GNG1103

Deliverable E: Project Plan and Cost Estimate

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Abstract

In this document, the task for the next three deliverables are stated and separated into subtasks. Each task will then be assigned to a specific group member or if assigned to team it must be completed together during our weekly meetings. This allows for us to easily divide the work to ensure the work is being shared equally among group members. Our project has a budget of one hundred dollars, therefore the next section of our report will be used to ensure that in all three of our prototypes we do not exceed this budget. The budget is broken down into each part required for the three prototypes. Finally our chosen concept has been modified after the client meeting. This report will explain potential risks of our chosen concept. It is essential to explore these risks in case we run into problems while working, we have a back-up plan prepared.

Deliverable E

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1. Introduction

In the makerspace a current problem identified by a CEED employee was that the 3D printers have to be constantly checked to see the status of the print jobs. This is because one a print job is completed the employee must remove the print job so that another student can use that printer. A second issue was knowing if the 3D printer has malfunctioned. A malfunctioned printed is a waste of resources and time. Our project goal is to increase efficiency of the 3D printers by alerting the CEED employee. With our product the CEED employee should not have to leave the main reception desk in order to know a print has been completed. This will increase efficiency of the CEED employee as well as reduce cost if a potential malfunction in print job can be determined early on.

2. Task

2.1 Prototype I: Basic Proof of Concept

Task	Duration (days)	Team member responsible
Research motion sensors and create a pros and cons list	2	(2) Sophia, Erin
Decide on which sensor to purchase	1	Team
Research and learn code that is relevant to programming the motion sensor	4	Team
Brainstorm different Dashboard interfaces for alerting the CEED employees	3	Team
Decide on one Dashboard interface to implement	1	Team
Simple analysis report of the sensor subsystem	2	(2) Sophia, Erin
Simple analysis report of the Dashboard interface	2	(2) James, Sophia, Carly

Table 1 Proof of Concept for Prototype 1

2.2 Prototype II: Critical Subsystems

Task	Duration (days)	Team member responsible
Purchase motion sensor and arduino board	1	(1) Erin
Program the basic functions, such as input and output	4	(2) James,

		Carly
Test out the code and see if the arduino receives data from the motion sensor	2	(2) James, Carly *Same as people above
Explore and learn how to use Dashboard	4	Team
Implement some of the basis features of the Dashboard interface we designed	4	(3) Lynne, Sophia,Erin
Test of the code to see if it will display the necessary information	3	(3) Lynne, Sophia, Erin
Research how to create pop up notifications on Dashboard	2	(2) James, Lynne

Table 2 Proof of Concept for Prototype 2

2.3 Prototype III: Fully Functional Comprehensive Prototype

Task	Duration	Team member responsible
Complete the code for the arduino that will receive input from the motion sensor	3	(2) Carly,James
Test out the code and fix bugs	2	(2) Carly, Sophia
Complete the code of displaying information to Dashboard	3	(3) Lynne, Sophia, Erin
Test out the code and fix bugs	2	(3) Lynne, Sophia, Erin
Combine the code for the motion sensor and Dashboard and test all the components together	2	(2) James, Lynne
Fix any problems with the system and any bugs in the code	2	(3) Lynne, Sophia, Erin
Final test to ensure everything works	1	Team

Table 3 Proof of Concept for Prototype 3

3. Cost

3.1 Prototype I: Basic Proof of Concept

Component	**Cost ($)**
Drawing	0

Table 4 Proof of Concept Cost for Prototype 1

3.2 Prototype II: Critical Subsystems

Component	**Cost ($)**
Arduino	17
Motion Sensor	11
Jumper Wires	1
Total:	29

Table 5 Proof of Concept Cost for Prototype 2

3.3 Prototype III: Fully Functional Comprehensive Prototype

Component	**Cost ($)**
Arduino	17
Motion Sensor	11
Jumper Wires	1
Total:	29

Table 6 Proof of Concept Cost for Prototype 3

4. Significant Project Risks

4.1 Chosen Concept

After consideration of both the monitoring and alerting matrices, we have come to the conclusion that the best all-around solution will be an accelerometer hooked up to the nozzle to sense the stop of movement. In order for the employee to be alerted of information, they will have access to a grid with live information that will show the status of each printer.

Upon our client meeting with CEED, we have learned that our proposed idea presents multiple risks. First of all, we learned that when a 3-D printer finishes printing a 3-d model, the nozzle of the 3D printer will continue to move in the path it was programmed to when building the model. In light of this new information, we as a group came up with a contingency plan of putting a motion sensor in the filament tray. This plan has more potential as we would have an effective way of monitoring movement through the filament emptying over time. Having the motion sensor in the back would also look better aesthetically as we could enclose the motion sensor along with any wires behind the 3D printer.

So having our new project concept of motion sensors in the filament tray also presents potential risks.

4.2 Potential Risks

4.2.1 Motion Sensor Signals Detecting Other Movements

If we bought a motion sensor that detected the movements of people in the background or the nozzle moving around in the programmed path when the filament tray is empty. This would be a problem as it would send false data to our Dashboard and Arduino program saying there is movement around the motion sensor even if the filament were to be empty. To mitigate the risk of having a motion sensor detecting its surroundings, and preferably one that monitors motion in a centralized area, we would do thorough research on different potential motion sensors and look at online reviews to get a sense if it would be a good fit for our project. But if we bought a motion sensor that detects surrounding movement we also have a contingency plan for that.

The motions sensors that we want to use are the Arduino Passive Infrared Sensors which is an electronic sensor that measures infrared (PIR) light radiating from objects in its field of view. An ideal motion sensor would be one that sends out light and can sense when the beam is broken or not reflected back because it would be able to detect movement and when the filament is empty.

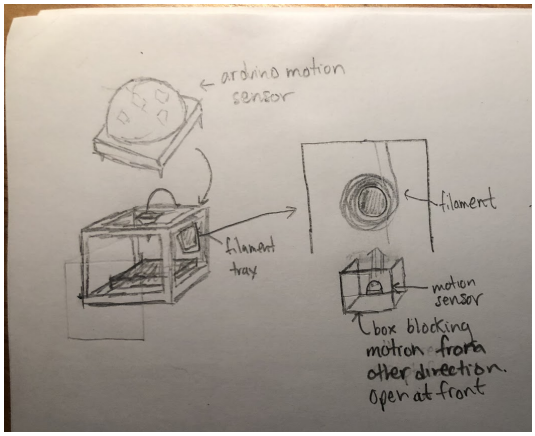

Figure 1 Detection of Filament

If we decide that the motion sensor is not giving accurate data (collecting data from surroundings, not centralized on filament tray), we would come up with methods of blocking the motion sensor's signals in order to focus primarily on the filament tray. One way of doing this would be enclosing the motion sensor in a thick but compactable box, opening one end of the box in the direction of the filament tray so we block the signals in all directions except for the desired direction.

4.2.2 3D Printer Malfunctions

Another potential risk of the plastic filament getting lodged and stuck in the 3D printer or 3D printer malfunctions are both legit risks that can cause the motion sensor to tell the user that a print is finished when it is not. Having the tubes of filament expanded so filament never gets stuck is not a tangible option but telling the employees to be more aware of the 3D printers is a way to mitigate this risk.

4.2.3 Motion Detection

Finally, another possible risk is if the motion sensor does not detect the signals that are projected from the motion sensor cannot be collected because it is too dark to receive light input. If signals are blocked then the motion sensor is triggered saying there is movement, giving us false information. To fix this we could enclose the sensor in a box, then make sure the box is made of transparent material so light can be emitted and received.

5. Gantt Chart

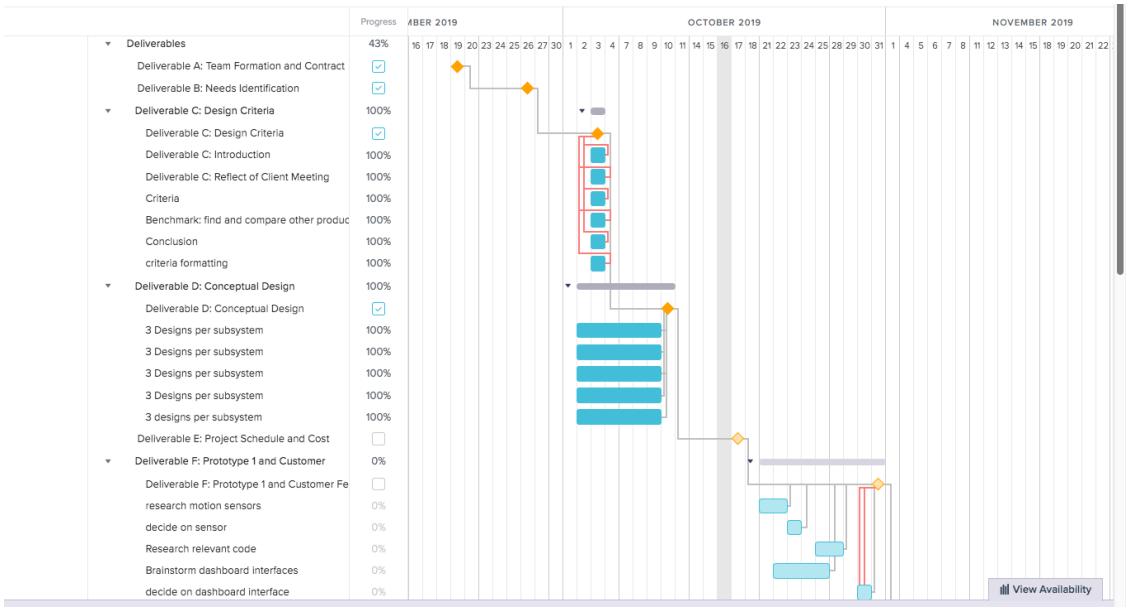

Figure 2 Upper Half of Gantt Chart

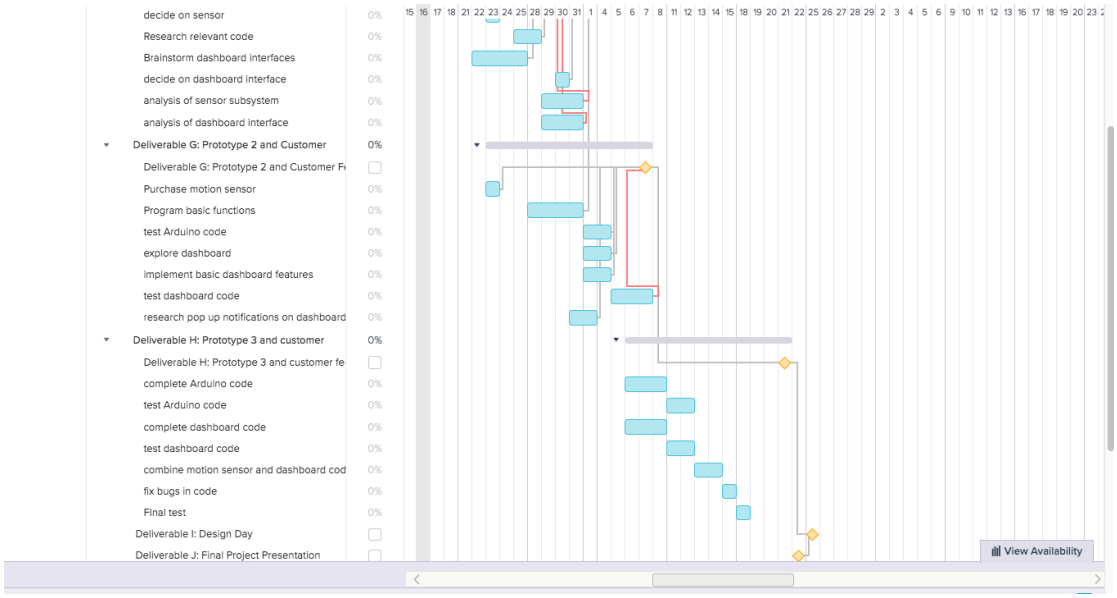

Figure 3 Lower Half of Gantt Chart

6. Conclusion

This document states the task for the next three deliverable. Each task will then be assigned to a specific group member or assigned to the team. Our project has a budget of one hundred dollars, therefore our budget estimate has been established for the three prototypes. Our chosen concept has been modified after the client meeting, and all potential risk factors such as

motion sensor signals detecting other movements, printer malfunctions and motion detection. We are set to continue on for our prototype one with our newly modified concept of a motion detector in the filament tray, we have prepared a backup plan based on our potential risk and are prepared for the approaching obstacles.