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MECH-457

Project Proposal

Idea 1 – Exceptionally Useless Box

A useless box is one that features a single switch (usually a toggle switch) where upon engaging, something (like a hand) comes out of the box, switches the toggle back, and goes back inside the box. This proposal focuses on an *exceptionally* useless box. The idea is that instead of the user initially engaging the switch, the box will detect the user's hand approaching the box, and *another* hand comes out of the box to push the switch before the user does (and the original hand comes out and closes it and both hands go back in the box.

This second hand would feature a closed-loop feedback controller with the input being some kind of sensor to detect proximity (ultrasonic, infrared, photoresistor, etc) to control the position. Both hands will be driven by a dedicated servo, controlled by the Arduino. The box will be some laser cut enclosure that fastens the servos into place and facilitates the mounting of a switch. Deadlines for any specific feature is mostly arbitrary – the design would be iterated until it's right. Let's say an initial prototype without an enclosure would be completed within 4 weeks.

Idea 2 – Button That Avoids Being Pushed

This project idea expands on the first idea above, but is mechanically more complicated. In fact, our hope is to start with idea number 1 and if completed with ample time, expand the project to this idea as the control will be similar. The idea is that there is a button that looks very satisfying to press, where at the moment the user attempts to do so, the button *moves* away from the user enough to not be pressed. Think of whack-a-mole but it's just one mole and it can move over a limited space.

The input would be similar for proximity detecting and the controller would feature the same kind of closed-loop feedback. Mechanically, the idea is still up in the air. One could have the button travel linearly along a rail like an aluminum extrusion, or it could have some kind of X-Y rail system. Alternatively, the thing could have wheels on it and could simply travel anywhere. So, the project would require the Arduino, a couple of motors and a button along with the hardware to facilitate changing position. Motor would depend on the particular solution for changing position: steppers for any rail-based setup, or a DC motor for wheels. Here, the electronics should be prototyped fairly quickly – within 3 – 4 weeks. The mechanical portions would likely take an extensive amount of time. Rail-based solution would be far quicker, but more expensive (let's say 4 weeks for this as well). For wheels, I could see this taking the entire semester.