor prototypes. A BOM includes the necessary components with their prices and our equipment list covers the tools needed to build the prototypes. We have outlined the tasks that need to be completed and assigned them to members of the team, as well as the project risks and contingencies. With the outlined prototype test plan, uncertainties are reduced, and the team can use the feedback from the tests to iterate our design. This will ensure that our final product is high quality and meets the client's needs. Once we pass through each test objective, we will land on the final reliable and effective solution for the last prototype.

References

-Little Bird Electronics. (2023). Laser sensor for Arduino. [diagram]
<https://learn.littlebirdelectronics.com.au/arduino/laser-sensor-for-arduino>