

GNG1103

Deliverable H

Prototype 3 and Customer Feedback

Submitted by

A01, TEAM 14

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Abstract

Throughout this paper, the team will outline a prototyping test plan and develop a prototype that will be used to achieve the objectives of the plan. The team will also analyze critical subsystems, the results of which will allow the team to reduce uncertainty in future prototypes and use our analysis to improve on our product.

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List of Acronyms

Acronym	Definition
CEED	Centre for Entrepreneurship & Engineering Design
SD	Secure Digital
STEM	Science-Technology-Engineering-Mathematics
ETC	Estimated Time of Completion

1. Introduction

The goal of this document is to display and explain the purposes of our third prototype. Changes were made to the layout of the DashBoard and the functions behind it based off feedback from each prototype made. Hardware prototyping was started from prototype 2 and will be finalized in this prototype. The circuit design, made from prototype 2, will be physically completed to connect the limit switch, NodeMCU and DashBoard together so comprehensive testing can be done. The second prototype allowed the team to fully envision the final look of the DashBoard panel layout, as a result our third prototype will be of high fidelity and testing will be as comprehensive as possible. A box will be made to house the circuit and attached to a mock 3D printer for testing. The team will also design the wifi connection of the NodeMCU to the DashBoard panel and an email response system for when prints are finished.

2. Prototyping

2.1 Testing Purposes

- Revamp layout of DashBoard interface in response to customer feedback
- Set up DashBoard listening server to allow NodeMCU to give data
- Finalize design of Dashboard panel
- Connect limit switch to system to enable 3D printer start/finish notifications
- Ensure that email response system works
- To ensure that overall system works and functions as planned
- Design NodeMCU enclosure to attach to 3D printer
- Measure response time of limit switch to available/not available change on DashBoard

Overall: Finalize the design of the DashBoard panel. Ensure that all hardware components are functional along with the connections.

2.2 Design Concept

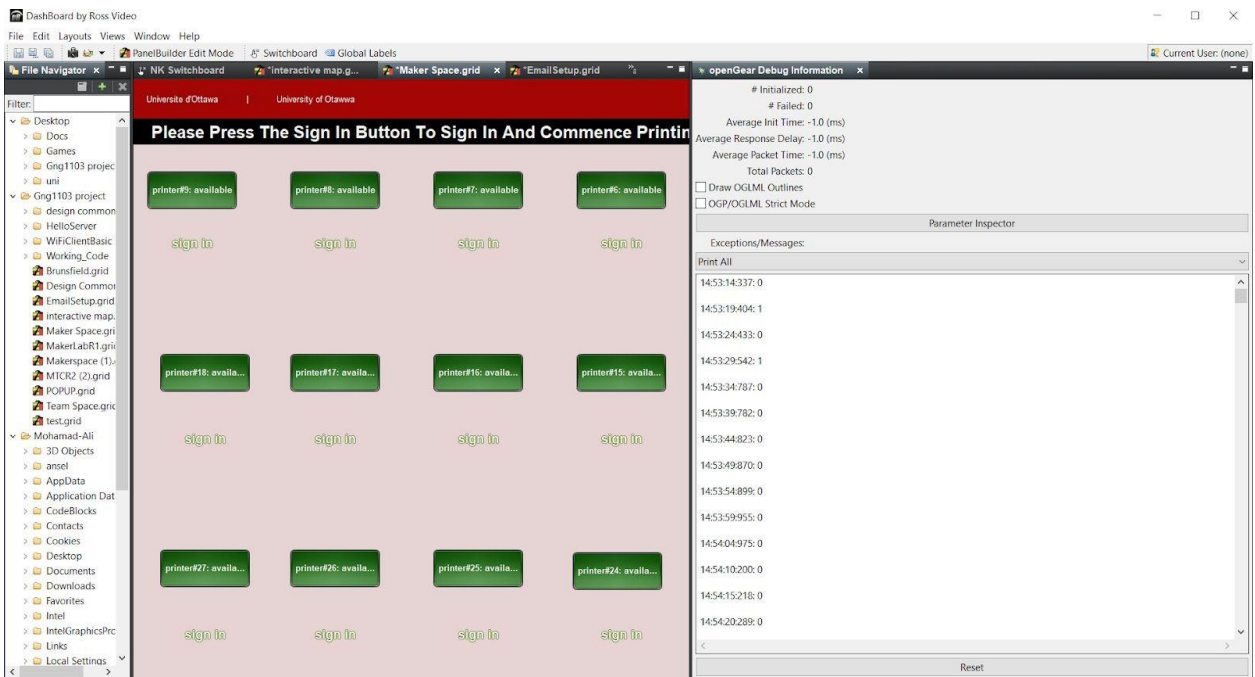
Following the feedback from Prototype 2 and the pitch presentations, we have stopped pursuing the idea of hosting our project on a website as well due to the client's concerns with implementing it. For our final prototype we wanted to ensure that the listener server was set-up successfully and integrated into our system so that we can finalize the project.

For our email automation, we had to discard the idea as we realized that an Arduino cannot access files directly to read or write on a laptop. This meant that we had to set up a listener server on the end of the laptop to listen to the same port as the Arduino is sending to. Then it will launch a program when it reads different numbers. This is something we did not have enough experience with and would take us more time than we had to complete.

Instead, our product operates by the following:

When the user types in their email, the email, along with the time, is saved on a .txt file. The CEED employee will then copy that email, paste it into an already set template, and then run the code. This code will send an email specifying that the print is done to an email address provided by the user. The whole process will not take the CEED employee more than 30 seconds.

Regarding the coding, we managed to connect the Arduino to the hotspot of the laptop. After that, it sends the current state of the switch to the port 8080. When the switch is on, it will send 1, and when off, 0. The DashBoard now receives the state of the switch and changes the colour accordingly.



In addition, Jason created a mock 3D printer to test our limit switch. This was done to test the limit switch in a mock environment as well as showcase it in that mock environment during the final presentation.

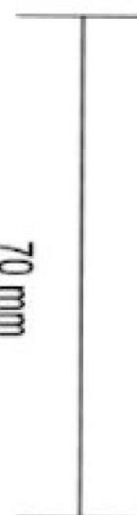
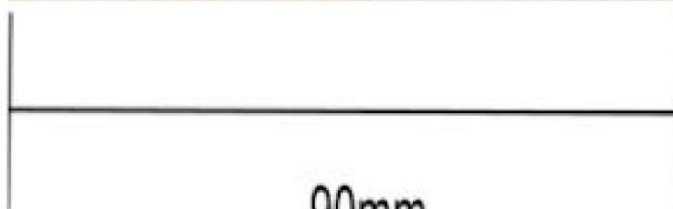
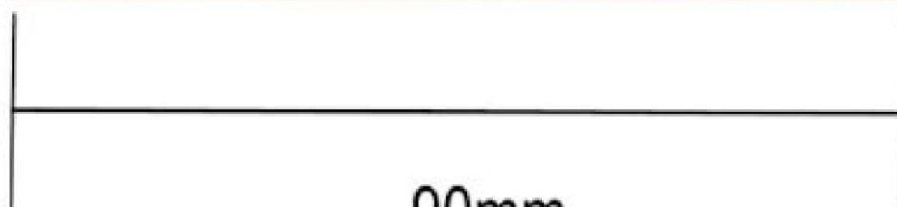


We also soldered the Arduino and created a housing for it:

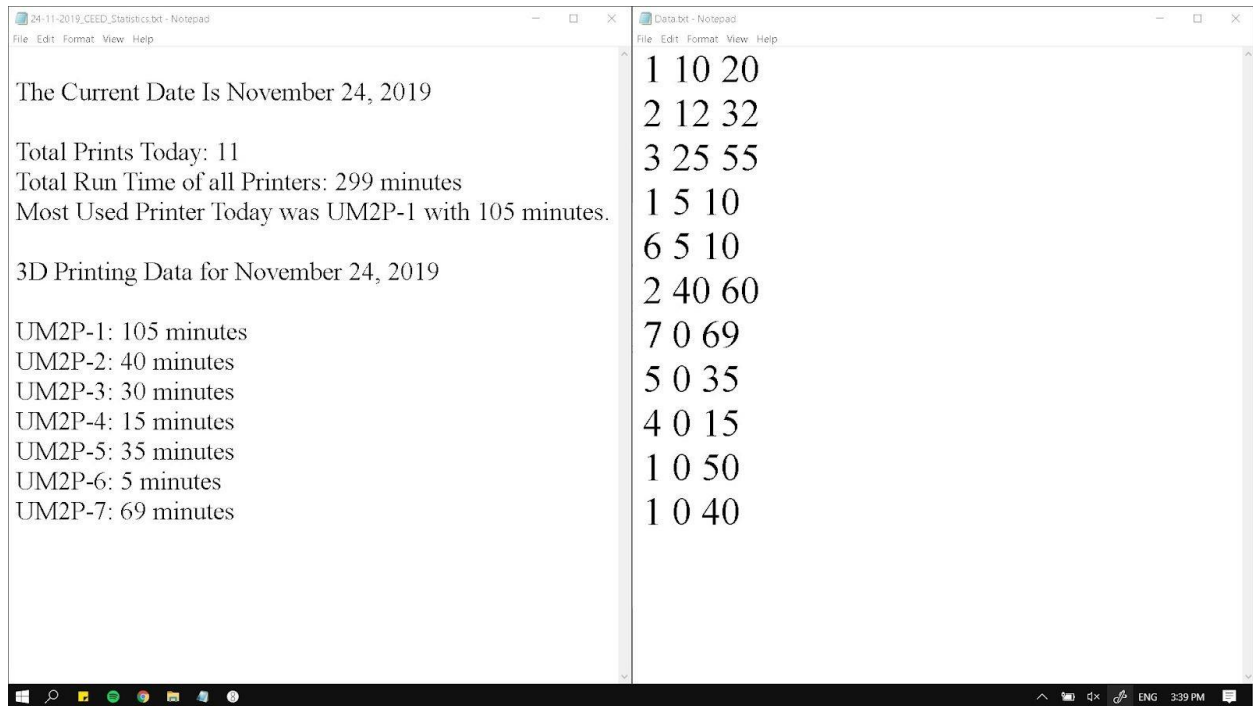


We thought that this housing did not look good, so we laser cut another one of these with dimensions: 70mm*90mm*40mm.





Alex also coded a Python script that takes raw data from a text file that would be written by the arduino and organizes it into a formatted text file. Unfortunately, we did not have enough time to implement it. The Python script was fully automated and would be run by Windows Task Scheduler at whatever time the CEED staff wanted. It would create a txt file with the current date as the title and include the information seen below.



2.3 Testing

Prototype 3 was mostly about finalizing aspects of our project and to test the project as a whole. With all our physical components we set up each system and then integrated the software code with the physical systems.

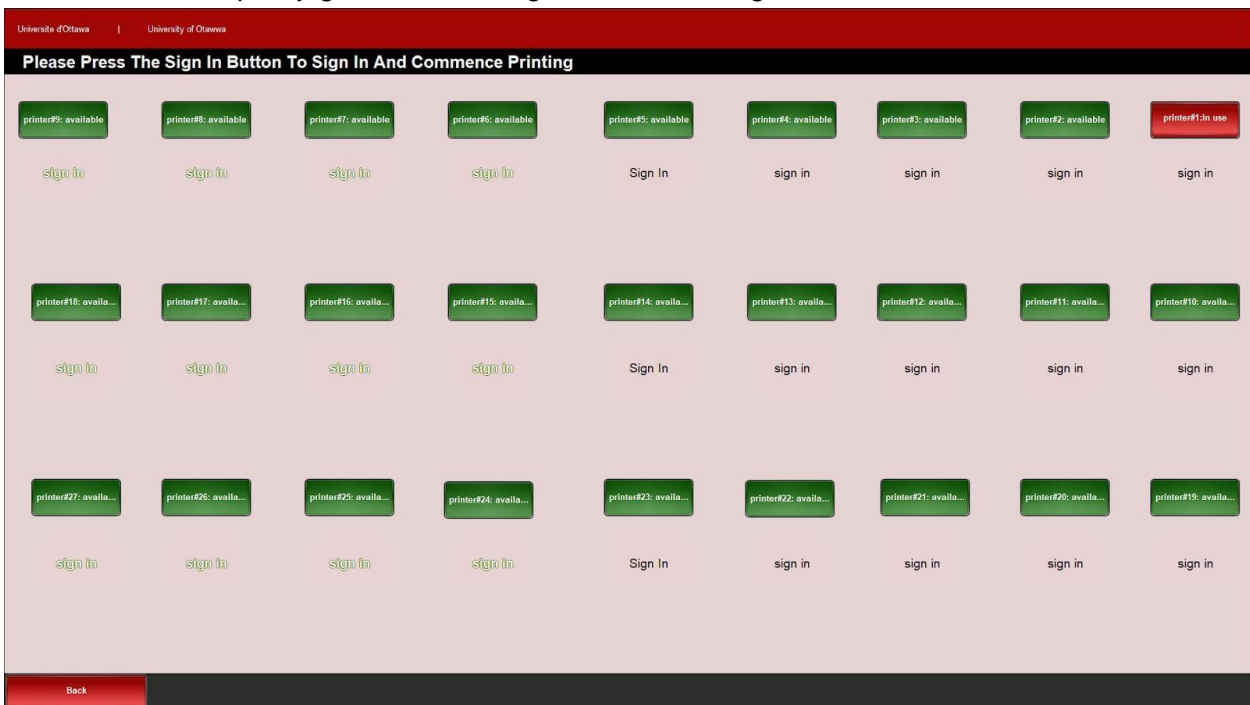
Design testing was done by asking various people throughout the day at MakerSpace about several design ideas and choices. Those of which include, but are not limited to, text colours, sizes and styles, as well as any prompts people would like to see. This is what we changed:

- The color of the sign in button
- Text style of the sign in button
- Added a prompt to let the user know that the email was copied.

In addition to that, we measured the response time and difference between the time the switch was pressed and the color change response on Dashboard 3.5 seconds to change to available. 2 seconds to change to in use.

The time also depends on whether the button was pressed at the beginning or the end of the loop cycle.

Overall times were pretty good considering this was working over wifi.



//shows the different fonts and colors used//

3. Validation

Prototype 3 has presented us with an opportunity to see the fruition of our efforts and hard work of the last three months. Although many ideas have been put away, the one that we have continued to work on show very good promise currently. The limit switch circuit works very well and with a listener in place it sends out data almost instantly, allowing for fast, accurate representations of availability. Furthermore, after testing different design concepts with CEED users, there has been a good response to the current design choices and colours. While the email system is not yet automatic, the current method for doing it could be upgraded to be automatic if given more time. Since none of us had any experience in coding prior to this, the time constraint limited the progress we could make. Moving forward, the next steps for this product would be automation and integration of the email system into the DashBoard, as well as continuing with ideas that have been dropped due to time constraints.

4. Transfer of Knowledge

For this deliverable, we have made constant references to previous deliverables to keep us on track. Deliverable E was used along with our constantly updated Gantt chart to ensure that each member knew what they were doing and when they had to complete it by. This made

it easier for us as a team to keep track of all the tasks for this deliverable. Deliverable D was used to ensure that each task in making this prototype was made with the customer's needs in mind. Deliverable F and G was constantly used to look ahead and make steps for completing prototype 3 (Deliverable H). Tutorials from Ross Video DashBoard were used to make final improvements on the project, including setting up the listener server and finalizing connections between each component.

5. Conclusion

In conclusion, this last prototype of the project continued to work on the strong foundation established before. With a functional method of changing the availability through the limit switch, as well as a way to send the emails, we are very confident in the work that we have done. With more time, next steps would be to upgrade the email system to be automatic, with less user input, as well as implementing more 3D printers to further demonstrate the capabilities of our DashBoard. All in all, we are proud of our product and what we have managed to complete within our time and budget constraints.

6. Further Thoughts

This last prototype has been stressful but rewarding at the same time. Knowing that the course is almost up, our drive has gone up and we all worked very hard to complete the things we really wanted to implement. Throughout this project, we have learnt to work together as a team on a bigger goal, utilizing everyone's strengths to complete our ideas to the best of our abilities. Looking forward, we have also learned many new skills and honed others, including the use of 3D printers, laser cutters. Looking back, we can remember the struggles of designing, and the new learnt method to break it down into 5 easy steps.

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