

Reducing leaking



Ninja SLUSHi

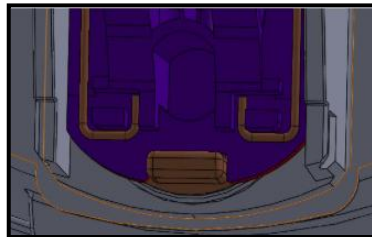
Shark | NINJA

Spout



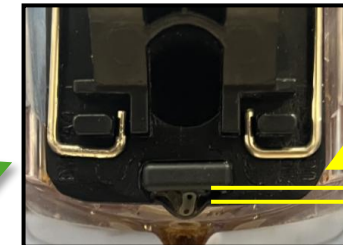
This spout design was showing bad results with “leaking”

(actual leaking or slush that is held after dispense and melts)



The 1st design change was to decrease the area in surface contact with slush after dispense

While completely removing material from the bottom helped with surface tension, it gave less engagement with rubber seal so **compromise state was found to fully solve the issue**



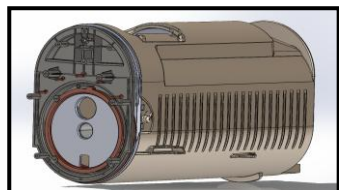
Reduced Fillet
Lower delta

Problem

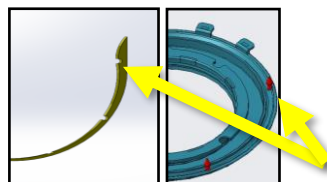
Prototyping / Validation

Result

Vessel



Leaking (back of vessel): Poor engagement between the seal, and unit, caused **leaking in FAI units.**

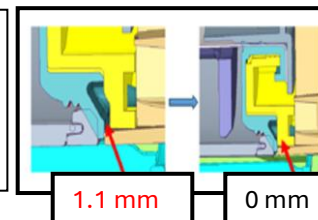


Design was contoured with holes around the semi-accessible tree knobs (in red) and made to be flexible enough to clear the evaporator barrel



FDM print **reduced leaking by over 90%**

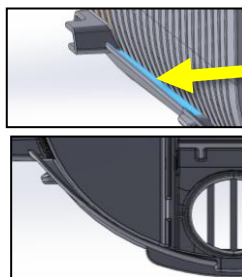
Which kicked off this tooling change for production



1.1 mm
0 mm

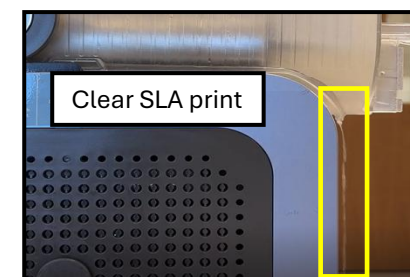


Leaking (side of vessel): Temperature difference between cold internal liquid and ambient environment causes **lots of condensation dripping off the side of the vessel**



2 deg draft for injection mold tooling

“Gutter” was surface modeled to redirect the condensation to a tab in the front away from all important internal / UI electronics



Clear SLA print

Water successfully being redirected to the front of the unit

→ Initiated tooling change across 5x models

Problem

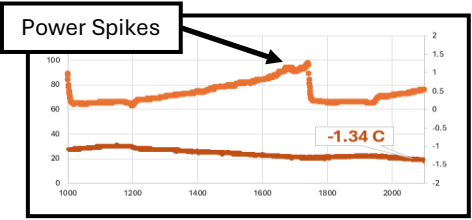
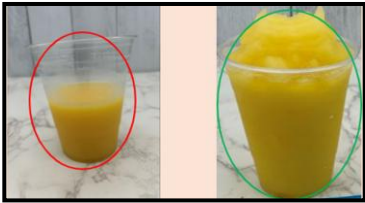
Prototyping / Validation

Result

Optimizing cooling cycle – Ninja SLUSHi (cont.)

Shark | **NINJA**

Some units showed poor performance reaching KPI for recipes like OJ, essentially having bad power draw (early kickdowns) that lead to warmer end temperatures.

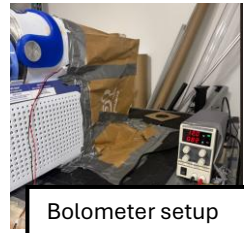


With MP approaching fast, we needed to implement a solution with a lead time that reached our release date, as well as one to resolve the issue long term.

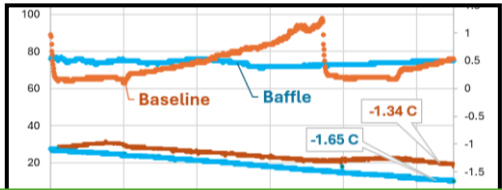
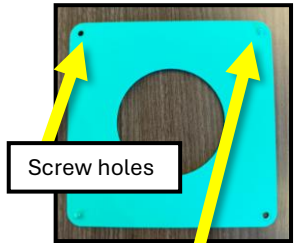
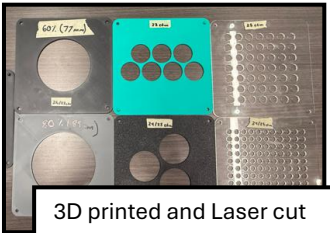
I owned the following workstreams:

Problem

Baffle Design (short term MP)



Iteration	Diameter	CFM
6V (Baseline)	74mm	24
80%	89mm	34
3 hole perf (50%)	42.72mm x 3	24/25
5 hole perf (50%)	27.97mm x 5	22
49 hole perf (~ <50%)	10mm x 49	25
121 hole perf (50%)	6.73mm x 121	24/25



Baffle cuts power spikes + gets colder

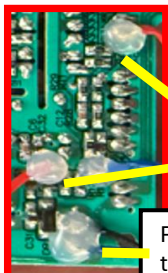
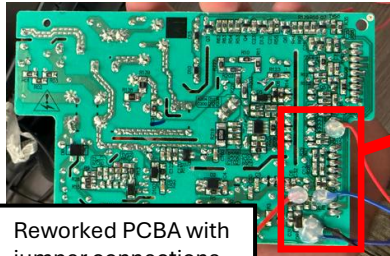
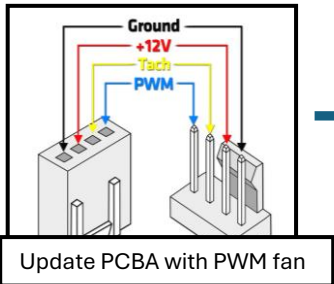
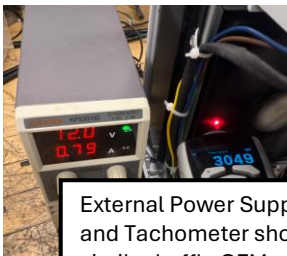


Released Eng. drawings to China for die-cut manufacturing

Prototype / Validation

Result

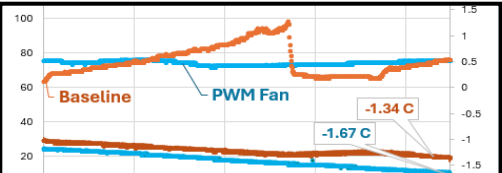
PCBA update (long term MP)



PWM connection

New data connection

Prev positive and negative terminals for 12V fan



PWM fan cuts power spikes + gets colder



Initiated ECO for new PCBA

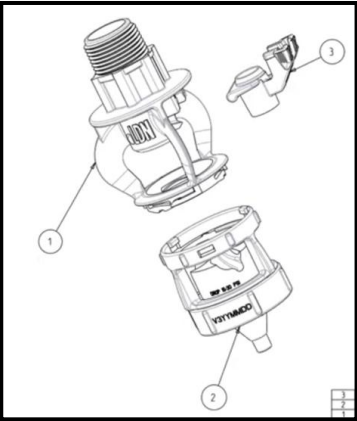
Prototype / Validation

Result

Sprinkler Redesign

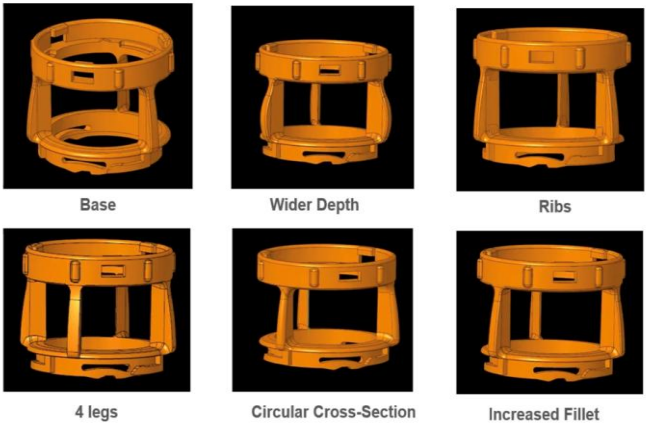


LDN Dynamic Drive

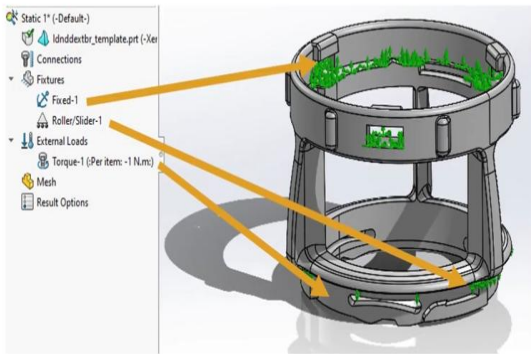


Visual demonstration of deformation

When the upper and lower assemblies are twisted in place, the **force sometimes causes deformation in the legs**



Design Iterations in CREO

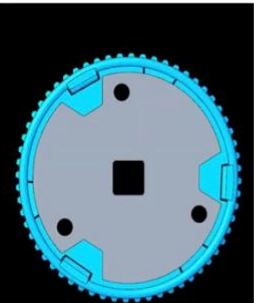


Design Change	Approximate Leg Shadow (deg)	Mass (g)	Max Stress (N/mm ²)
InFiller (0.9 - 0.11)	15°	194.23	6.89E+07
Equal Ribs (20 wide x 0.20 high)	15° - 35°	193.45	6.71E+07
Circular Cross-Section w/ InFiller	15°	190.5	7.19E+07
Wider Depth Legs	15°	198.01	7.30E+07
Base	15°	193.07	7.48E+07
Circular Cross-Section w/o InFiller	15°	189.9	8.04E+07
4 legs dec angle	15°	194.96	8.10E+07
Wider Depth Legs (Less Angle)	12.5°	194.09	8.13E+07

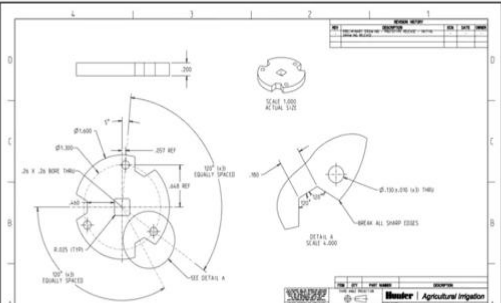
Simulation Setup and results

Problem

Prototyping / Validation



Testing Fixture CAD



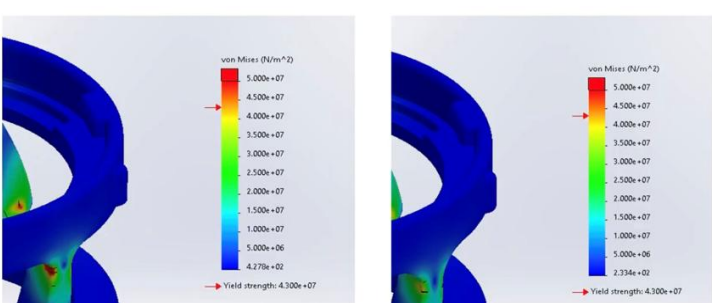
Engineering drawing for machinist



304 SS CNC fixture



Samples after being tested to fracture



Final design: **32.4% reduction in maximum stress**

Prototyping / Validation

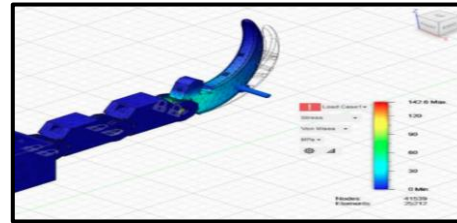
Result

Bionic Hand Grasp and Strength Testing

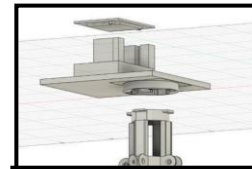


Typical pentadactyl bionic hands **struggle to grasp irregular objects** due to their asymmetric closing mechanism

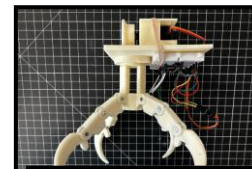
This project explored more symmetrical mechanisms in nature for potential application to our bionic hands.



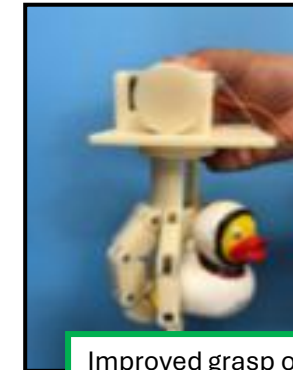
FEA



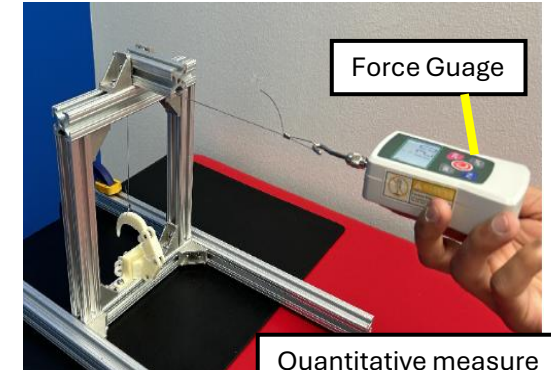
CAD in Fusion360



Electromechanical fixture



Improved grasp or irregular objects



Force Gauge

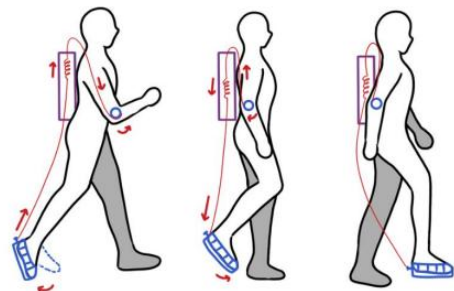
Quantitative measure of grasp **up to 64.3 N**

Problem

Prototyping / Validation

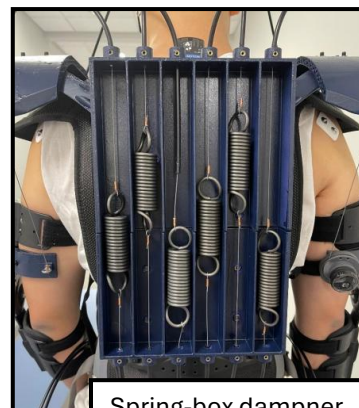
Result

Work-sharing of Upper and Lower limbs (WULL)



Lower-limb mobility devices are **often too bulky or rely on costly powered systems.**

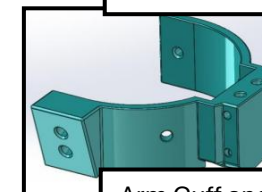
This project was to create a wearable mechanical solution that converts natural upper-body motion into assistive lower-limb drive



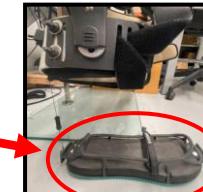
Spring-box dampner



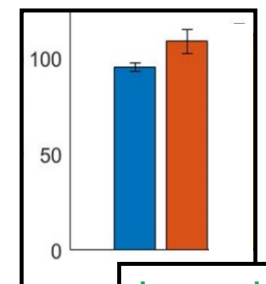
Ankle Brace



Arm Cuff and Ratchet Pulley



Fully integrated mechanical system



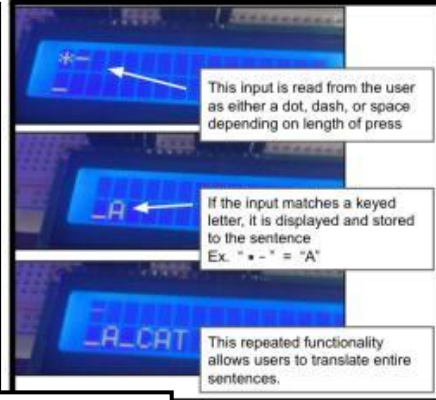
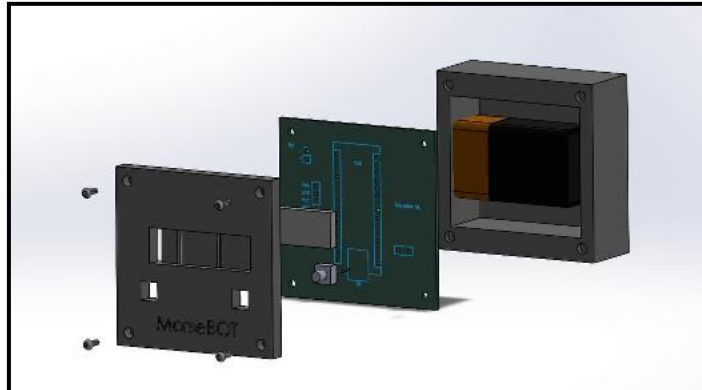
Improved heart rate of **18%** when worn

Problem

Prototyping / Validation

Result

MorseBOT – ShellHacks Submission



MorseBOT is a digital telegraph that converts analog presses into text

Overview

```
std::map<String, String> alphabetKey;

void setup() {
  Serial.begin(9600);
  pinMode(button, INPUT);
  pinMode(sentenceButton, INPUT);
  pinMode(buzzer, OUTPUT);

  alphabetKey["*-"] = 'A';
  alphabetKey["-***"] = 'B';
  alphabetKey["-*-*"] = 'C';
}
```

HashMap

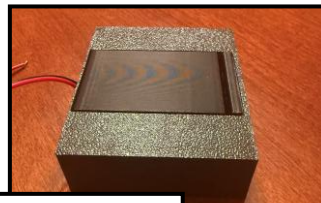
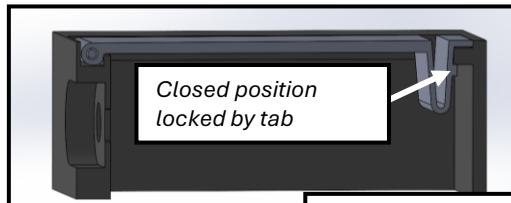
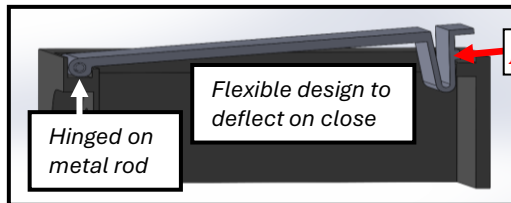
```
void loop() {
  buttonState = digitalRead(button);
  sentenceButtonState = digitalRead(sentenceButton);

  if(sentenceButtonState) {
    if(buttonState == true) {
      digitalWrite(buzzer, HIGH);
      timeHeld = ((millis() - timePressed) / 1000);
    }
  }
}
```

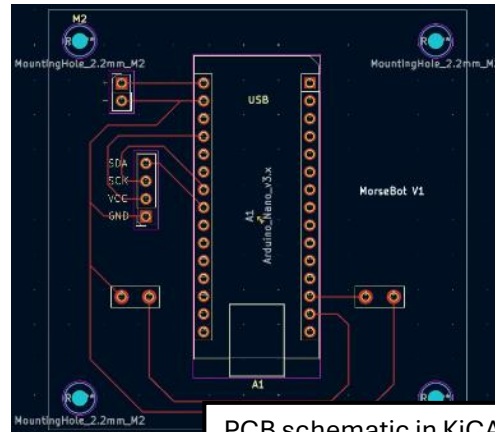
Logic to read dots or dashes

Segments of Arduino program written in C++ to decode dots and dashes into stored letter pairs

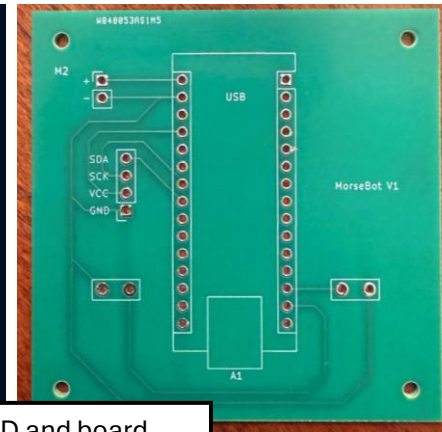
Prototyping / Validation



Battery door close mechanism



PCB schematic in KiCAD and board



Fabricated product assembled

Prototyping / Validation

Result