Exceptionally Useless Box

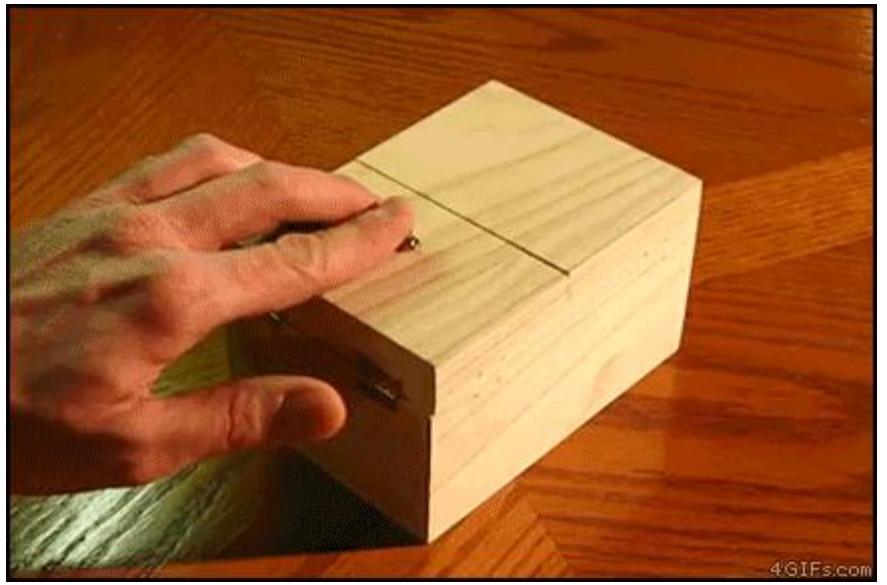
KYLE FITCH

NICK PADILLA

Motivation/Background

This is a useless box

But it's not really *that* useless…



HOW DO WE MAKE A BOX THAT IS *EXCEPTIONALLY USELESS?!*

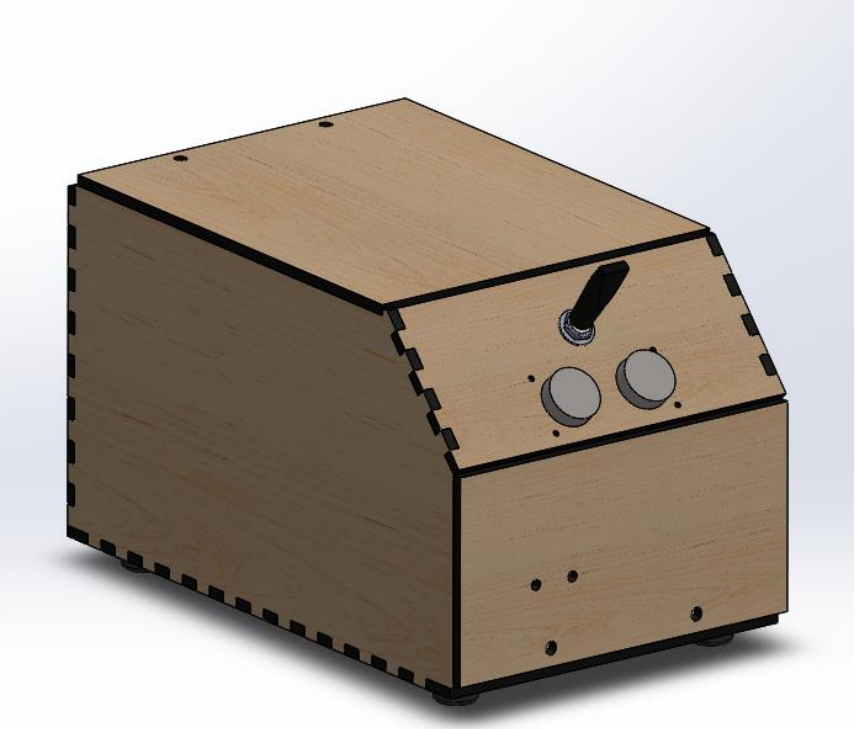
THE EXCEPTIONALLY USELESS BOX

Remove the interaction of the user with the box altogether

- The box flips the switch itself when a hand approaches
- Then the box flips it back like normal

Components:

- Arduino
- Ultrasonic sensor (measure distance of hand)
- 2 servos
- Toggle switch



How can a robot have a purpose when you take it away?

Calculation Components

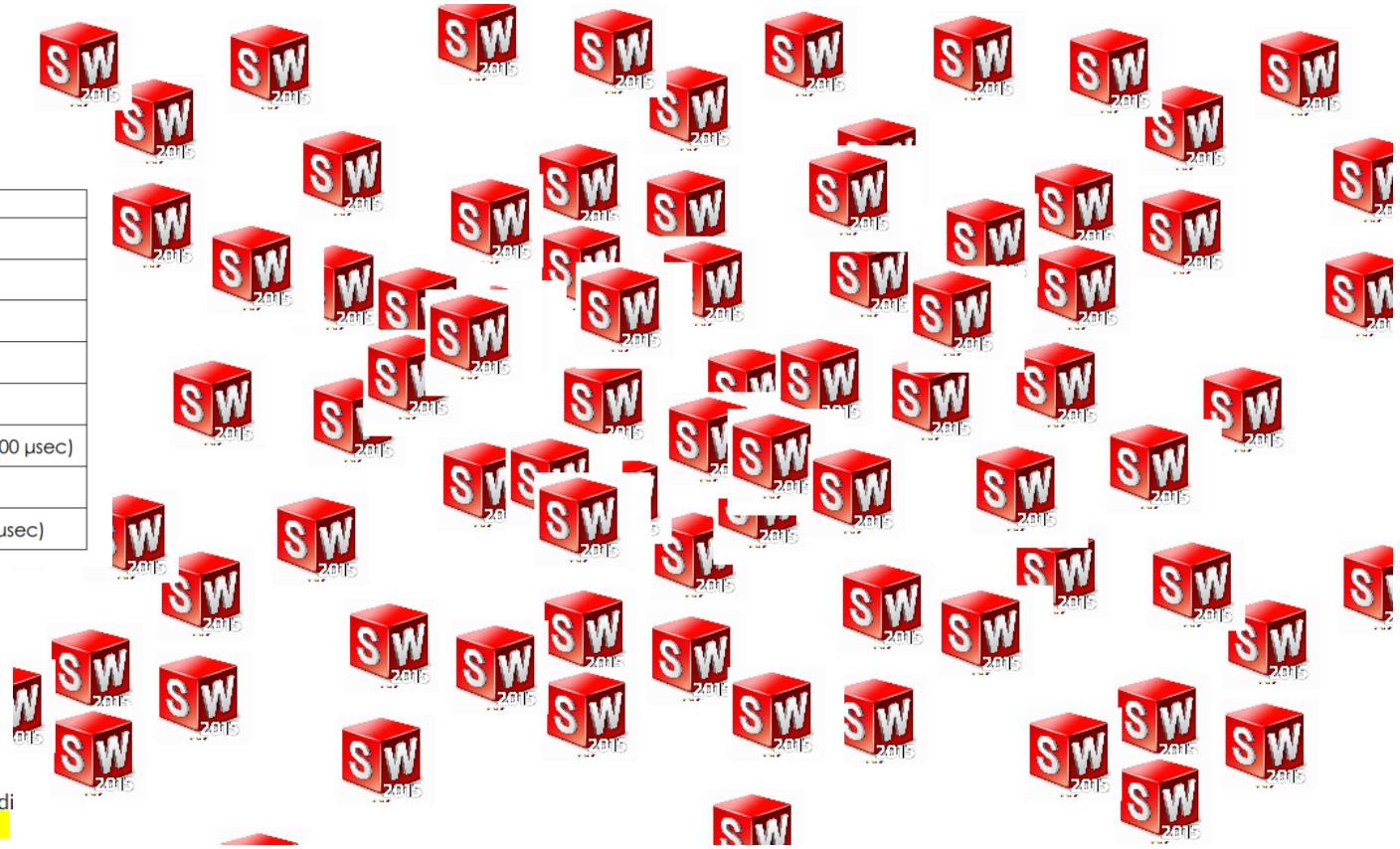
Well… about that

6. **Control Specification:**

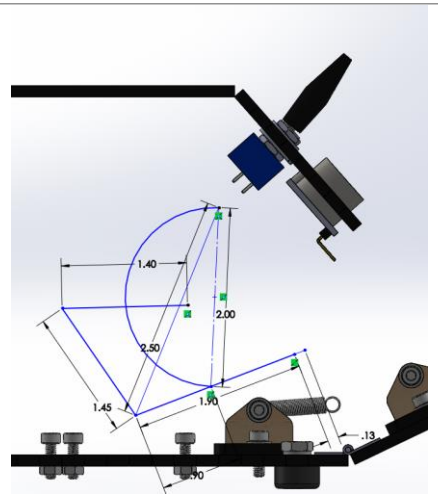
No.	Item	Specification
6-1	Control system	Pulse width modification
6-2	Amplifier type	Digital controller
6-3	Operating travel	90° ±5°
6-4	Neutral position	1500 μsec
6-5	Dead band width	3 μsec
6-6	Rotating direction	Counterclockwise (When 1000 ~ 2000 μsec)
6-7	Pulse width range	1000 ~ 2000 μsec
6-8	Maximum travel	Approx. 180° (When 500 ~ 2500 μsec)

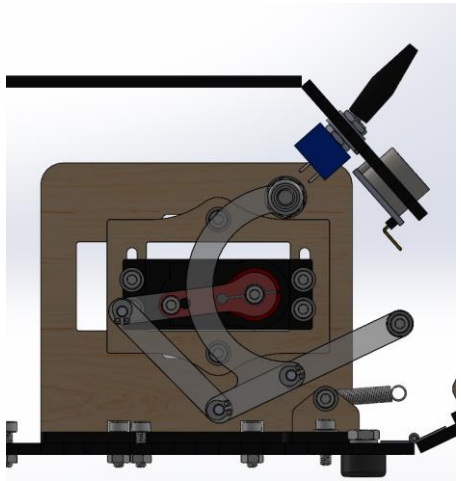
Parameters:
1. Use voltage: DC5V
2. Quiescent current: les
3. level output: high 5V low 0V
5. Induction angle: no more than 15 degrees
6. Detection range: 0.78~196 in/ (2cm~500cm)
7. High accuracy: up to 0.12 in/(0.3 cm)
8. **Connection mode:** VCC, trig (control), echo (receiving end), GND ground wire

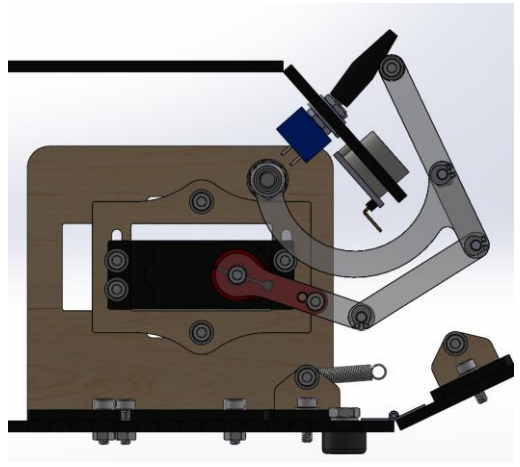
Module working principle:
Pull the **Trig pin** to high level for more than 10us impulse, the module start ranging.
The module automatically sends eight 40KHz square wave to detect whether a signal is returned.
Finished ranging, If you find an object in front, **Echo pin** will be high level, and based on the different di
So we can calculated the distance easily.**The distance = ((Duration of high level)*(Sonic :340m/s))/2**
Dimensions: 1.3 x 0.4 x 0.1 inch/3.03 x 1 x 0.25 cm (L*W*H)

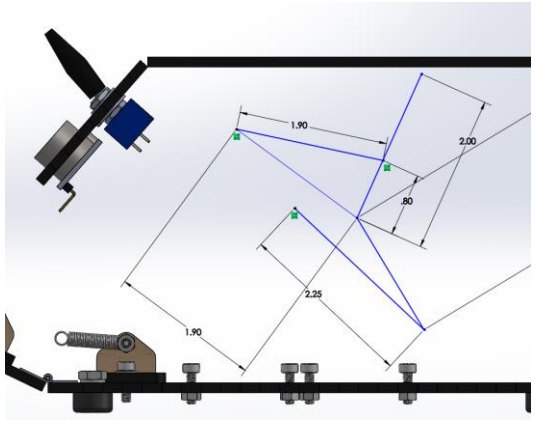


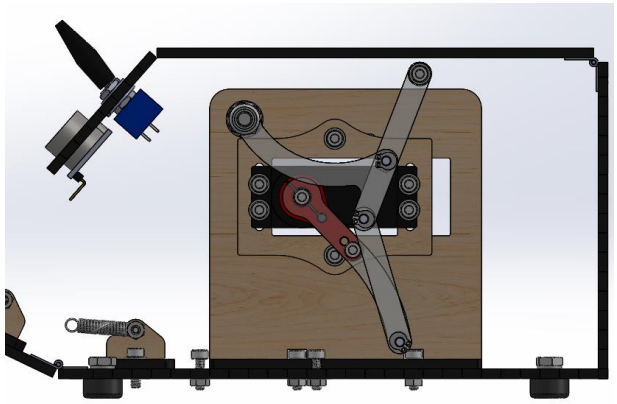
Calculation Components (2)

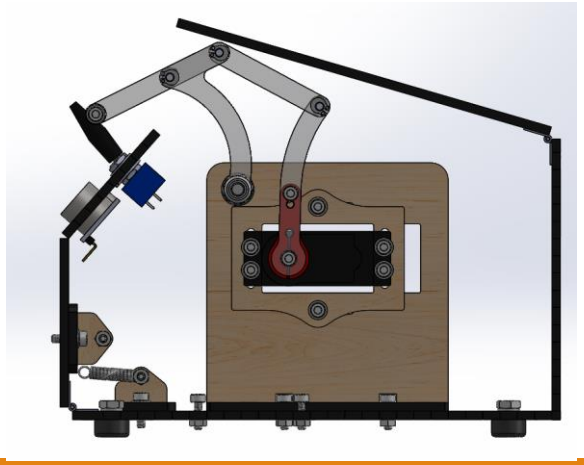




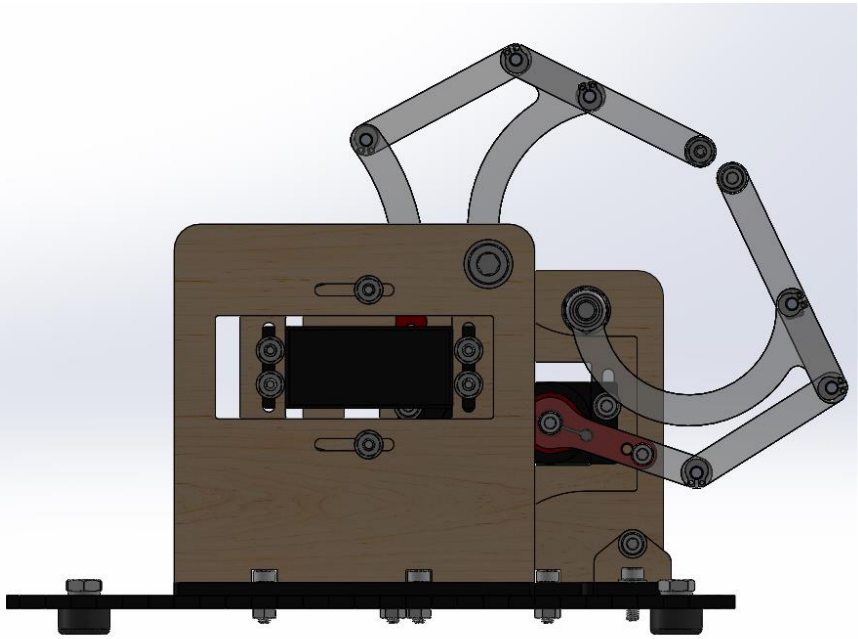


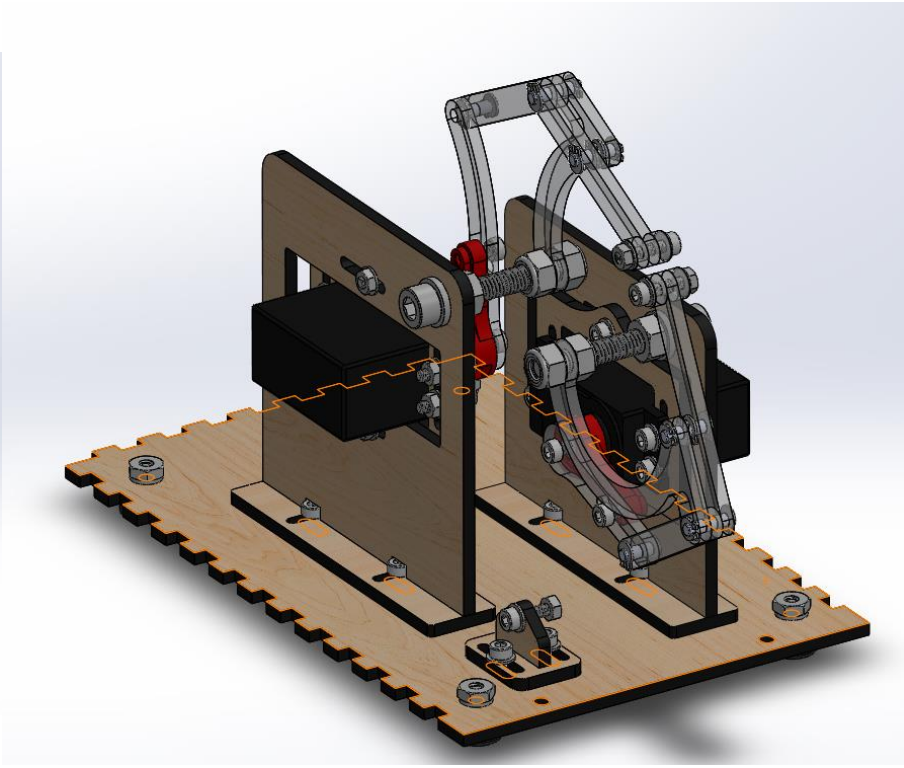


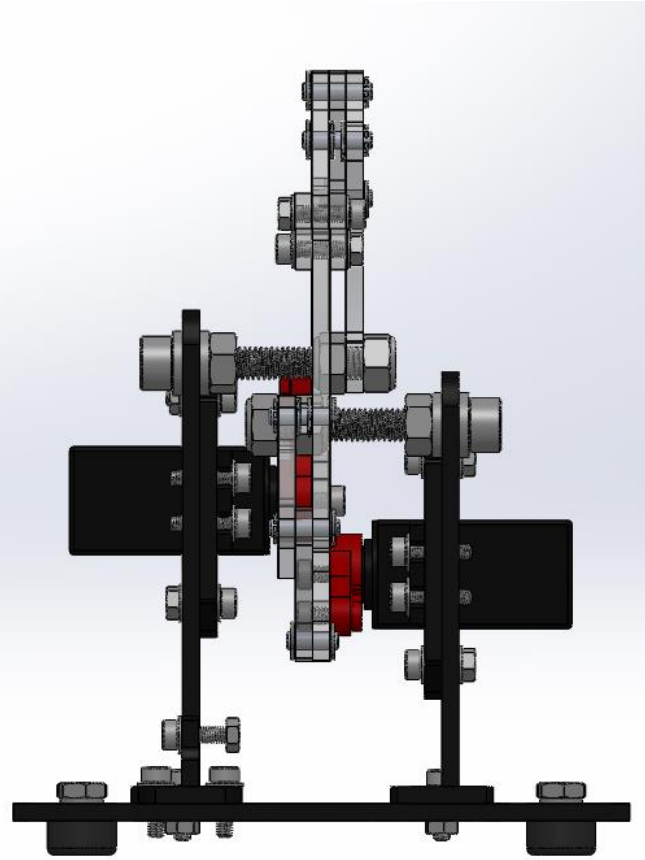




Calculation Components (3)







Mechanical Components/Design

Enclosure

- Laser cut chassis, 1/8” MDF & Delrin
- Piano hinges w/ spring return on front door
- Lots of M3 hardware

Servo Arm mechanisms

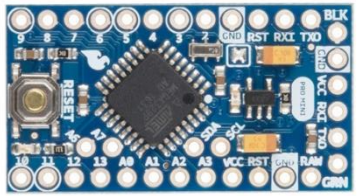
- Laser cut Delrin links
- 1/8” pins with friction-fit spring clips
- Adjustable mount

Electronic Components/Design

Toggle Switch

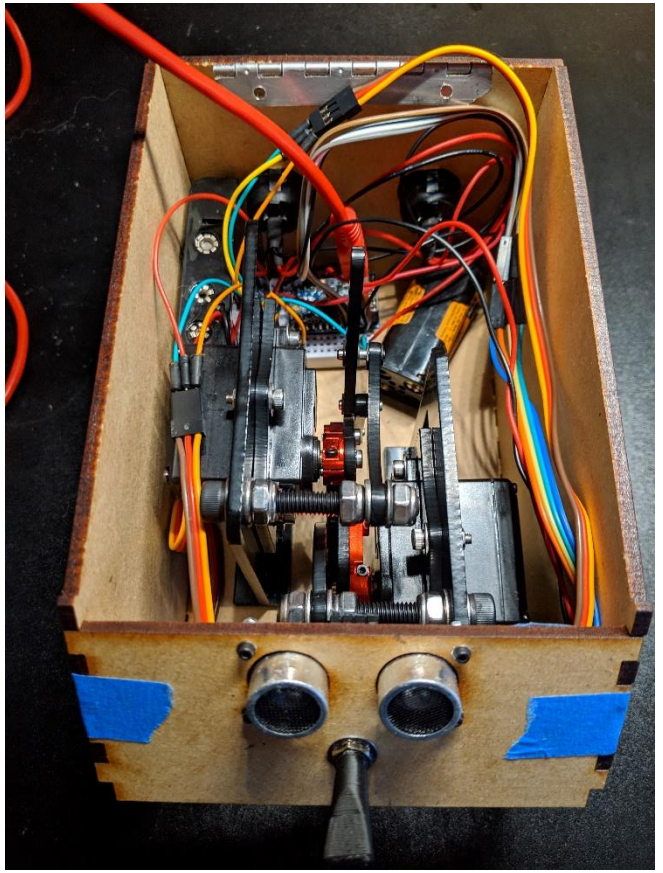
Ultrasonic Sensor

2 Servo Motors

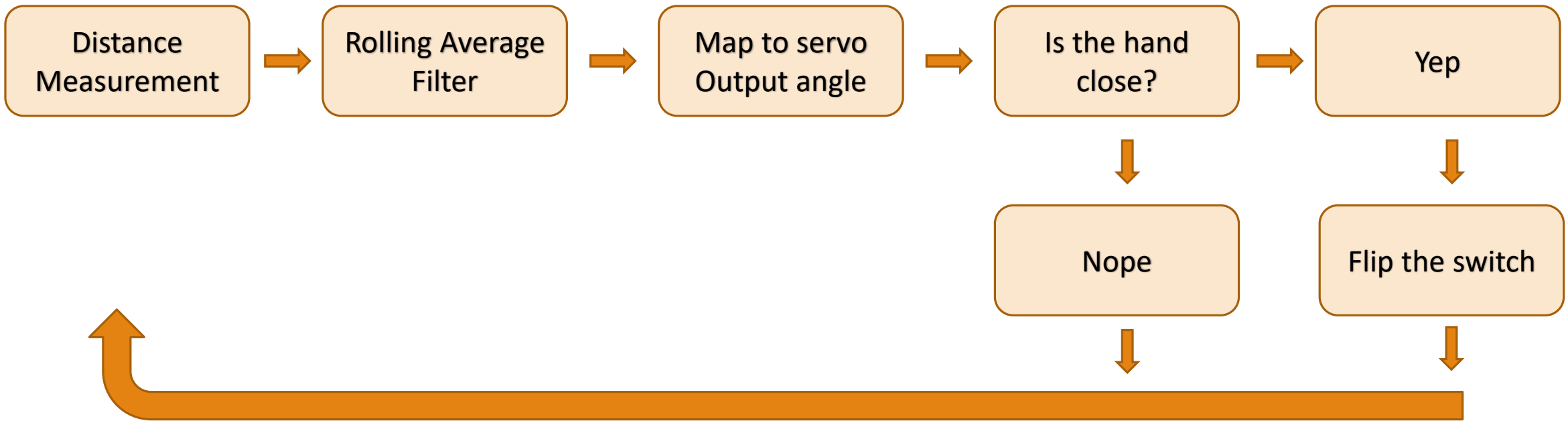


Arduino Pro Mini

And a LOT of electron spaghetti



System Control/Programming



Demonstration

Group Member Contribution

Kyle Fitch: Mechanical design, electrical design

Nick Padilla: Programming

McMaster Carr: Modeled all our fasteners, washers, nuts, rubber bumpers, snap rings, etc. Always delivered what we asked for in a day, always available to give us a part model, never argued. 10/10 group member, would recommend.

PEAK USELESSNESS AT MINIMUM EFFICIENCY

Questions?

(we have useful answers)