Introduction

In this report, we will be discussing the results of our 3rd and final prototype where we worked intensely on the hinge mechanism of the product along with some minor modifications on the "Dashboard" UI.

Why are we doing this prototype?

Up until this point, all our previous prototypes were focused prototypes where we simply testing certain aspects of the entire product. This time, we went to create a comprehensive prototype where we combined everything we've learned and achieved from the previous 2 prototypes into one final product.

Our objective for this prototype is to test the functionality of our design. In previous instances, we were able to confirm that the concept behind our idea is feasible and works very well. Now, we're simply putting all the pieces together and watching for how functional and easy to use the product is. We would also like to analyze how are critical subsystems functions with each other, those being the gate and the Arduino-Dashboard integration and how those 2 interact with one another. We would also like to minimize risk of the product failing due to errors we can avoid, such as gate breaking or losing connection between the Arduino and dashboard.

Results from last prototype

In our previous prototype design, we successfully integrated the "Arduino Node MCU" with "Dashboard". Turning the potentiometer between are our set "on" and "off" positions was being registered successfully and "Dashboard" was in turn indicating whether the machine was in use or not in use. However, the connection doesn't seem to get established 100% of the time, but rather only 50%-60% of the time. We assume this is due to the computer in use. The laptop that hosts the server that connects the Arduino to Dashboard is somewhat old, so we have since switched to a more powerful computer that should hopefully fix this problem.

In addition, we tested a spring and hinge mechanism which turned out to be a failure. Our initial hinge design was to be something similar to that of a door hinge that's loaded with a spring. However, after trying several times to design one that would fit our needs, we weren't able to make a hinge that could perform the function we intended it to. **ADD SKETCH OF DOOR HINGE DESIGN.**

Dashboard and Arduino Integration:

Hinge Design:

After many failed attempts of designing a hinge, we were finally able to create a hinge that would fit our needs that we are happy with. We went with a gate mechanism hinge, similar to what you'd see at the entrances of parking lots. The hinge itself is simply a spring that it's

attached to our 3D printed “gate” on one end and onto a cover piece on the opposite end. The gate requires *some* force to move up and out the way, but we believe with constant use the spring might loosen up a little and it’ll be a little easier to use. It was also designed in a way such that when an SD card is placed in, the gate won’t completely return to its original position and it will catch on the SD card sticking out the slot. This will be the mechanism in which the Arduino will convey an in use/out of use message. When the gate is completely closed, the printer is not in use. Whereas, when the gate is in the position where it’s catching on the SD card, this will indicate that the machine is in use.

The most important aspect this hinge has to live up to, is durability. For testing this, we moved the hinge up and then released it so that it could go back into its original position 100 times. If the hinge breaks during this test, the design would have to be redone again reinforcing the spring. There was a risk of the gate breaking since most of the parts are glued in together using super glue. However, the glue we obtained turned out to be incredibly strong. So, for this prototype, the glue would hold out fine. **INSERT IMAGES OF GATE.**

Customer feedback

In our last prototype, CEED had wanted to have the gate fully automated so that it doesn’t rely on the user making sure the gate was in the off/on position so that it could be a more effective product. Last time, we had thought we weren’t able to accommodate that request and decided to move forward with it. We rethought our design and came up with an idea where we were able to accommodate their request for a full automation.

Cost

Conclusion

In summary, we were able to create a comprehensive prototype with a functional hinge mechanism and Arduino-Dashboard integration. The gate is durable and the Arduino doesn’t lose connection to Dashboard as often as it did during our second prototyping phase.