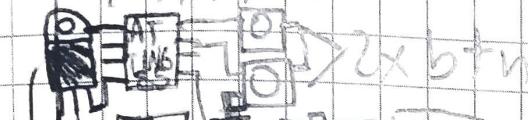


~~few weeks~~

[1/18/21]

KB Prototype - (Protoboard)

ATTINY85 x5



2S battery



for reprogramming (w/ bus pirate) Arduino code

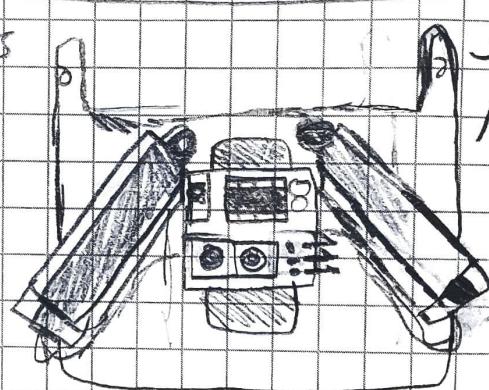
- fabr. KICad software

PCB

Manufacture
real model
of PCB



→ Place Components
→ Cut to size



fusion
Model
Update

- maybe
print one?

possible features:

• Sleep mode? when

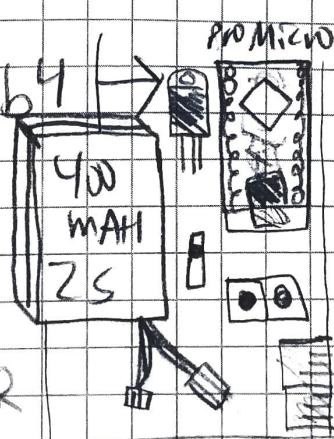
button not pressed, no activity, when pressed, code resumes

- update code documentation

→ week
Jan (9th → 16th)

Goals Accomplished:

- Higher voltage = more power
- 2x/4x switch
- Smaller board



Pro Micro
design prototype
on breadboard

Still need

- Charging circuit
- ATTINY version eventually
- Protoboard to the Pro Micro Version

MSPU30



PNR usage
for future designs

FORCE SENSITIVE RESISTOR

FSR: $\infty \Omega$ — $10k\Omega$ — 0Ω

Max

mid

direct control

Low pressure

High pressure

After experimentation with the sensor I have concluded that a stretch-based device will function better. Sparkfun

3/17/21 Mapping FSR to arduino using variables so that a better FSR can be used easily (with diff Resistors)

Working FSR control - POT's are more complicated than they seem :)

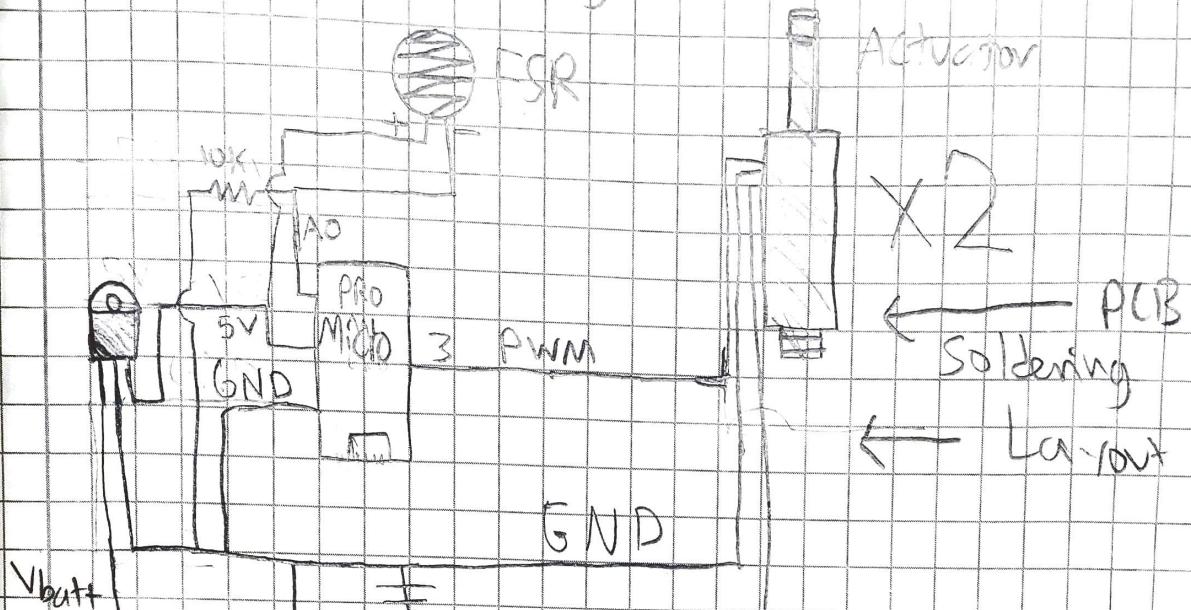
FSR model works

- Change Code resistor vals if it is upgraded

3/18/21

Modeling / electronics improvement

- Fitting into the formfactor:

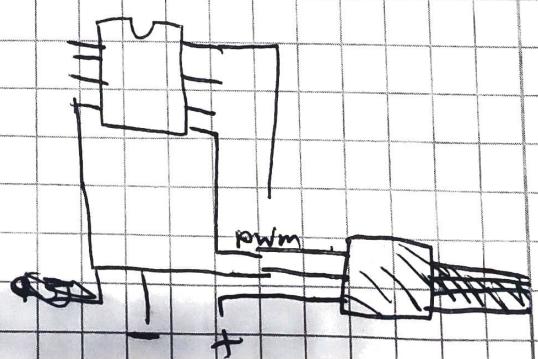
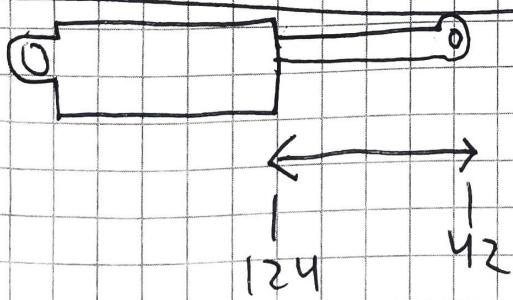
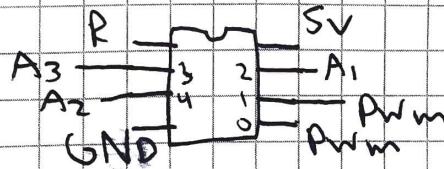


Vbatt

Switched Vbatt

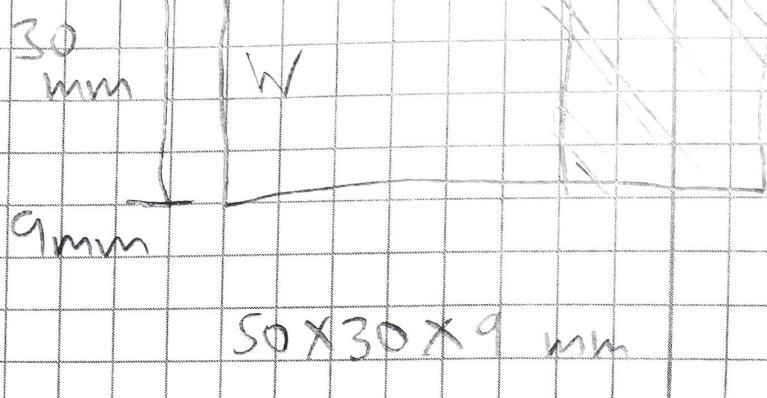
p1 → electrical shock
stimulation on Sensor

for grab
each finger



3/19/21

PCB mounting
& finishing test model

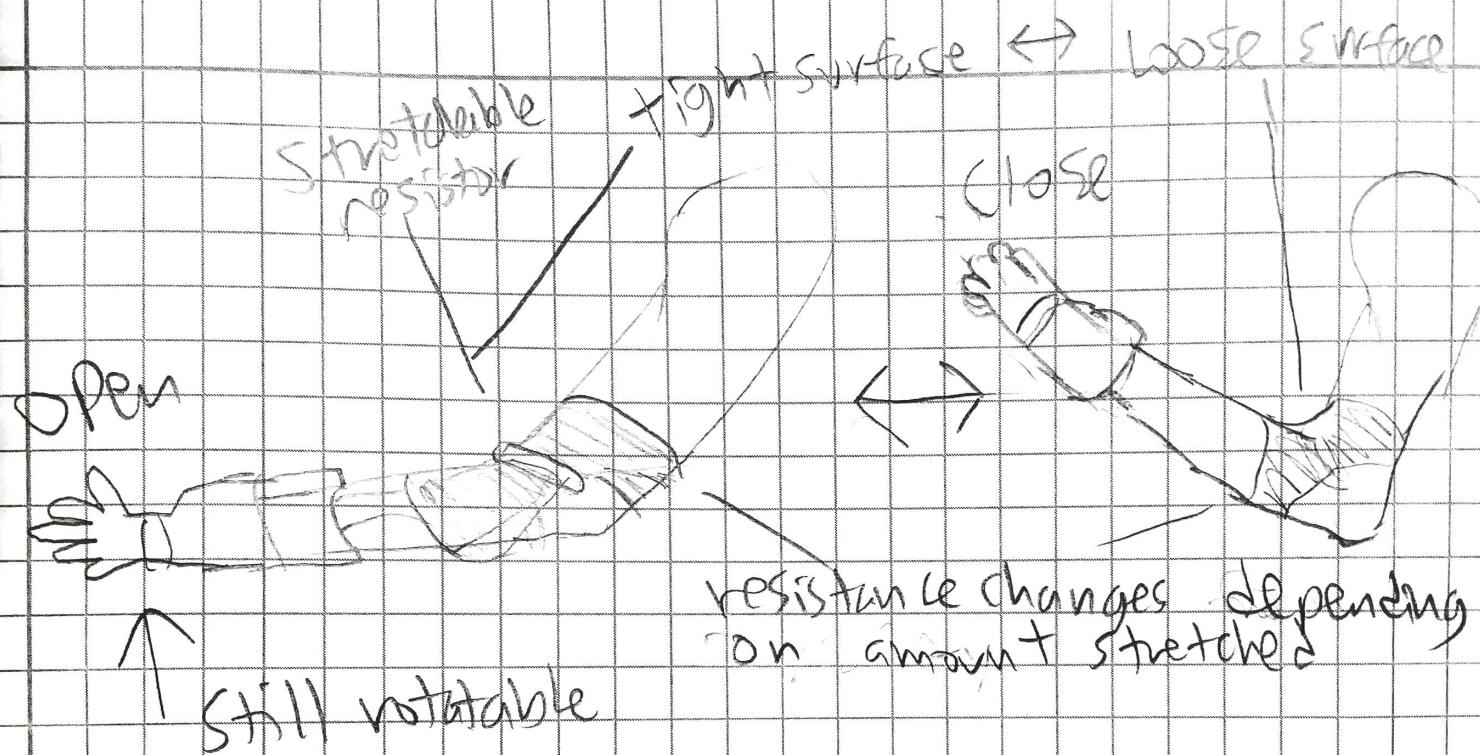


S:SM test printing 1st model

4/10/21

Fitting hand to Prosthetic

- To do:
 - Remove model base to fit battery + wires
 - Make PCB + my!



5/10/21

① learn how to assemble

031

- Worst case - if sensor fails, use long toggle trigger switch - either press to activate or press to keep open.
- Keep ATtiny - Swapable Socket to change code
 - might need new programmer → desk USB dock to program
- 63: Gear ratio promising - much more torque
- make model module to swap per hand size
 - to make redesign easier - actuator holder ✓
 - circuit board outside?
- hold to keep open, close otherwise

5/11/21

• Test actuator on tiny 85 and maybe lmh2 vs 85

- for now, build program on breadboard

5/17/21

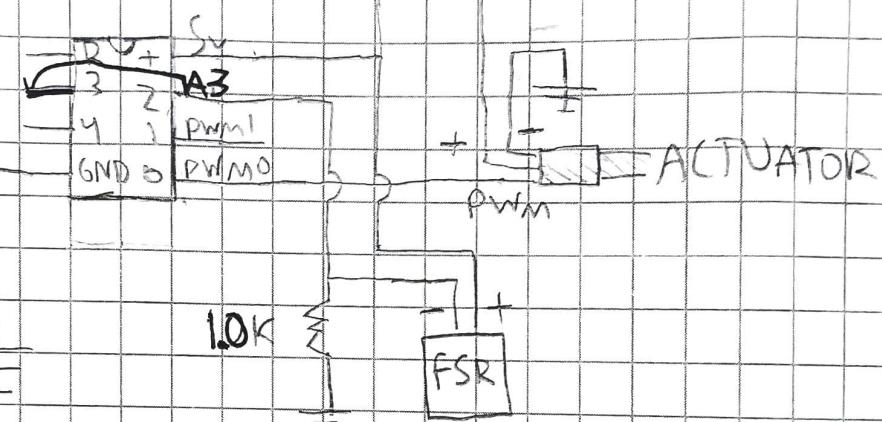
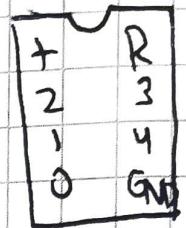
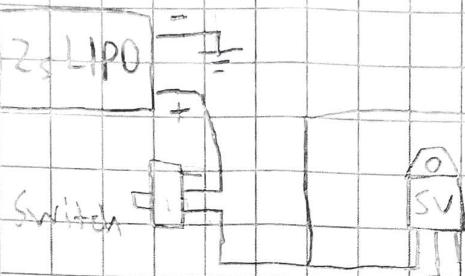
5/19/21 diagram

$b \leftrightarrow S_3 \rightarrow 0 \leftrightarrow 15$
 $70 \leftrightarrow 0$

BACK

POT

(SERVO RES Clean)



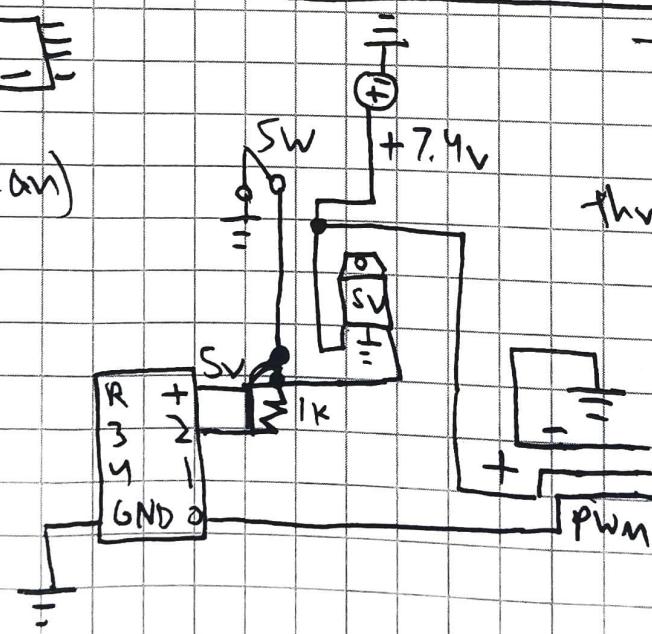
SWITCH



(SERVO BUTTON Clean)

Port A 4

through 1k puller to high
when



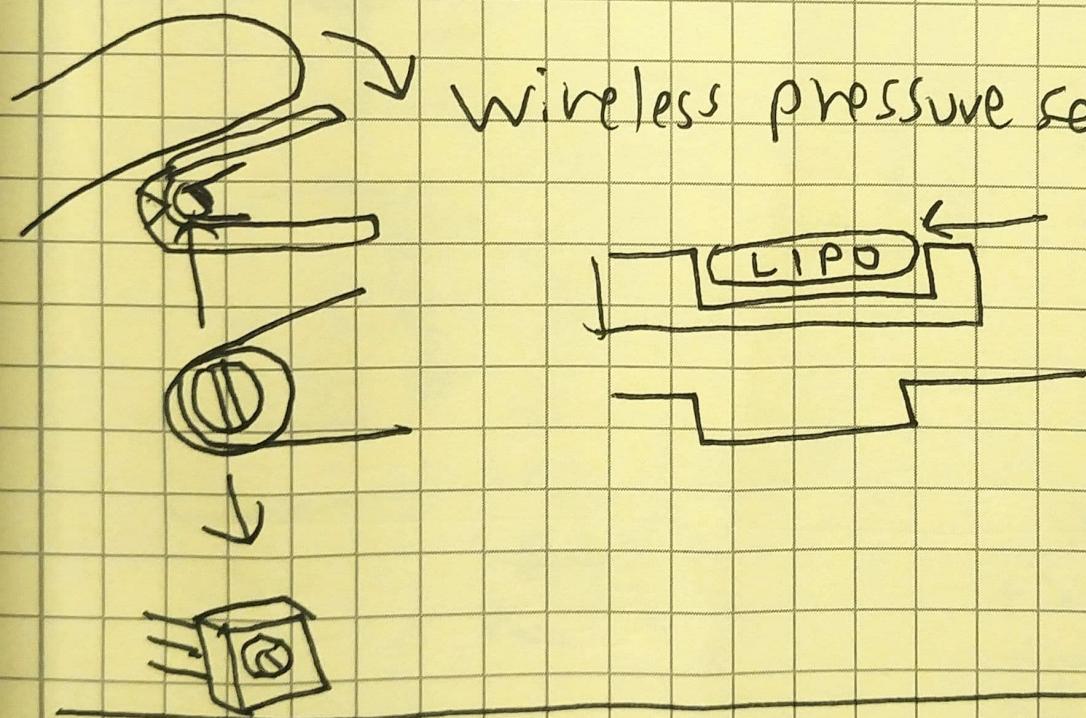
5/24/2021

Same code can't run both circuits due to overcurrent
— diff chips used

~~Var~~ PW0 = Analog Read PWM0

if (analogRead(VARPW0) > 42);
myServo.write(PW0);
wait 1s,
~~detach~~ servo

5/21/2021

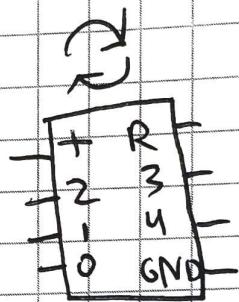
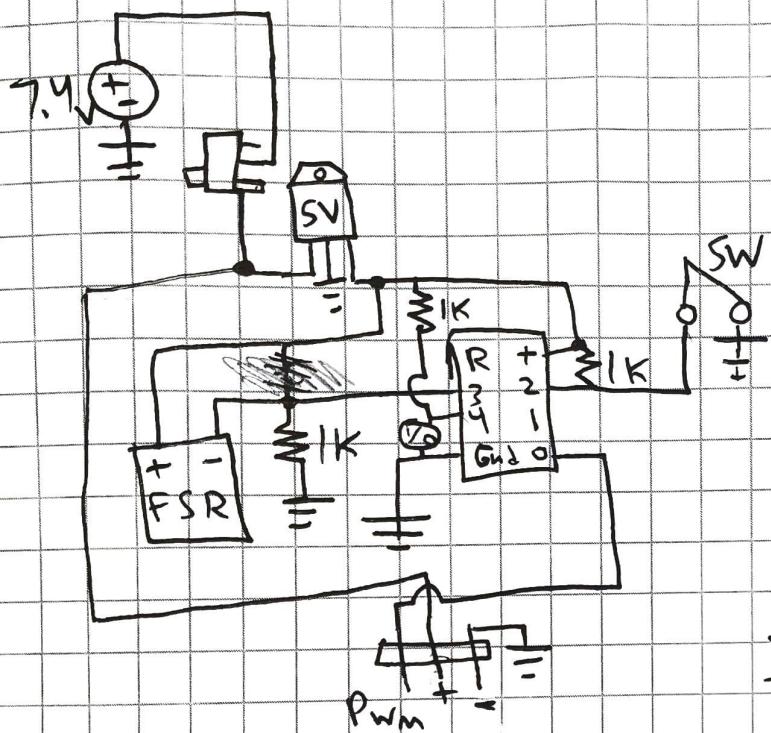


5/25/21
→

Both circuits integrated into one
swap out chip to change program ↗

- Build physical (KT → & model)
- Share model

Actuator / Button (Combined)



$$\text{Out} \leftarrow \text{From} \\ + V_{\text{batt}} - S_{\text{vP}} \\ G_{\text{w2}} - S_{\text{vReg}}$$

~~act form → act in~~

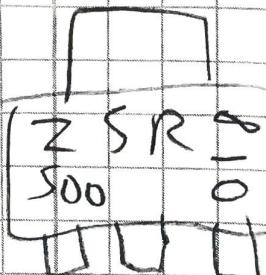
Switch → proxy + bw

$$\text{B} + \text{n} \rightarrow \text{p} + \text{n}_2 + \text{g}_{\text{n}_2}$$

$$\text{FSR} \rightarrow \text{Pm3} + \text{Sv}$$

$\text{S}_{\sqrt{02}} \text{ } 3^{\text{u}}$ Vbatt Gnd

- I really should design the circuit PCB in easy EDA and have it manufactured!



★ ADD AUTO SHUT OFF at Low VBAT

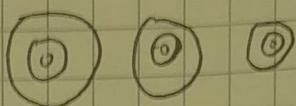


re-enables at
sensor input

~~✓~~ Add relay to disable motors after switch connection

bearing with ext inserts

⑥



5/27/21

goal:

timer relay disables motors to save energy

Loop normal program

program starts if sensor input changes

(Switch flips OR #5 R input changes
→ (if in that mode) ← input is a small threshold)

→ timer resets

if timer reaches 10 min of no activity
relay disconnects motor power to
save energy over 1 min

OR I could implement this in regular program

if no sensor input change this loop

→ disconnect relay's motors ← (Only if relay is quiet)

battery
saving

Battery voltage (discharge Voltage check)

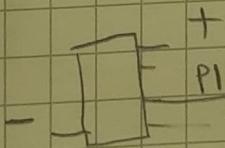
28/21 → sleep mode NPN switch

NPN (transistor as switch)

SPST switch

Power Pin 1

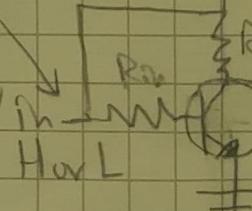
Pin 1 → digitalInff(high) 8.7V actuator +



+
Pin 1 → digital out → V_{in}

-

→ high if
active, low
if not active



Pin 1
R_{in} V_c = V_{cc} when open
= 0V when closed

either
ground
V_c or lets

it float ($V_c = 0$)

switches when be > 7V
off (high on P1)

? PNP more efficient

if transistor draws > 10mA

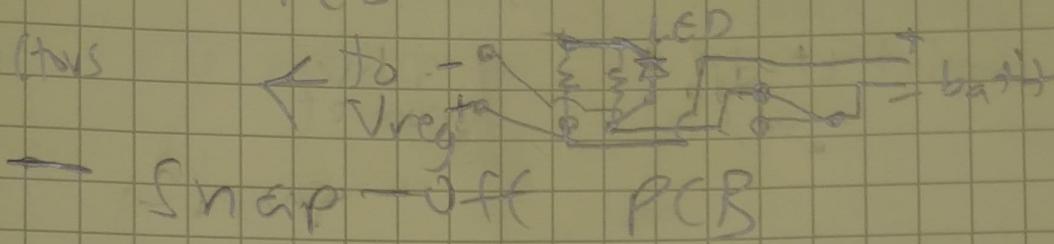
when closed, the circuit is useless

Improvements for next version:

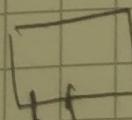
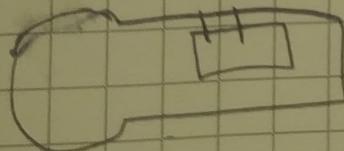
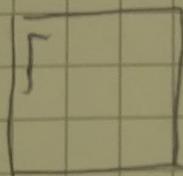
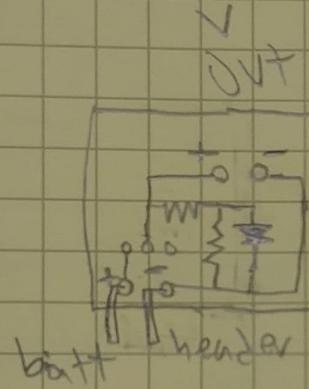
034

- Small battery connector
- New PCB w/ PWM headers x2 & batt direct
- V protect PCB

mount SMDs (two)
internally



Snap-off PCB

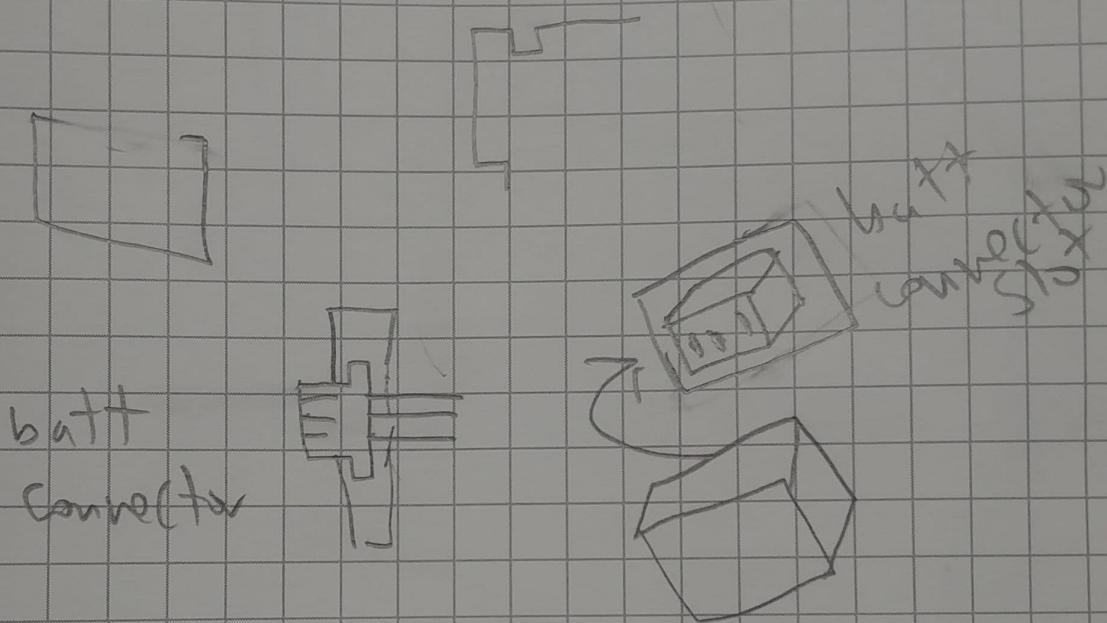


Improvements for V2

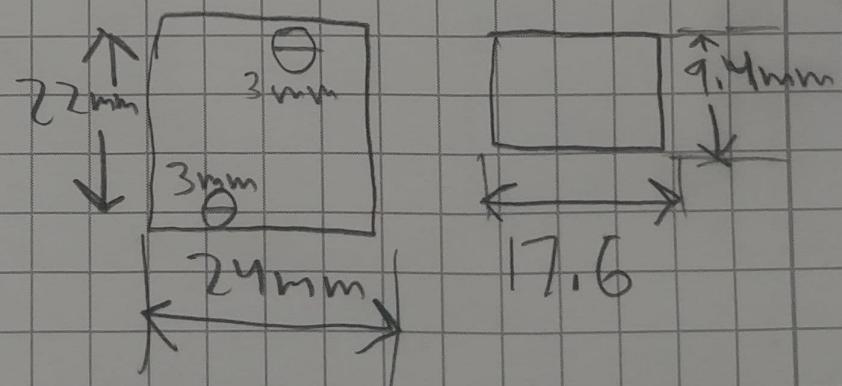
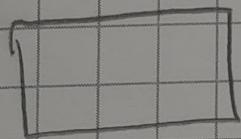
• Screw in back • dual PWM slots

view board for PWR mgmt ? waterproof

Possible 1:100 ratio

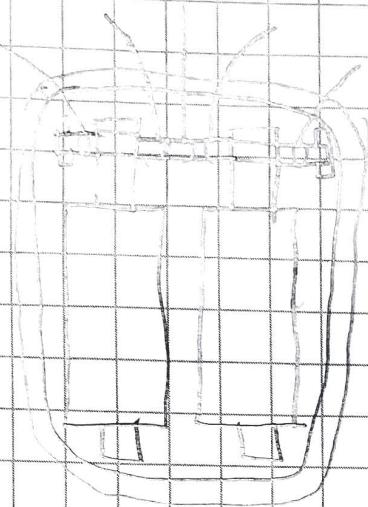


batt board



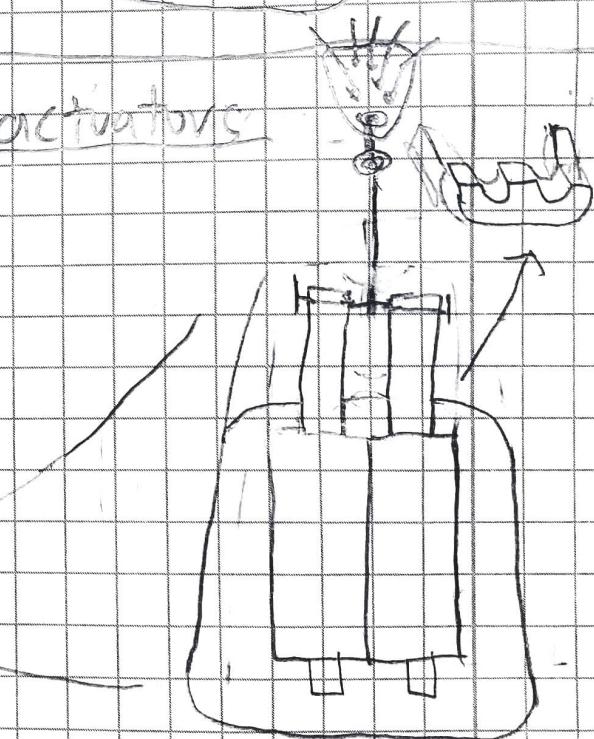
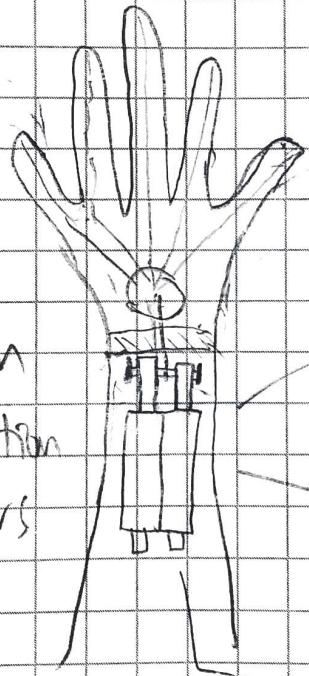
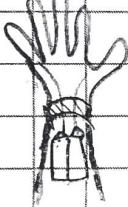
Possible actuator positions (July 9, 2011)

* Central palm actuators



Insert for larger
Palm length

* Central wrist/forearm actuators

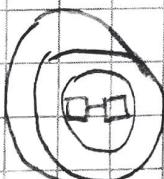


To make string path
more direct - less friction
no angle for actuators
to fight against

Invention distance:

- Varies depending on size of
forearm center

* Wrist twisting is fine, only
twists one string



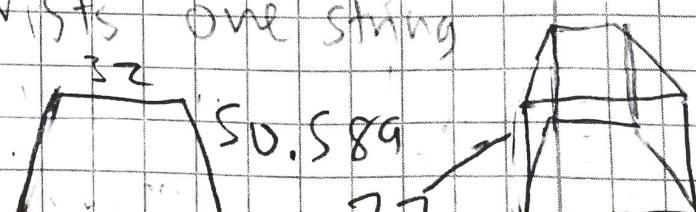
32mm



10mm

47.386

0.03



7/12/21

12 → 3

3hrs

7/15/21

7/13/21

12 → 3

3hrs

7/14/21

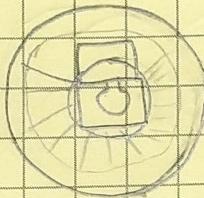
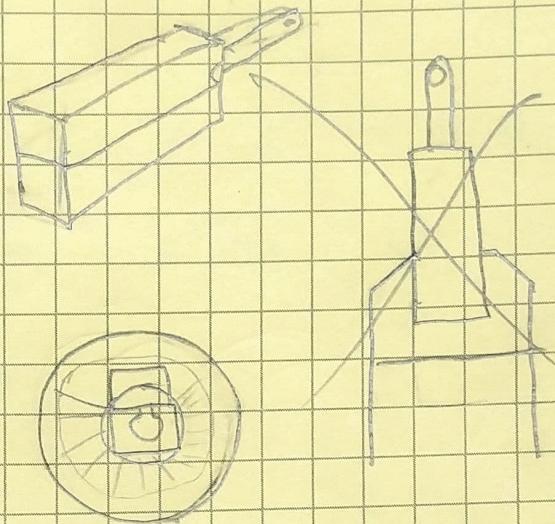
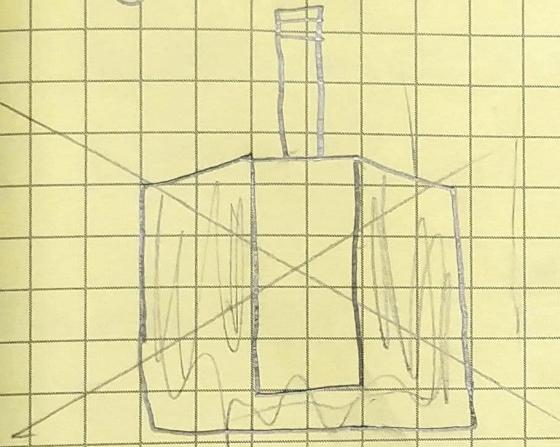
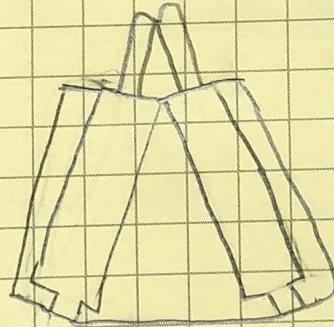
12 → 4

4hrs

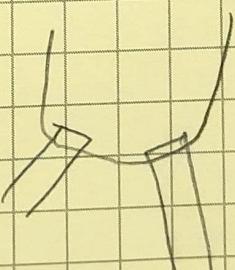
9 - 1

4hrs

Single actuator

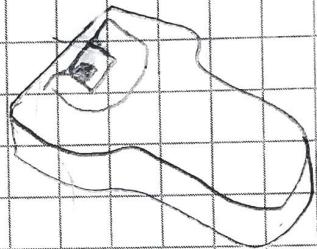
Dual
actuator

No box for hand here



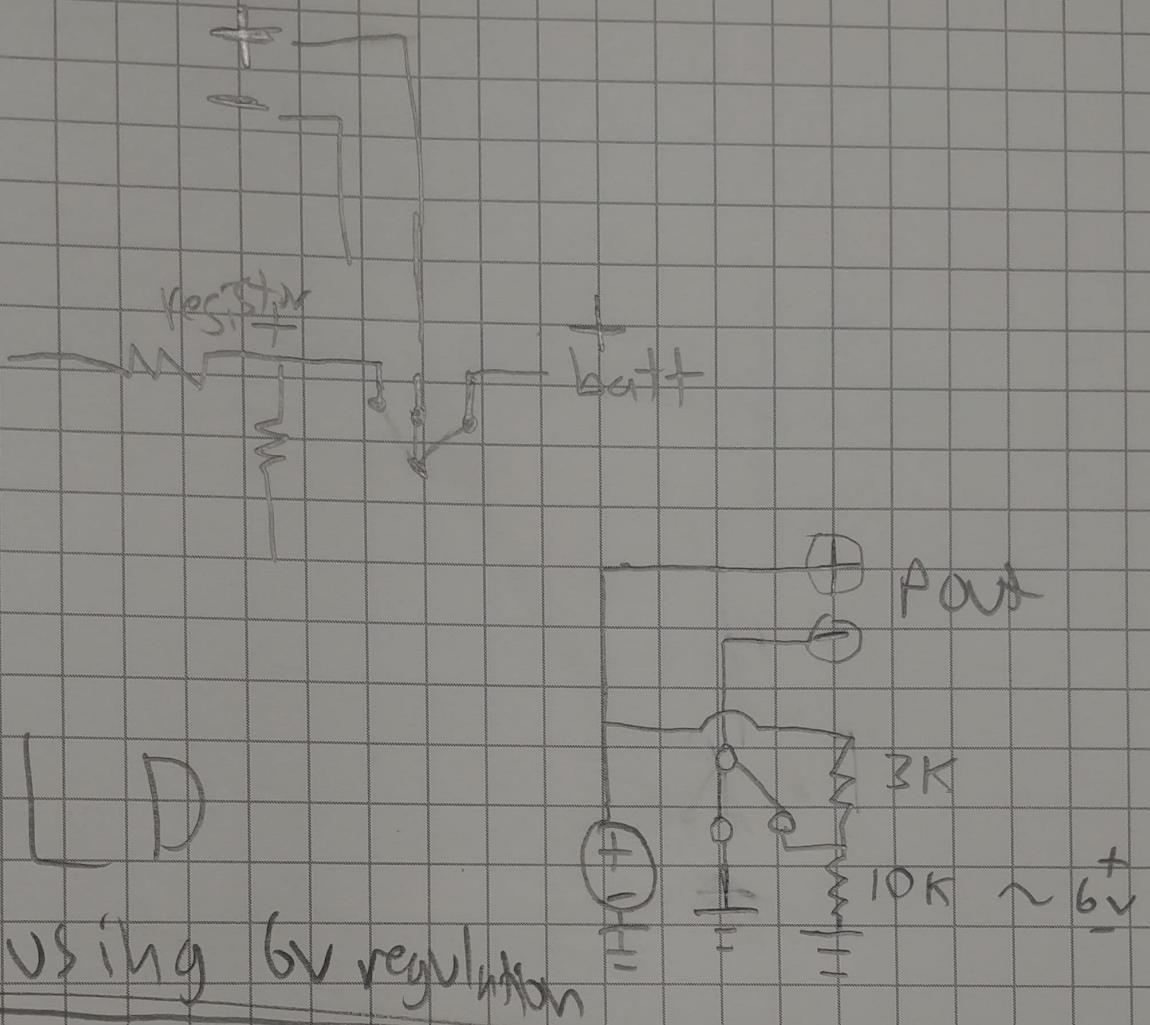
Improvements for functionality:

- * Potentiometer sensitivity adjust for FSR
- * Right elbow ✓
- * less intell ✓
- * better angle/placement of actuators ✓
- * better mode switch location
- * mount batt charge
- * mount trigger switch
- * Battery board size
- * modified main board

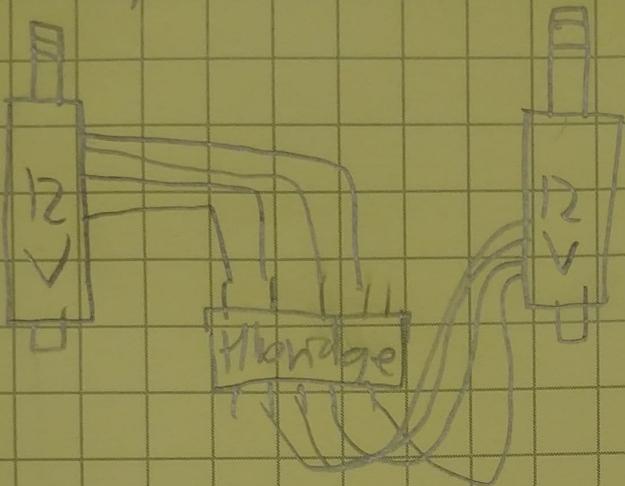


Led indicates ON - turn off when not in use

Switchable



overwriting
only if the 6V > 8V Version fails
possible
Heringe implementation



FR	Mon	Tues	Wed	Th	F
Zhvs					