

Patrick Hurtado

## Iteration Assignment

### Introduction

This is a total redesign of my Nametag and Arduino projects, and attempts to use motors, a new sensor (Piezo Crystals) to create a novelty desk toy. A user would knock on the box, and the box would open up, display their name, and generate Powerball numbers so that the user could continue to test their luck.

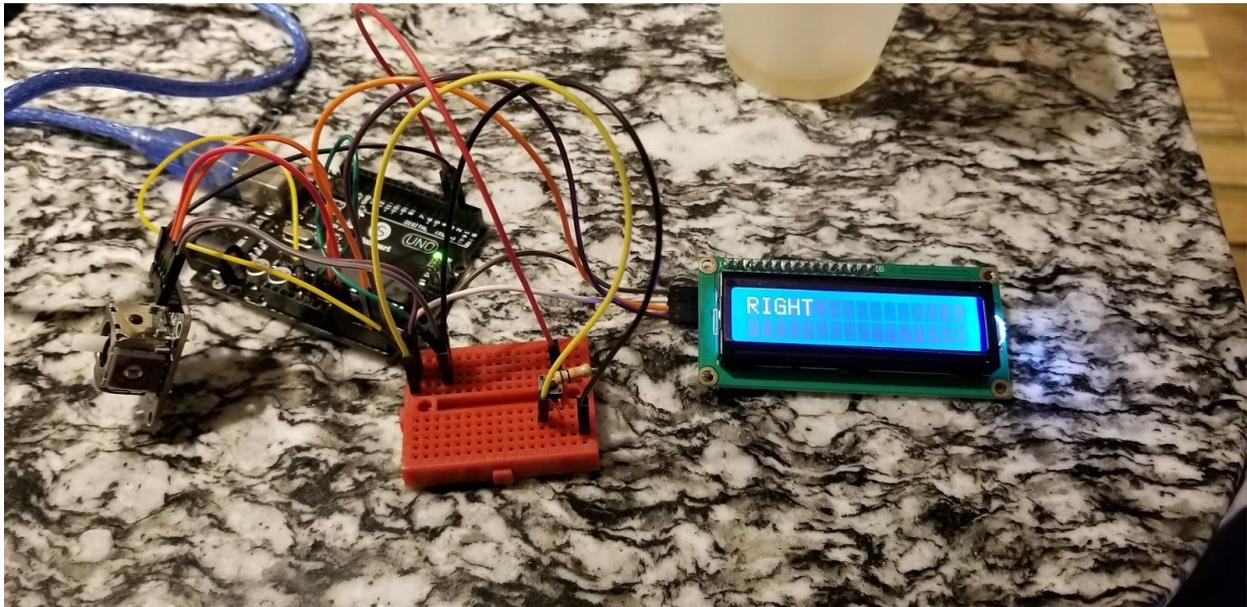
### Original Designs

The original nametag was a wearable that utilized laser cutting to shape out the name plate.



In this new iteration, the name is no longer etched into the wood, but displayed on an LCD screen so that more information could be displayed later. Furthermore, the concept of name and wood were decoupled, so that the laser cutting was used as a means to create the box, as opposed to being the location of the name. The iteration is no longer wearable.

The Arduino Intro project used a joystick to control an LCD screen, and the Arduino Robot project utilized servos to move.

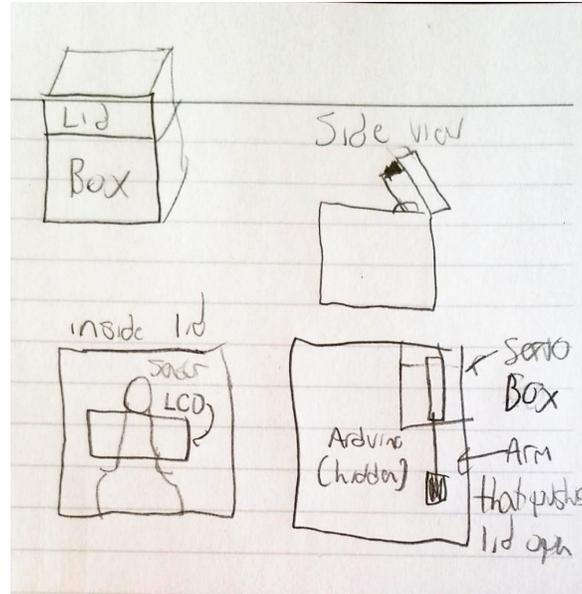


[Robot Video 1 for reference](#)

[Robot Video 2 for reference](#)

In this new iteration, a servo is present, but just one, and of greater strength. Instead of moving from point A to point B, it's new purpose is to raise and lower a lid of non-trivial weight (hence the upgrade to a stronger servo). The input sensor is no longer a joystick, but a piezo crystal. Users do not interact with it directly, but instead knock on the wood, which is when the piezo crystal detects that change, beginning the opening process.

[Initial Sketch](#)



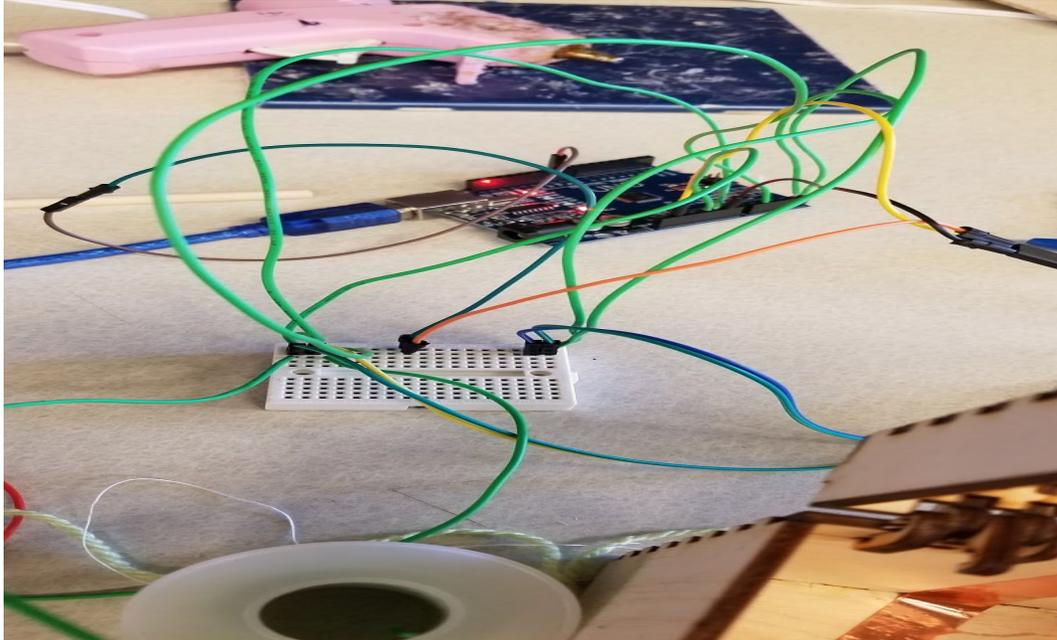
The initial design meant to hide all the systems and wiring, as well as place the LCD screen on top. The box would also contain a subcompartment for the servo, and a false floor to hide the Arduino.

### Process

Once the box was cut, there was not an easy way to install a sub compartment and recut for the servo. Secondly, the servo used for the Arduino Robot assignment proved to be too weak to open and close the lid effectively, especially with the LCD screen in place. Therefore, a larger servo was needed, and such a servo would need a compartment that would begin to interfere with the usages of the box, so it was forced outside.



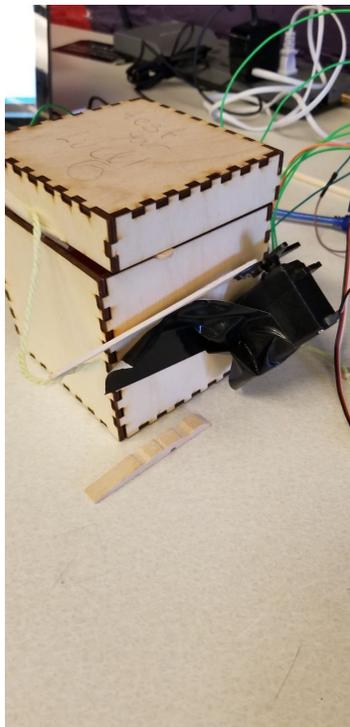
Due to the permanent nature of installing the LCD on the lid, I decided to place on top of the box itself. The Arduino and Breadboard was also left outside for easier access.



Some of the many issues I came across was the fragility of my design. Firstly, since I wanted to use copper wire to attach the piezo crystal to the Arduino, I needed to make certain that contact was created between the tape and the wires; something tape alone could not do. I also constructed the box first before I did anything else, which made debugging even more difficult than if I planned out and implemented my layout before construction. The piezo crystal, from what I understand, is not strictly designed to be sensitive to vibration of sound across wood, making finding a good threshold fairly inconsistent.



Final Design



[Link To Video](#)

The final design was a gutted product of the initial concept; everything was left outside the box in the name of testing and to reuse the parts. The servo is now attached outside to maximize space. The LCD screen is also not attached and is on the bottom of the entrance of the box, again for reuse.

### Conclusion

While the final design wasn't what I wanted, I did achieve my ultimate goal of knocking on a box to get it to open. I am taking away from this process the value of preplanning and how ideas cannot simply be implemented easily; steps must be planned and taken accordingly in order to ensure that the idea is viable and, if it is not, how to replan to bring the end result to fruition.