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Learning Module: 4

Initial Paragraph

The goal we wish to accomplish by the end of the learning module is to learn about 3D modeling and create a unique design with with some hardware functionality to it, right now we are thinking of making a working safe using a fingerprint sensor. We plan to also utilize what we've learned from previous learning modules like arduino and soldering. Along the way we also will learn how to effectively use the 3d printer and CNC machine, learning to export the files and set up the parameters to make a real world model out of our designs.

The methods & resources we are using is the program Autodesk Fusion 360 which will be used to create our sketches and models for the printer and or CNC machine. Additionally we are going to need a solenoid lock, an Arduino Uno, a power source, and other small forms of hardware like wiring and mosfets. Our roles are essentially the same thing since we will be working on the same task together until we reach our objective. We will both be learning how to join electronic aspects, arduino software and mechanical aspects to develop a trifecta of skills and knowledge to create a working model of what we imagine.

Project Timeline:

On Day 1: We hope to do the installments and preparations on our laptops and finish the sketch of our model on the program. We also want to establish what coding language and what innovation we plan to create in the long-run. The essential concepts we have in mind are a safe with a fingerprint identification to open it or some-type of device that is controlled by a wireless handheld device.

On Days 2-4: We will be using this time to finish fleshing out the idea and working on the code and physical aspects of the project. This will be a key period to hit the ground running to utilize as much time as possible so we are able to finish by day 8.

On Days 5-8: We are developing the software and making a verification for any inputs that aren't in the database. We will do the final touches to our model and be working on the wiring on the product.

Daily Log

Day 1 (10/23/2019): We began working on installments and watching tutorials of where to begin the project. We saw many similar innovations and got inspired to model our safe completely from scratch & went through a list of what components we would need. We formulated the list of required parts and components to achieve our goal and discussed our limit of time and what would be required if we were to finish this project in time.

Day 2 (10/24/2019): Began working on the code and ordering hardware. Also began making simple dimensions of the safe on fusion 360.

Day 3 (10/28/2019): Finished first basic design, fleshed out the CAD model and only awaited for the parts to arrive to implement the correct measurements into the design.

Day 4 (10/29/2019): Added aesthetic touches to the model (text, handle design, fillets).

Day 5 (11/1/2019): Measured the parts and began incorporating them into the design. Hit roadblock with model size not being able to fit within the 3d printer build volume (Replicator+ in Willis's room). Thus began editing the CAD file to accommodate for the print size.

Day 6 (11/4/2019): Got news that the replicator + wouldn't be available to utilize due to complications with the printer thus now began making plans for the safe to be made at the CNC machine.

Day 7 (11/5/2019: Resorted to using Mr. Detrick's 3d printer and began formating/slicing the 3d file to craftbot

Day 8 (11/12/2019): Tried testing the arduino with the solenoid lock but was having issues with power, and setting up fingerprints. Went home reset code and rewired to make the fingerprint/solenoid function well together.

Josh's 2 hour

(10-30-19 @ 6pm-8pm): I brought the arduino kit at home and work with the library and the wiring. Tried adding some extra features with light bulbs but then I noticed there really isn't any point because of the design of our project. Then I hit a roadblock with the lock not having enough power source to properly function so I just wired everything correctly so it will be ready for school tomorrow.

Alex's Hours:

10/31/19: (2 hours 30 minutes @ 8pm - 10:30pm) recreated the design from scratch to fit the makerbot replicator+ build volume. Also began creating a backup model to be cut on the cnc if 3d printing proved to be unviable.

11/3/2019: (2 hours @ 9pm - 11pm) further incorporated the finishing touches on the sketch model and planned for the prospective future (whether we would 3d print or cnc, and which would be a better route to take)

11/4/2019: (2 hours @ 6pm - 8pm)) Continued working on other parts and attempted to format using the craftbot software before taking it in to print the next day.

11/5/2019: (1 hour 30 minutes) Stayed after school to start printing the door model.

11/8/2019: (5 hours @ 11am - 3pm and @9pm - 10pm) wrapped up final ideas and component sketches and began testing with different prints varying dimensions to find out what works best on a real world scale. Since 3d printing cant be 100% accurate I had to reprint and calibrate many settings to get the print quality at a stable level.

11/9/2019: (2 hours @ 10pm - 12am) redesigned some components (safe door) to accommodate for hinges and bolts. Got the final hardware (hinges, nuts, bolts) printed. Had the safe door printing overnight.

11/10/2019 (1:30 hour @ 12am - 1am) After the safe door had finished printing I began printing the frame-cap (connector between door and frame of the safe), and set up all other files for printing. Lasty putting the last pieces to print to hopefully to be done by tomorrow (the 11th).

11/11/2019 (5 hours @ 4pm - 9pm) Went home reset code and rewired to make the fingerprint/solenoid function well together. Did a lot of experimenting with a proper battery source that would provide the solenoid with enough amps to activate. And initially experimented with the wiring but managed to find proper wiring schematics online. Solution for power was to simply run two fully powered 9volt batteries in series. Also set up the large frame of the safe for printing cutting it close with the schedule.

11/12/2019 (5 hours @ 4pm - 9pm) Reprinted a couple pieces for a better appearance and aesthetic value. Spent a lot of time attaching the printed parts and electronics together to functional normally and as ergonomic as possible. Specifically modifying the safe body manually with a soldering iron to give room for some of the slots. Tried cleaning up blemishes and printing artifacts to have a presentable appearance. And did final functionality testing.

Final Report:

The group members of this project were Alex Suero and Josh Mercado. We had various goals at the start of this learning module. We wanted to begin by finding a project that would test our boundaries for the amount of time given. What can we do or make that will draw attention towards our strive, a clock, a car, a program but then we agreed on making the module on .
The resources we used were Fusion 360 which was used to create and design our models, a 3d printer to create tangible components of our design. Additionally we used a solenoid lock, an Arduino Uno, a power source, and other small forms of hardware like wiring and mosfets to make our module functional. The only essential issue or road block we came across was our power source which we were using batteries wasn't strong enough to power everything and especially the lock which we didn't realize until later that the simple solution was to get new batteries. We accomplished an original module for the school for them to use this for their own innovations and we accomplished making a safe completely from nothing with using a 3D printer. We learned a lot more about wiring, soldering, power sources, & using the arduino in a more efficient manner. We learn in this module how to bring 3D models from a software to life with a 3D printer which is how the safe was created. If we were to do this again we probably wouldn't cut the heads off the fingerprint wires & add even more functions to the product. Some highly recommended suggestions we would say is to get all the parts you need early into the module & plan out what each of you are doing like we did on the first day! It will come into your favor greatly if you plan everything effectively per person and make sure all your measurements for your design are accurate! Additional things we were going to do but for the sake of time we

couldn’t finish adding these features were to add an interior department to hide all the wires and the kit being visible. Another feature was to add a digital display screen to guide the user by the screen saying “Place finger” or “Invalid Finger” to sort of add more creativity in the design. Our overall experience was we had a great time creating and pushing our boundaries with the time limit. We would be willing to do something much bigger and original next time because of how much fun we had.