

GNG1103
Technical Report

Prototype II and Customer Feedback

Submitted by

Project Group 19

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Date: November 7, 2019

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Abstract

This project is being executed because we want to solve problems regarding the automation of STEM. We have empathized with our clients by becoming users in their space and listening to their needs. We then defined a problem statement in which we highlighted the main problems. We have ideated to assist in brainstorming possible designs and solutions. We created an initial prototype in which it deemed successful based on our criteria to evaluate it. Our second prototype was successful as well. We are looking to put more time and effort into the user interface for the future.

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List of Acronyms

Acronym	Meaning
UI	User Interface

Table 1: List of Acronyms

Introduction

In order to deliver information about the timing of the prints, the availability of printers, while also being able to monitor the progression of the print, a user interface is needed. To ensure the least amount of time is wasted for the users while also making sure that 3D printing at Makerspace is simple, our group is pursuing a solution to guide users by using a UI that is powered by Ross Video. We aim to design a UI that is simple to use and straight forward. It must display the retrieved values from OctoPrint such as the time remaining for the print to complete and how much of the print has been completed. Within this report we will discuss how we created our bare bone UI. We will also discuss the tests that occurred involving the UI as well as creating multiple instances of OctoPrint.

1.1 Problem Statement

We want to design a system with a user interface that help automating the use of 3D printers while eliminating the troubles with SD cards to enhance the user and staff experience with 3D printing, organizing, time management, and ease of use.

2 Design for Prototype II

The prototype consists of using one raspberry pi, four 3D printers, one computer, one power source, four printer cables and multiple instances of OctoPrint. Each instance will connect to the same raspberry pi. The g-code is then uploaded from OctoPrint to the desired printer from the web browser.

Our group is making a UI that indicates if a printer is in use or not. The UI will display the printer to be “Occupied” by turning the button red. On the button, the time left for the print will also be indicated with a live countdown that will be obtained with a response file from the GET request. The UI will then parse through the response file to continuously update the time of the print.

Our UI will also have an “Available” category as seen in Figure 1 that will be represented by the green colored buttons when there is no print job in queue. The amount of time remaining before MakerSpace closes is also displayed to the user to indicate if their print can be completed within the open hours of MakerSpace. The estimated print time is compared with the open hours of MakerSpace to allow or deny prints that are too long.

Information from the OctoPrint web interface is then displayed in the UI through HTTP GET requests. This is possible because each instance of OctoPrint has its own API key, which prevents any mix up in which printer is being requested the information. The estimated print time and the percent completed is then displayed in the UI. Web requests are constantly made to update the UI because the estimated completion time of the print is subject to change.

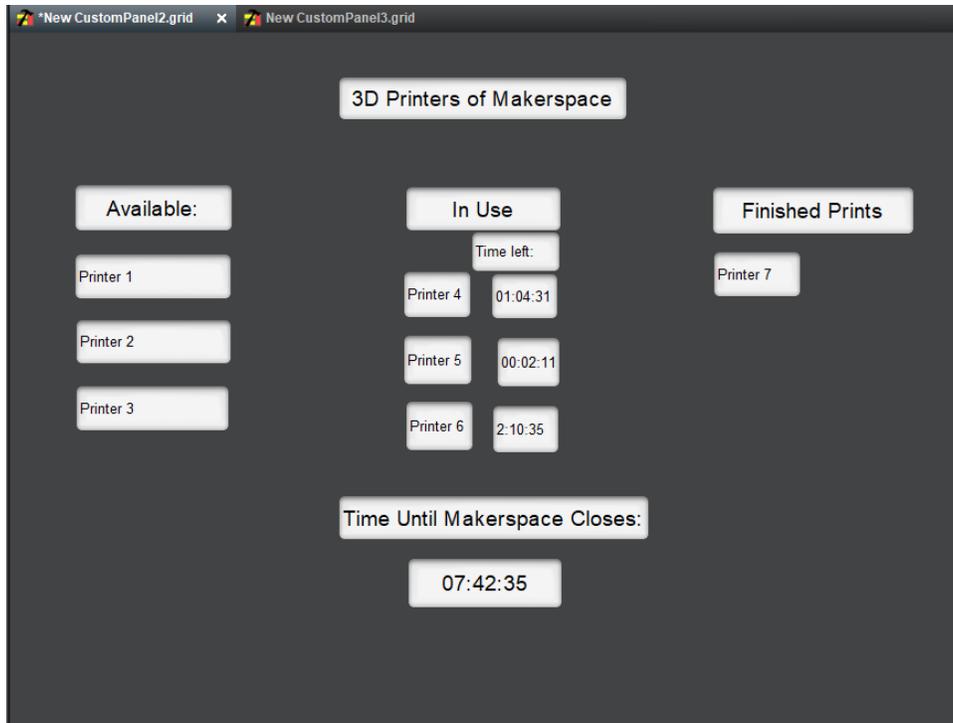


Figure 1: Bare Bone UI

3 Bill of Materials

Table 2: Bill of Materials

Part Name	Picture of Template	Description/ Specification	Quantity	Cost (CAD)
Raspberry Pi		N/A	1	\$55.97
Micro SD		16 GB	1	\$9.30
Printer Cable		6ft/1.8m	1	\$4.43
Printer Cable		6ft/1.8m	3	\$4.60
3D Printed Case + Stand		ABS/PLA	1	\$0
Wall plug		3 Amp/5Volt	1	13.99
TOTAL COST(GST=\$3.59)				\$101.08

4 Project Plan and Execution

The plan for this prototype includes making multiple instances of OctoPrint and assigning each instance to a port on the IP address of the raspberry pi. We then plan on making a static IP address for the raspberry pi to prevent it from changing constantly throughout our design.

5 Prototyping and Testing, Customer Feedback

A successful test will be when the g-code is sent to the 3D printer wirelessly and the print completes. This data will be tracked with successful prints to attempted prints ratio. The data will be manually tracked. The test will be complete when there are two consecutive short and long prints are made. The short prints will be anywhere from 10 to 15 minutes and the long print will be anywhere from 30 to 60 minutes.

Short and long prints were successfully completed. OctoPrint was successfully able to manage the print settings to produce high quality results.

Our initial prototype consists of a raspberry pi inside a 3D printed case as seen in Figure 2. This is connected to a power supply to power the pi and the pi is connected to the 3D printer via a printer cable as seen in Figure 3. The g-code is uploaded through the OctoPrint web interface as seen in Figure 4.

After receiving feedback from CEED staff member and from the pitch presentation, we realized that we need to work on the UI more and be able to integrate HTTP GET Requests with Ross Video Dashboard. Also, judging by the feedback we received, we were able to realize that we need to refine the UI to be simpler and easier to view. Our incorporates a variety of solutions to our client's problems as opposed to just one.



Figure 2: Raspberry Pi and 3D Printed Case

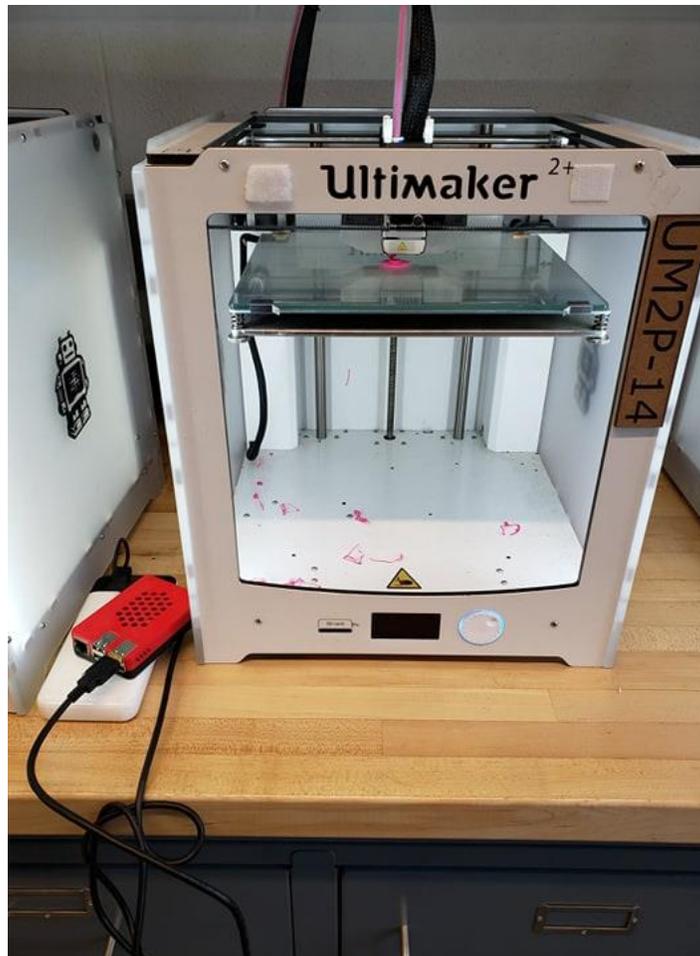


Figure 3: Raspberry Pi Connection with One Printer



Figure 4: OctoPrint Web Interface

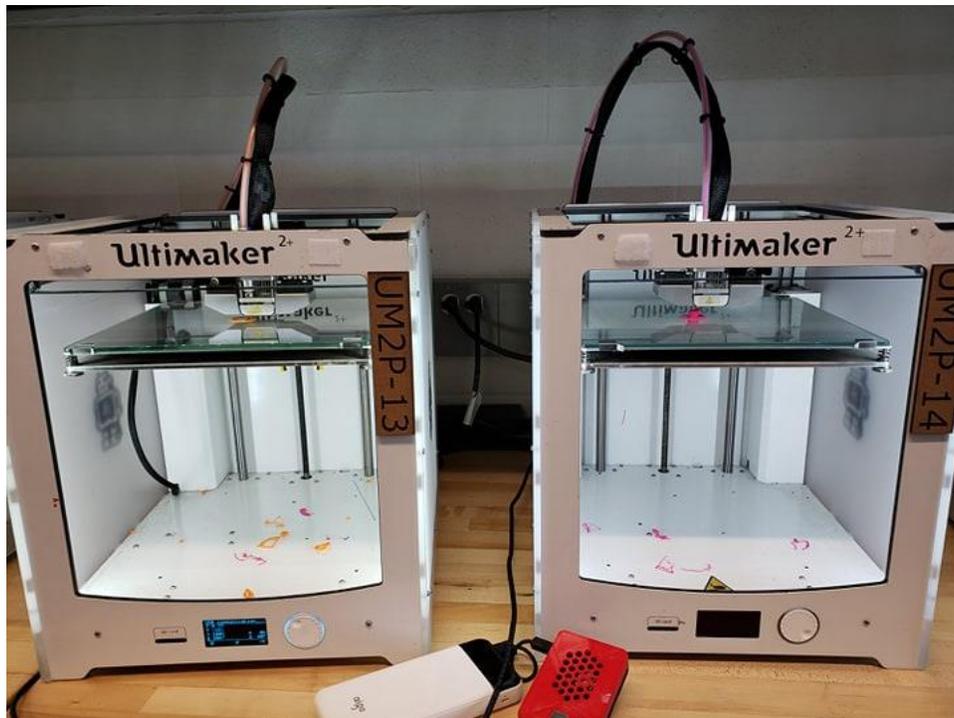


Figure 5: Testing Multiple Prints at Once

6 Analysis:

After attempting to implement values from OctoPrint into Dashboard, we ran into several issues. One issue was that we could not make a button that would transfer to different categories in the UI. We realized that we need to make the buttons stationary and display the retrieved values in a static button. Furthermore, with our current knowledge, we are unable to implement a condition between allowing a print and comparing it to the closing time of MakerSpace in Dashboard. Based on our concept design and what is possible to achieve with Dashboard, this prototype would be labeled as medium to low fidelity.

We planned on uploading the g-code from Dashboard, however this was not an ideal solution because the web interface was much easier to use.

After testing multiple instances, we ran into some problems with prints being cut off half way. We realized this was due to the lack of power and we placed an order for a power supply that was more compatible with the raspberry pi. To add, majority of this prototype was successful, we were able to set a static IP address, create multiple instances of OctoPrint, and we were able to run simultaneous prints. The UI could use more work as we were unable to retrieve values from OctoPrint to display in the UI. This was due to the lack of knowledge in Dashboard. We have started emailing Ross Video for assistance on implementing our solution in Dashboard.

7 Conclusions and Recommendations for Future Work

We deem our prototype as successful because it went as according to plan which was being able to successfully start multiple prints at once. Adding on, many of the recurring problems we encountered were solved and so far, we were able to connect the pi to two printer and have two successful prints. In the future, we plan on putting more focus and effort into completing the UI with assistance from Ross Video. Using Trello, helped us stay on track to complete prototype one and assisted in distributing the workload amongst the team. We plan on sticking to the created schedule to stay on track and execute our project accordingly.