GNG1103

Deliverable D: Conceptual Design

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Deliverable D

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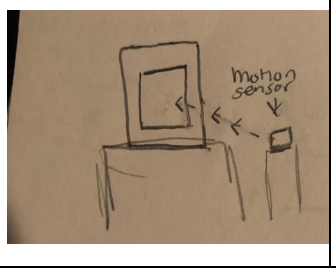
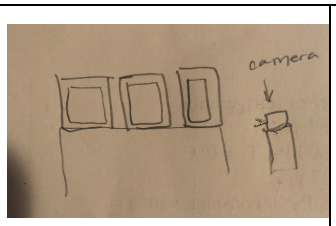
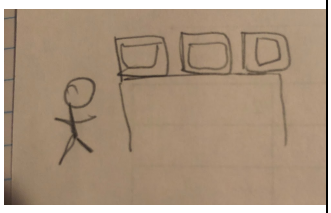
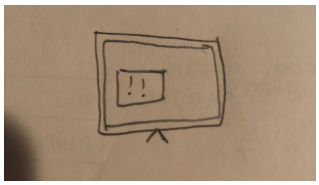
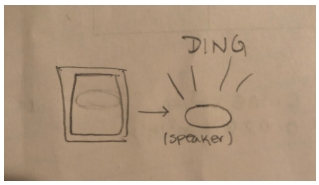
1. Introduction

In this document, each group member will display their three individual concepts for each of our subsystems, which are based on our problem statement, benchmarking and our list of prioritized design criteria. Our individual ideas are evaluated and modified until three global concepts are established. The three global concepts are all feasible ideas to be used for our teams final project. A selection matrix is then used to compare our global concepts against the design criteria. Finally a concept will be chosen from the selection matrix which will be used as our main concept for the project. This document will compare and evaluate individual members concepts through a rigorous selection process until a single modified concept is chosen.

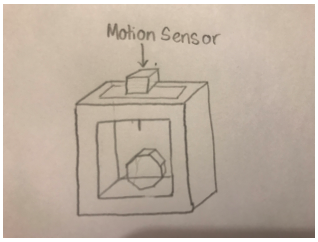
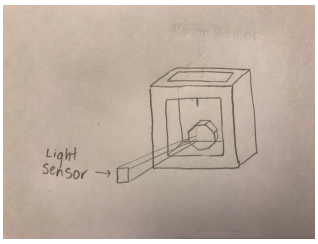
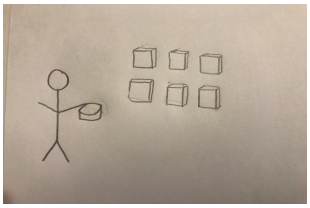
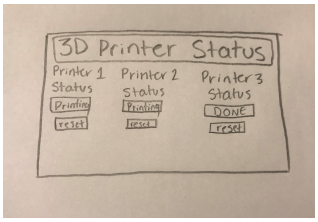
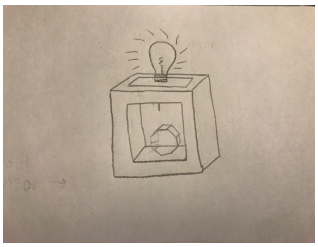
2. Individual Concepts

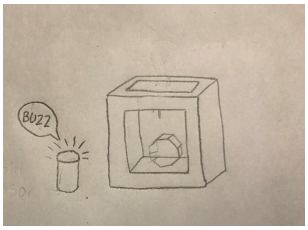
2.1 Erin

Monitoring	**Sketch**	**Description**
		A motion sensor will be hooked up to an arduino and positioned directly in front of a 3D printer. The motion sensor will detect when the motion in the printer stops.

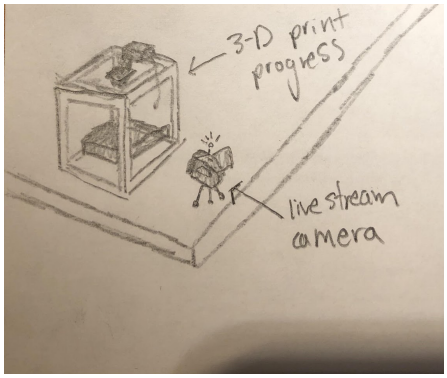
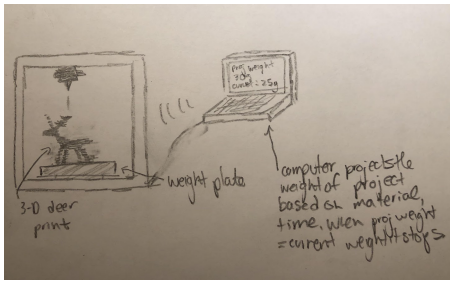
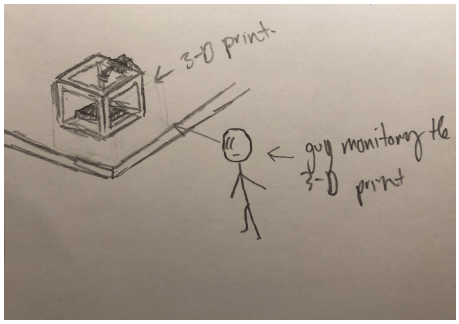
		A video camera will monitor all 3D printers simultaneously, the feed will be sent to a monitor that has a motion sensor.
		A volunteer will routinely check the 3D printer's progress every 30 minutes.
Alerting	**Sketch**	**Description**
		When a motion sensor senses a stop in motion, a pop up window will be sent to the main computer in the workspace with an alert.
		A "ding" noise will be set off when motion stops on a 3D printer. The noise will be played on a speaker which will alert the employees.
		Every 3D printer has a buzzer on it, when the motion stops in a specific printer that corresponding buzzer will go off.

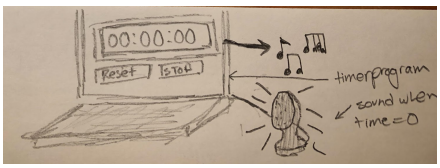
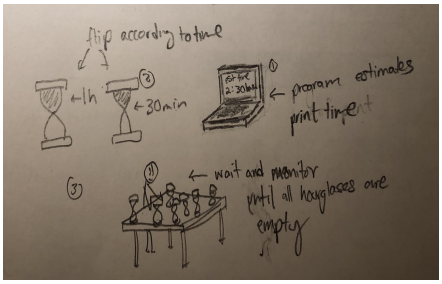
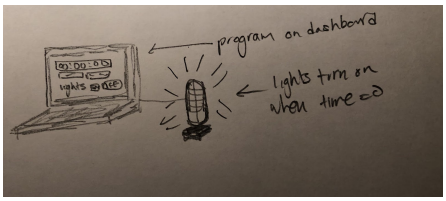
2.2 Carly

Monitoring	Sketch	Description
		A motion sensor which detects when the printer stops moving. The printer motion will indicate whether it is moving or not.
		A light sensor which indicates what 3-D printers are still running or if they have turned off.
		A system in which students who are working in the maker space can hit a button to indicate they have noticed a print job has been completed.
Alerting	**Sketch**	**Description**
		A dashboard screen which allows the CEED employees to check the status of the print job from his laptop.This would have a reset button to reset after the employee has retrieved the print.
		A light on the top of the printer that is large and bright enough so that the CEED employee can view it from the front desk.

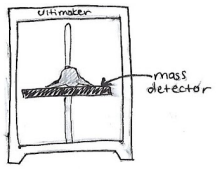
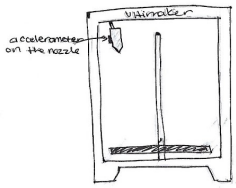
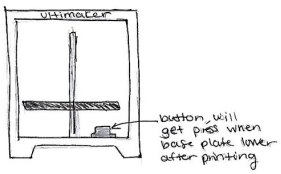
		A buzzer which will go off as soon as the print job is completed. This buzzer only will go off once as to not interrupt all of the students working.

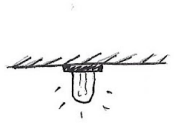
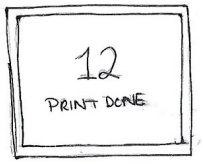
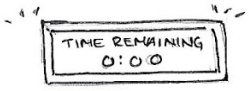
2.3 James

Monitoring	**Sketch**	**Description**
		Have a camera in front of each 3D printer and live stream its progress. It allows users to log in and watch when their printing is done.
		Have a weight plate under the printing surface and when a user prints something, it will give a projected weight and when that weight is met then the printing stops.
		A guy standing next to it: Have a CEED employee stand next to all the 3D printers and alert people when the print is done the printing.
Alerting	**Sketch**	**Description**

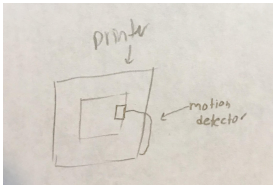
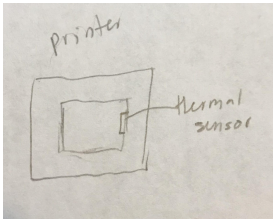
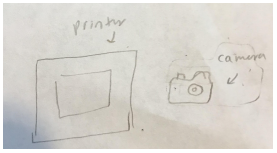
		Have a program that hooks up to an Arduino that automatically sets a timer when the user starts a print and sounds a noise/ song when print is done.
		Have multiple hourglasses that empty in 1hours 30 min and flip them all when the printing starts to the projected amount of time the print should take.
		Have a program that hooks up to Arduino that sets a timer to light and when the print is done a light lights up next to the machine.

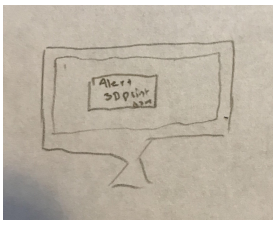
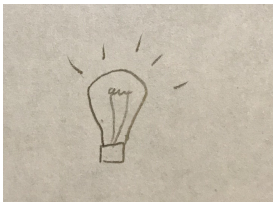
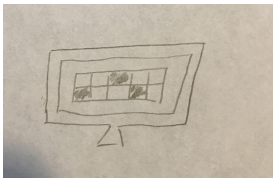
2.4 Lynne

Monitoring	**Sketch**	**Description**
		A mass detector is connected to the base plate of the 3D printer and once the mass stops increasing for about 30 seconds, it will inform the alerting system that the print is complete.
		An accelerometer is attached to the arm of the nozzle so it can detect when the printer is printing. Once the accelerometer reads zero for 10 seconds, it will communicate with the alerting system that the 3D printer is done printing.
		A button is placed at the bottom of the 3D printer below the base plate. Once the print is completed, the base plate will lower and hit the button. When the button is pushed, it will inform the alerting system that the print is done.

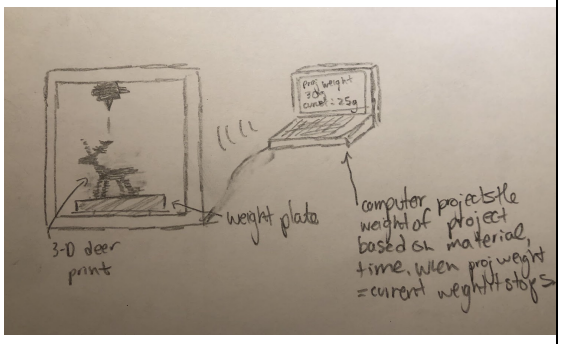
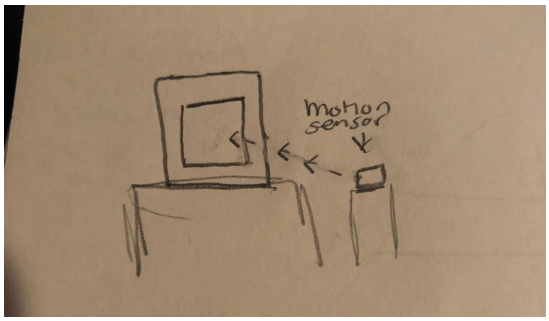
Alerting	Sketch	Description
		A light placed on the ceiling will start flashing when it receives information from the monitoring system that a print is complete.
		A screen is placed on the wall where it is clearly visible for the CEED workers. The screen will display that a print is done and the printer number once is receives information from the monitoring system.
		An alarm is placed at the 3D printer and when the print is completed, the alarm will go off.

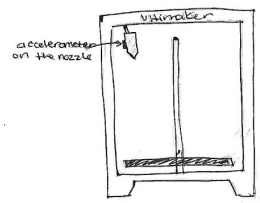
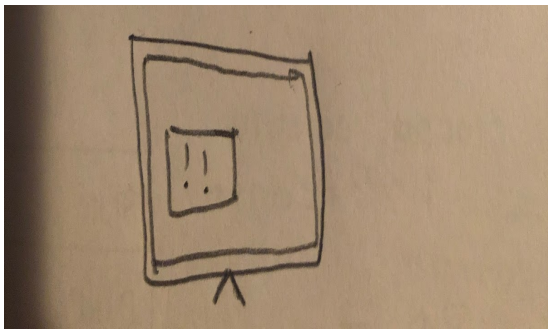
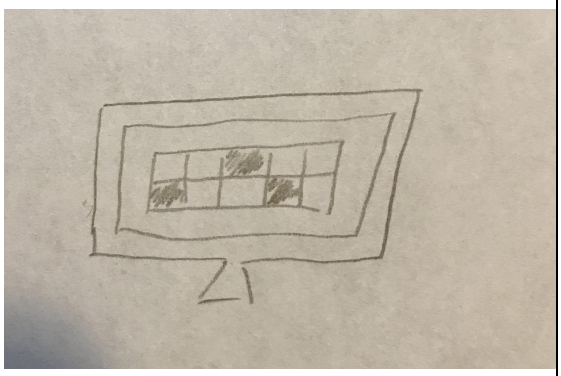
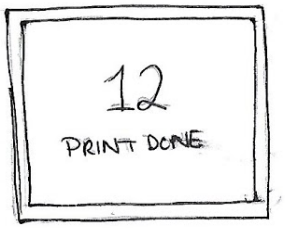
2.5 Sophia

Monitoring	Sketch	Description
		A motion detector attached to the printer that sends a signal when motion is complete.
		A thermal detector attached to the printer that sends out a signal when the temperature reaches a certain value.
		A camera monitoring the printer that has a live feed.
Alerting	**Sketch**	**Description**

		After receiving signal an alert pops up on employees monitor telling them that printer #n has completed its print
		After the print is complete and the signal is received the lightbulb turns on to indicate the print is complete
		A dashboard that has the grid corresponding to certain printer numbers. When the print is complete/printer is not in use the cell for that printer turns the corresponding colour.

3. Global Concepts

Monitoring	**Sketch**	**Description**
		Mass sensor: Have a weight plate under the printing bottom surface and when a user prints something, a program on Dashboard will give a projected weight and when that weight is met then the printing stops. This is good because you could incorporate dashboard.
		Motion sensor: A motion sensor will be positioned directly in front of a 3D printer. The motion sensor will detect when the motion in the printer stops. A motion sensor is a good choice because it is easy to use and reliable.

		Accelerometer: An accelerometer is attached to the arm of the nozzle and detects when the nozzle stops moving. An accelerometer is accurate, small and easily available.
Alerting	**Sketch**	**Description**
		Pop up notification on computer: Once a print is complete, a notification will pop up on the CEED computer alerting CEED employees that a print is done and to pick it up. This method can easily be done using dashboard. There is no additional cost and easy to implement.
		Dashboard grid: A dashboard that has the grid corresponding to certain printer numbers. When the print is complete/printer is not in use the cell for that printer turns the corresponding color. This method has no additional cost, and allows the employee to know which printers are available and in use.
		Display Monitor: A screen is placed on the wall where it is clearly visible for the CEED workers. The screen will display that a print is done. A display monitor is effective because it is easy to see, and user-friendly.

3.1 Selection Matrix

3.1.1 Monitoring

Specifications	Importance	Mass Sensor	Motion Sensor	Accelerometer
Cost	4	2	3	1
Weight	2	1	2	3
Dimensions	3	2	2	3
Aesthetics	1	1	2	3
Product life	3	3	2	1
Easy to use	5	2	1	3
Reliability	5	2	1	3
Total		46	40	55

3.1.2 Alerting

Specifications	Importance	Pop Up Notification	Dashboard Grid	Display Monitor
Cost	4	3	3	1
Weight	2	3	3	1
Dimensions	3	3	3	1
Aesthetics	1	2	3	3
Product life	3	3	3	2
Easy to use	5	3	3	3
Reliability	5	3	3	3
Total		68	69	48

3.2 Chosen Concept

After consideration of both the monitoring and alerting matrices, we have come to a 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.

4. Conclusion

This document contains each individual group members concepts for each subsystem. We used these preliminary ideas to come up with 3 global concepts. Each of these concepts was then put into a selection matrix to decide on a final concept for a project. The chosen concept for our project is an accelerometer to detect motion, as well as a dashboard grid to alert the CEED employee. Our final concept has been selected and we will proceed with it for the remaining deliverables.