# GNG1103 Deliverable F: Prototype 1 and Customer Feedback

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#### 1. Introduction

In the following report we will be discussing our first prototype along with it's feedback. First, we will outline our prototype test plan. This plan will include the concept we are testing along with the purpose and method of testing. Next, we will do an analysis of the monitoring and alerting subsystems. After, we will share the feedback that we received from the testing of our product. Last, we will present our finished prototype 1. This document will contain the project's first prototype along with its test plan and feedback.

## 2. Prototyping Test Plan

## 2.1 Purpose of Test

For prototype 1, we will be focusing on a conceptual design for our project of using motion sensors to detect motion of filament to alert CEED employees that a project is finished printing. We will first brainstorm through group discussions and basic sketches for a Dashboard platform that would make it very easy for CEED employees and users to understand what is displayed on the screen. We want to create a design for what the Dashboard program would look like so that the new CEED users that rotate shifts, are able to quickly and effectively understand the program and verify 3-d printers that are done the printing. We also want to test the motion sensor to see if it will accurately and effectively record the filament's movement, we understand that the motion of the filament moving through the tube may seem stationary to the motion detector because it is moving so slowly. If this is the case, we would use the wheel where the filament is wrapped to detect movement. The general objective of this prototype is to gain feedback from CEED employees, Ross customers that will help us better de-risk and learn what changes need to be made.



# 2.2 Test Objectives Description

-Things we want to test

- If the motion sensor is able to detect filament movement
- -If the motion sensor is able to detect the filament wheel movement

- If the dashboard platform we sketch/brainstorm is self-explanatory and easy to use for CEED users
- Reduce uncertainty
- Receive feedback from client/users
- Reduce risk

## 2.3 What exactly is being learned or communicated with the prototype?

- Sketching a basic design of what we want the Dashboard platform will look like and prototyping it will help us learn if it is self-explanatory and easy enough to use that a new CEED employee is able to quickly understand how to use it.
- Potential risks and uncertainties, areas of topics about Arduino/Dashboard that we need to learn more about.
- Our prototype design would be a visual representation concept of how we would alert when 3-D printing is complete.
- Where we need to place the motion sensor to detect motion accurately.

## **2.4 Possible types of results**

- Motion sensor only able to detect movement of wheel/filament
- client/users find dashboard platform too difficult to use
- client /users find dashboard platform easy to use

#### 2.5 How the results be used to make decisions or select concepts

- Based on feedback received from experts we should have a better idea of where we should place the motion sensor to have the best success in future prototypes.
- If clients decide that the Dashboard platform is too complicated we would interview and ask questions on what would make it easier to use, and use the new information to design a new platform based on client feedback.

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#### 2.6 Criteria for test success or failure

- Success for the motion sensors would be that it if our drawing clearly show our idea and that experts consulted feel that are concept will detect the movement of either the filament tray or the filament wheel
- Failure for the motion sensors would be if experts feel that our sensor will be unable/inaccurately to detect the movement of the filament tray and/or wheel
- Success for the Dashboard platform would be for the client to understand how our design concept is supposed to work and give constructive feedback on how we could improve it
- Failure for the Dashboard platform would be the client needing to ask multiple questions on how our design concept is supposed to work.

#### 2.7 What is going on and how is it being done

- Prototype 1 will be a focused prototype because we are getting feedback on a few attributes of our final product. (motion sensor capability, Dashboard platform). Prototype 1 is a focused

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prototype because we are only implementing a few attributes of the Dashboard platform in a sketch format for feedback purposes.

- We are also looking to answer questions we have regarding both the motion sensor and the Dashboard. (Questions such as..)
  - Will the motion sensor detect movement of the filament/wheel?
  - If the filament movement in the tube to slow for movement to be detected?
  - Will placing the motion sensor to the wheel allow the motion sensor to detect movement?
  - Is the Dashboard platform clean, aesthetically pleasing and informative?
- We will also be designing multiple possible Dashboard platform sketches to have more Diversity. This would help us gather information on what the client likes and doesn't like to be able to implement this feedback into a final sketch.
- Finally, having our Dashboard Designs only being sketches describes it as a focused prototype but the motion sensor aspect of our project is able to be tested.

#### 2.8 Testing process

Once we have purchased all of our material (arduino, wires, motion sensors) and have done enough research about Arduino and Dashboard, our first test would be with the motion sensors. Using our motion sensors, wires and Arduino, we would attempt to find an ideal spot where there will be movement when printing is in process by asking for opinions from an expert. Potential sites are the filament tray and the wheel behind the printer. For prototype 2, we would test to see how we would communicate the motion sensor to the Dashboard. Upon finishing our Dashboard program, we would run tests by exposing motion sensors to something movement then something stationary. If that works we would then test it for the chosen location on the 3-D printer.

#### 2.9 Information being measured

#### 2.9.1 Non-functional

- How quickly and effective users can understand our Dashboard platform
- How much clients liked our design

#### 2.10 Information being observed and how is it being recorded

#### 2.10.1 Non-Functional

- If the client needs to ask multiple questions on how to use our given design Dashboard concept
- Observations would be feedback regarding the Dashboard and motion sensor from client feedback

#### 2.11 What materials are required and what is the approximate estimated cost?

#### 2.11.1 Material we purchase

- Arduino, motion sensors, wires, material to create a box

#### 2.11.2 Estimated cost

- \$29

## 2.11.3 University material

3-D printer, CEED employee

### 2.12 Work to be done

- We need to do some self-learning on both Arduino and Dashboard programs and understand the basics.
- Further research on how to connect motion sensors to Arduino needs to be done.
- Further research on how to use Dashboard and how to actually create the designed platform on Dashboard.
- Further research on how to connect the Dashboard to interact with the Arduino
- Further research on how the motion sensors will detect motion and alert Dashboard

## 3. Analysis of Prototype Test Plan

Our prototype 1 is very conceptual, its purpose is to see our ideas are easily understood by potential users. After the completion of this prototype we will have no actual proof that our plan will succeed. Our prototype will be validated by the expertise of individuals we seek out for feedback. This is a good method because we have very little existing knowledge on 3D printers, motion sensors or dashboard interface. By having a conceptual prototype we will be able to seek advice from individuals who have worked with these things before and can tell us potential issues with our prototype. Our simple drawings of our prototypes will have enough detail as to clearly communicate the final idea of our project. All user interface features are clearly indicated in the prototype. This prototype is just for the purpose of gaining feedback on appearance and usability of user interface. Analysis will be taken in future prototypes.

#### 4. Analysis of prototype

#### 4.1 Analysis : Sensor Subsystem

Currently we plan to place the motion behind the 3D printer and aim it towards the spool of filament so that when the 3D printer is printing the spool will spin as the filament is being used and the motion sensor will detect that. Once the print is done and the spool will stop spinning and the motion sensor will not longer detect motion and send that information to dashboard to alert the CEED employee that the print is complete. However, the spool spins quite slowly so we are not sure if the motion sensor will detect the movement. We will test it and move the sensor elsewhere is the motion can't detect the movement of the spool



## 4.2 Analysis : Dashboard Interface

We decided to prominently place the Makerspace logo at the top to clearly indicate what CEED space the interface is for. Just beneath that, there is a grid which would contain as many boxes as there are 3D printers in Makerspace because each box represents a 3D printer. The colour of each box would indicate the status of the 3D printer with the corresponding number. Green means available, yellow means in use, red means the print is done and ready for pick up, and lastly grey would indicate that the printer is out of order. On the right side of the screen are buttons that will allow the CEED employees to change the status of the box to match the printer. Users will click the select button, then choose the box or boxes that they want to change the status of and then select the status that they want to change the box to. The select button is added so that users can change the status of multiple boxes at the same time.



#### 5. Feedback

#### 5.1 Ceed Employee 1 Feedback:

Employee 1 loved it

Ceed Employee 1 feedback:

Our design would be great because it would make things much more organized. This organization could help them stop losing as many S-D cards.

Really liked the idea of having all the printers layed out and color coded. This made it very easy for him to analyze and understand which printers are doing what.( in printing progress, available, out of order) **5.2 Ceed Employee 2 Feedback:** 

Our design was nice and clean, liked having all the printers laid out and color coded. He would have liked to have more buttons on the Dashboard. Maybe for timers, clocks, filament available till empty. He thought it would also be helpful for them to know what color filament specifc filament print out.

# 5.3 Ceed Employee 3 Feedback:

Thinks the simplicity of the design makes it clear, easy and quick to use. Likes being able to click on the printer and being able to see the status instead of walking to check. She would have liked if they were displayed in a horizontal table opposed to the square.

#### 6. Conclusion

After our initial prototype we will move forward with our prototype 2 based on our current drawing. Our drawing was determined to be simple enough to understand based on the feedback we received from CEED employees. We will use this drawing as a guide for creating a user interface in dashboard for prototype 2. We initially wanted to place the motion sensor to detect motion of the filament but after we showed our prototype to experienced motion sensor user we learned that we may have difficulty detecting the filament movement since it is a constant stream. For this reason we have decided to place the motion sensor to detect motion on the wheel. We are now ready to move forward to prototype 2 which will be an analytical prototype.