Design Portfolio

JumpOn!

Pajnucci Vue
December 2015

A sensory toy that induces physiological comfort, promotes reflexive motor planning, and encourages play.

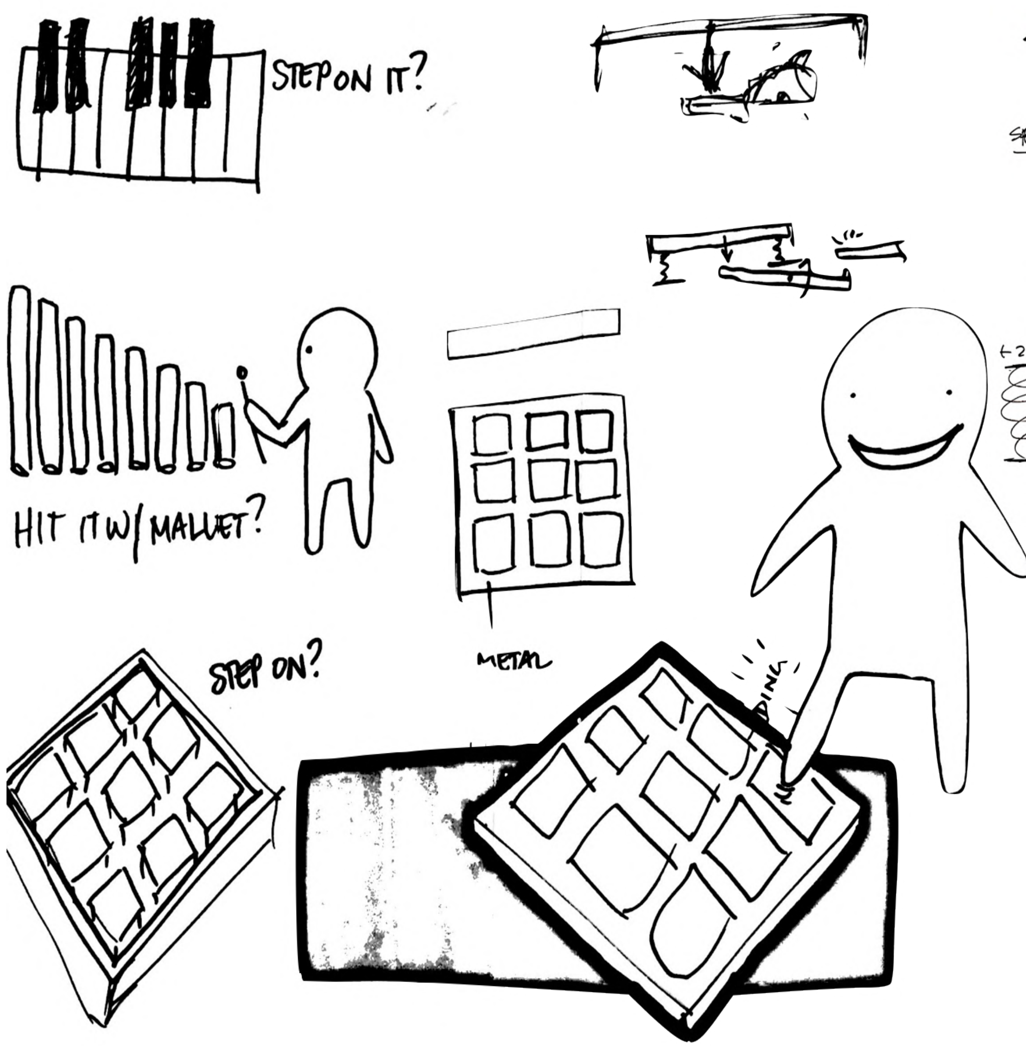
INSPIRATION

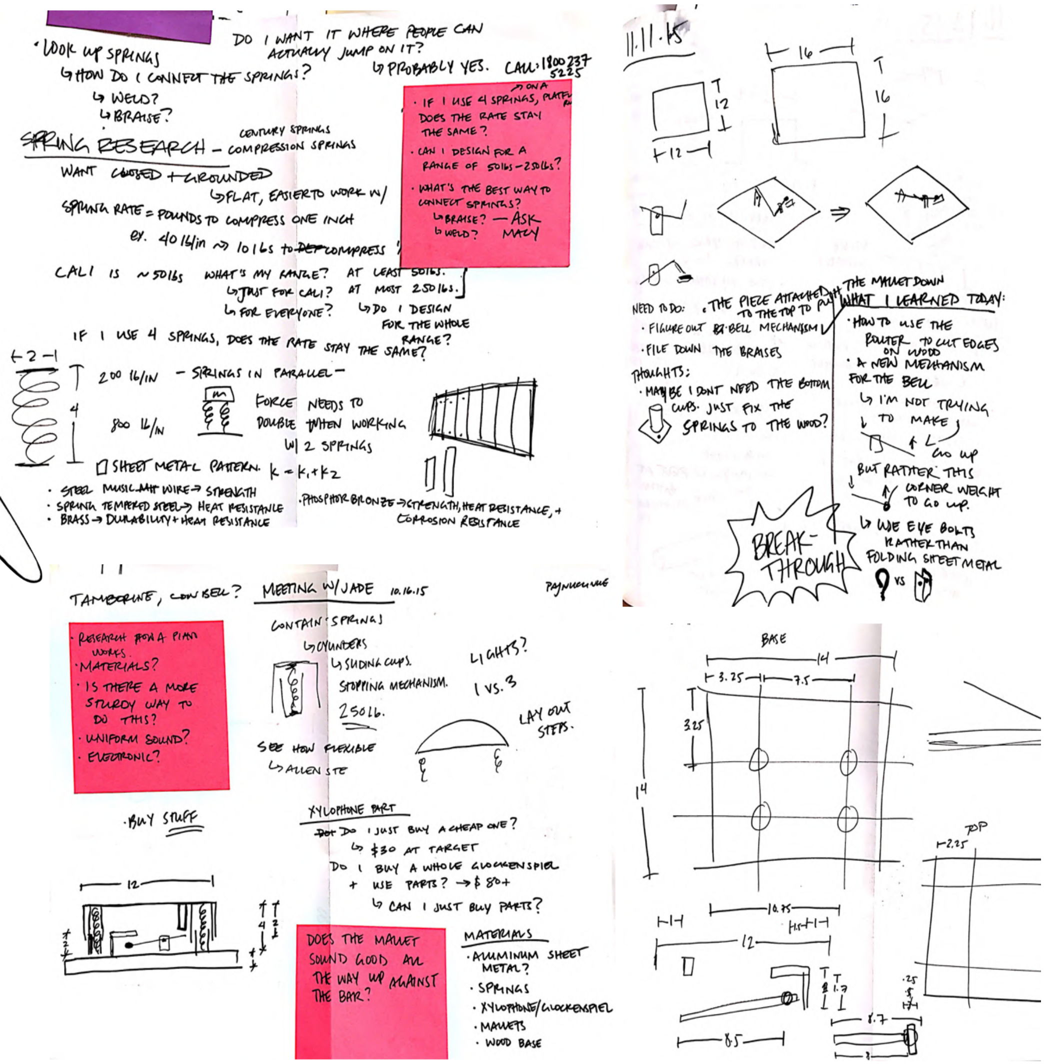
Cali, a seven-year-old girl, is painting at her desk at home. All of a sudden she folds over and her body starts shaking. Her family members rush to her side and lay her down on the floor. They're saying, "Breathe, Cali. Breathe," even though she cannot even comprehends them. They wait helplessly for it to end. About 30 seconds afterwards, she's breathing normally again and that's when you know her seizure has ended. Some days she just gets back up and returns to what she was doing, but other days the seizure knocks her out and she sleeps for hours at a time.

Cali has on average 3-5 seizures a day and has 2-3 medical appointments a week. Because of her condition, she is home-schooled. She has a room at home dedicated to her schoolwork, but does not have a playground. JumpOn! is an attempt to bring the playground to Cali.

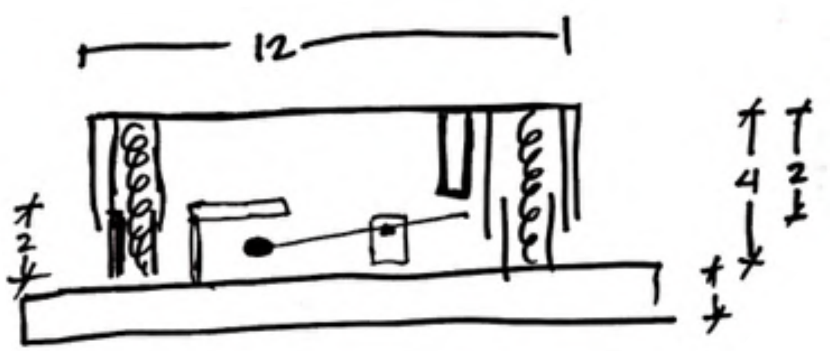
LOGBOOK

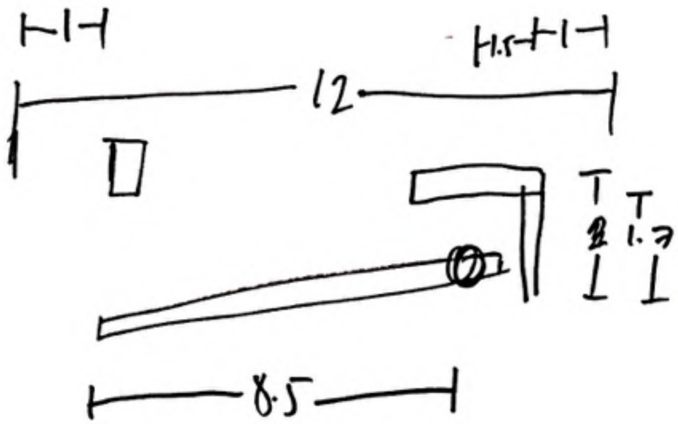
CONCEPT SKETCHES AND BRAINSTORMING



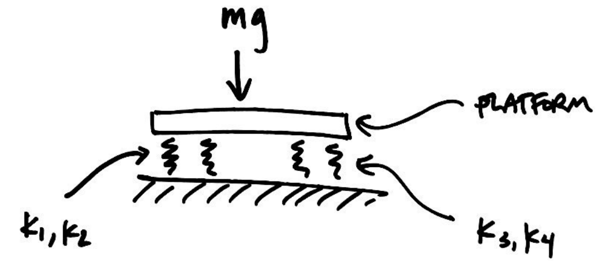


INITIAL SKETCHES AND CALCULATIONS





$\boxed{\text{FBD}}$



$K_{eq} = k_1 + k_2 + k_3 + k_4$ (SPRINGS IN ~~SERIES~~ PARALLEL)

$k_1 = k_2 = k_3 = k_4$

$K_{eq} = 4K_1$

$\boxed{\text{CALCULATIONS}}$

m = 100 lbs PERSON

$m \approx 50\ \text{Kg}$

$g \approx 10\ \text{m/s}^2$

IDEAL DISPLACEMENT

$\Delta X = 1.5\text{in} \approx 0.03\text{m}$

$F = \Delta x \cdot K_{eq}$

$\frac{F}{\Delta x} = K_{eq}$

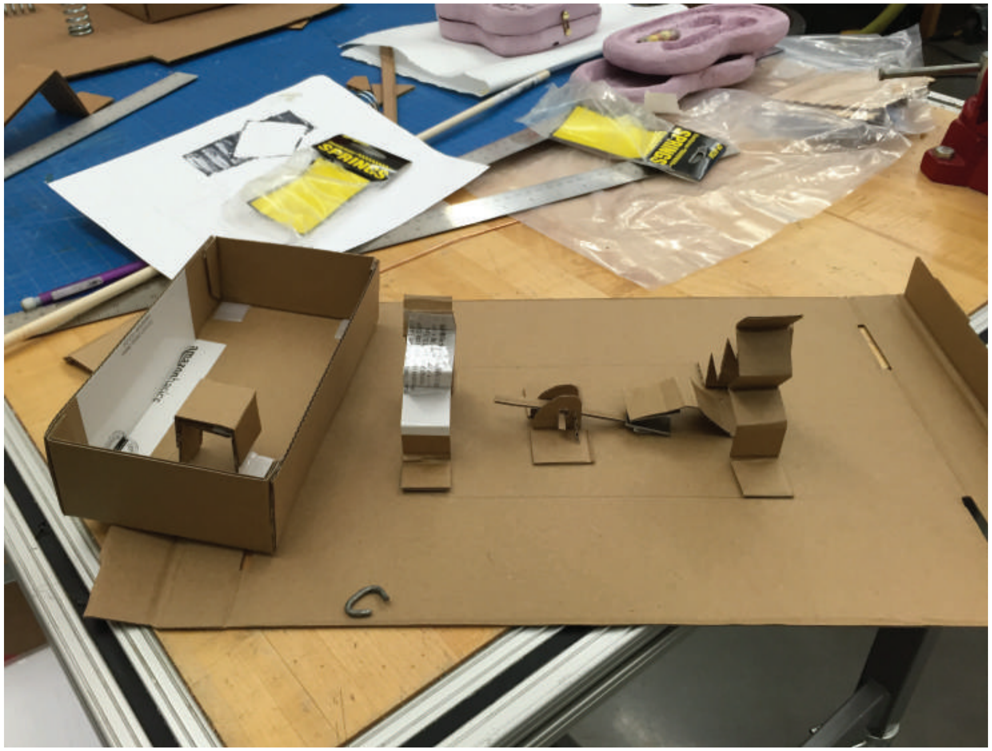
$\frac{mg}{\Delta X} = \frac{500\text{N}}{0.03\text{m}} = 16{,}666\ \frac{\text{N}}{\text{m}} = K_{eq}$

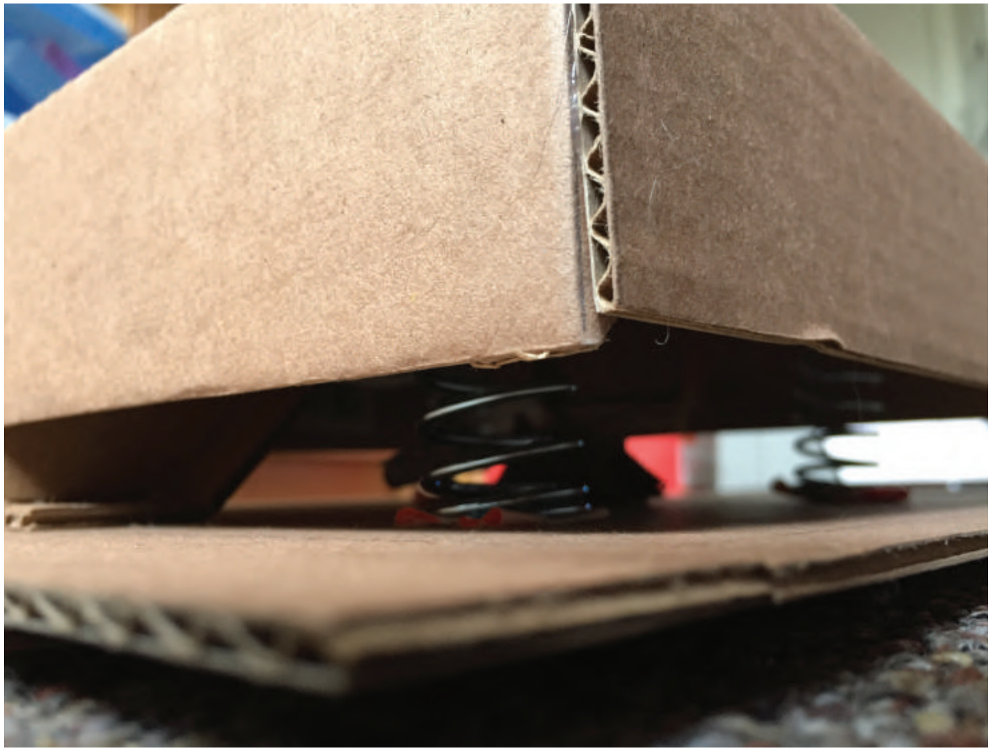
$\frac{K_{eq}}{4} = K_1 = \frac{16{,}666}{4} = 4{,}166\ \frac{\text{N}}{\text{m}}$

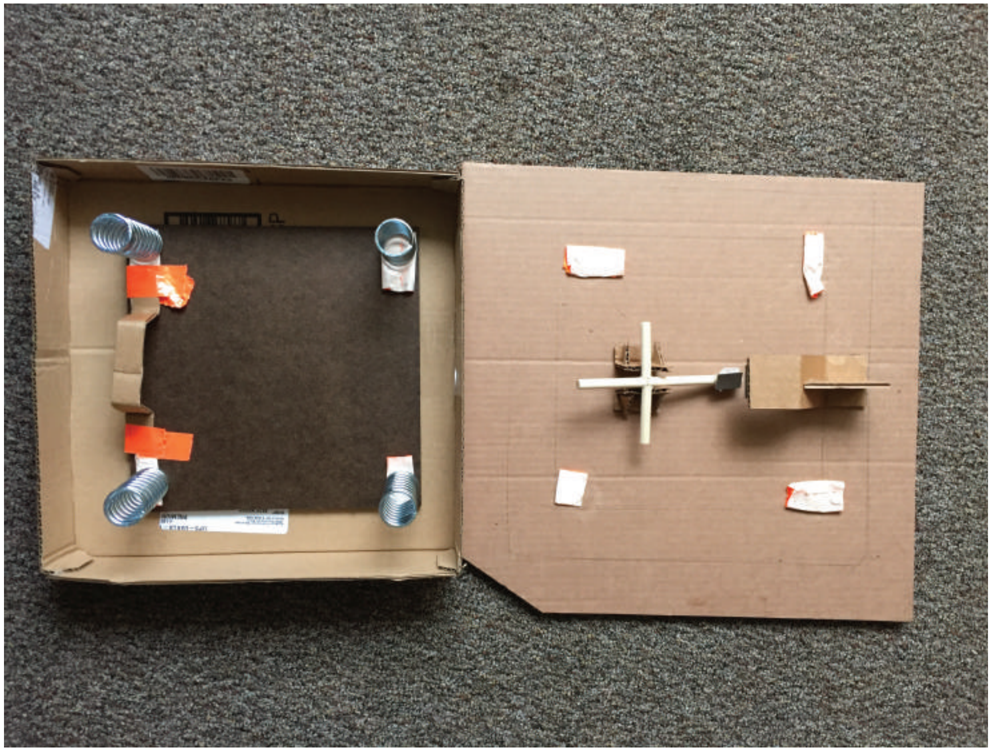
MINIMUM SPRING FORCE TO ACCOUNT FOR = $K_1 = 4{,}166\ \frac{\text{N}}{\text{m}}$

PROTOTYPING

I used cardboard to prototype the musical mechanism. I learned that I needed to create a lever mechanism that when someone jumps on, it pushes the lever down and hits the bell. Also, I prototyped size, and went with 12'x12' to ensure that both feet can fit on top of the toy.

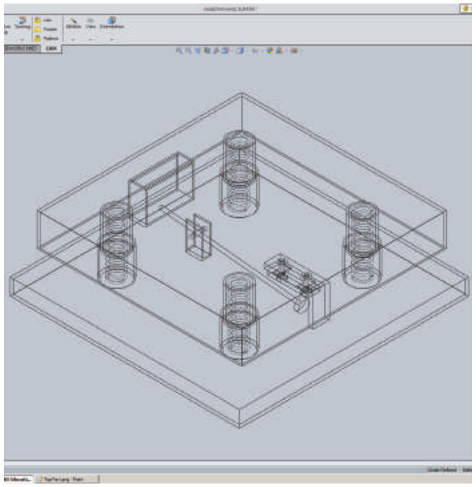


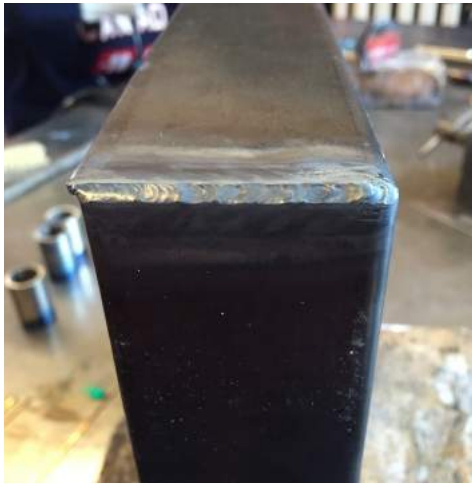


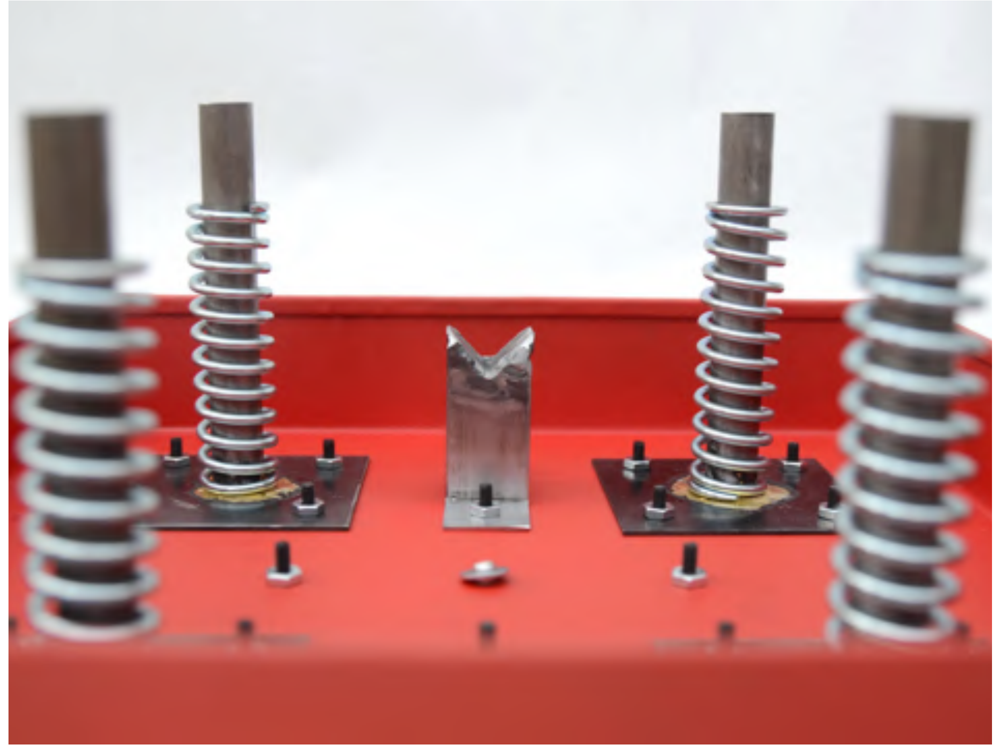


MANUFACTURING

I welded together the edges of the top steel part. I brazed steel tubing to steel squares to make flanges. I then milled the top part to have a grid of holes in which I could attach different parts using nuts and bolts. Finally, I constructed the wooden base out of pine.







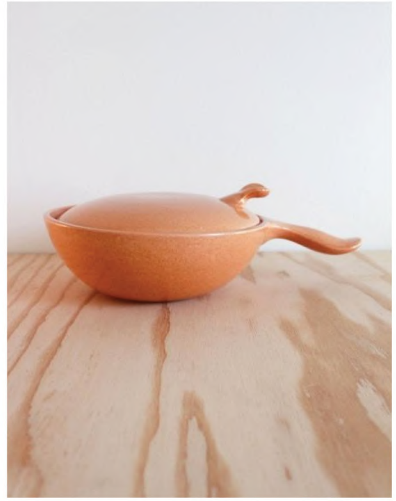
JumpOn!

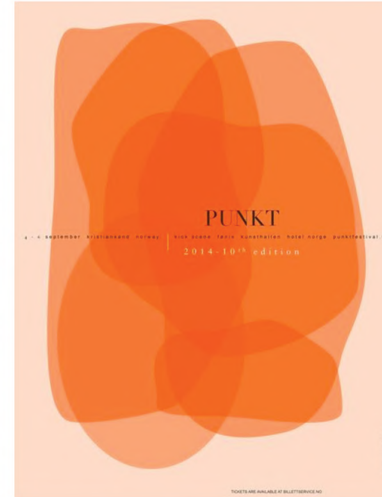
Pajnucci Vue
December 2015

The Guava Chair

PAJNUCCI VUE | THE CHAIR | WINTER 2019





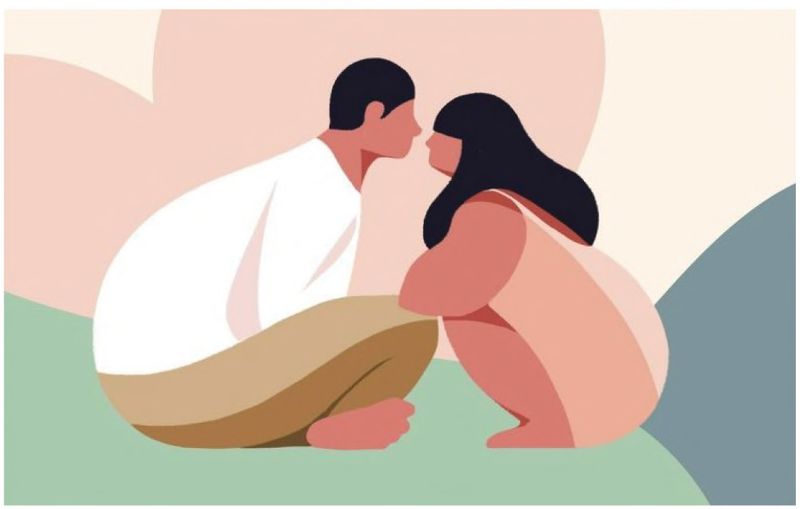


creamy

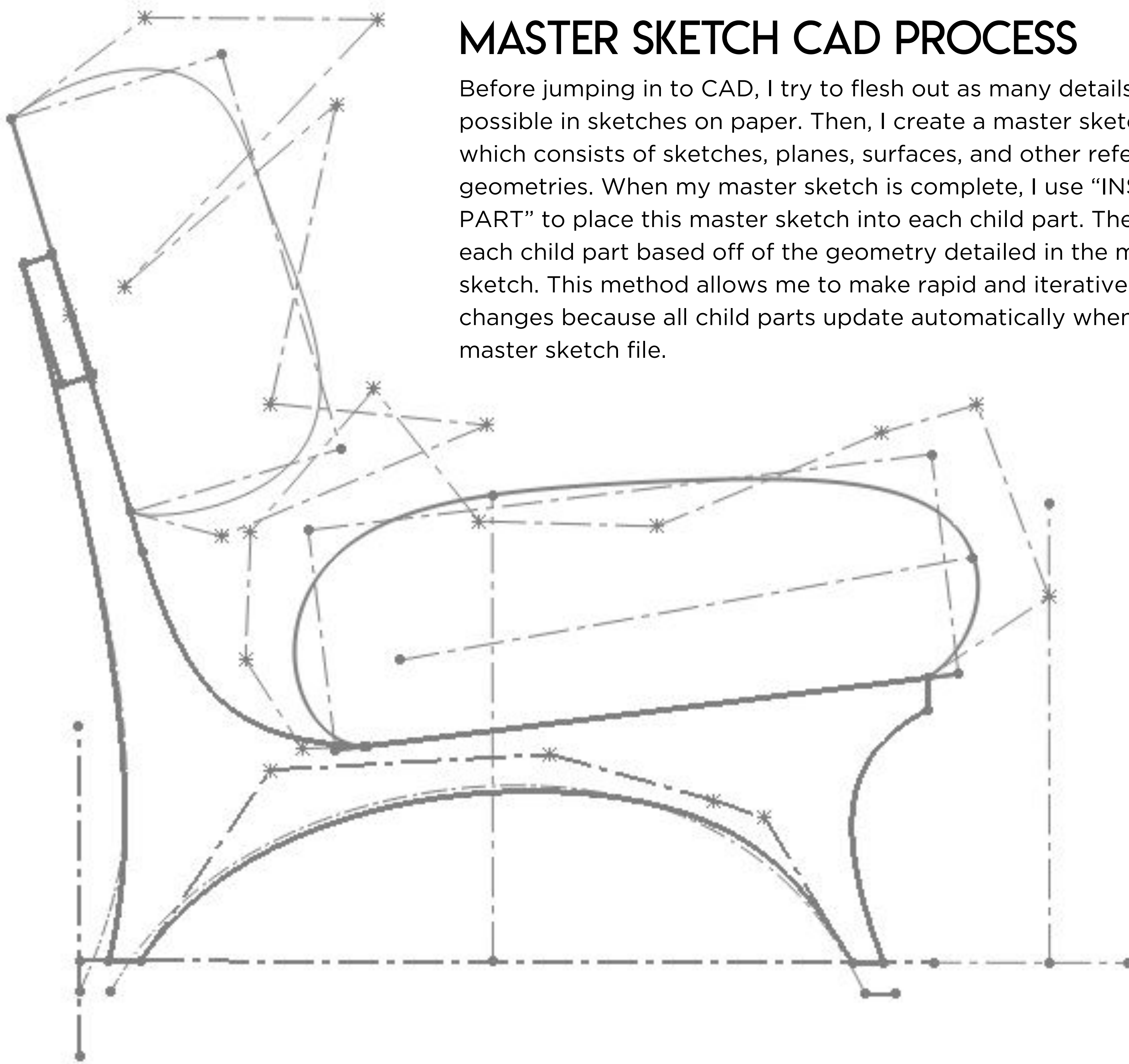
sturdy

sassy





SKETCHES



MASTER SKETCH CAD PROCESS

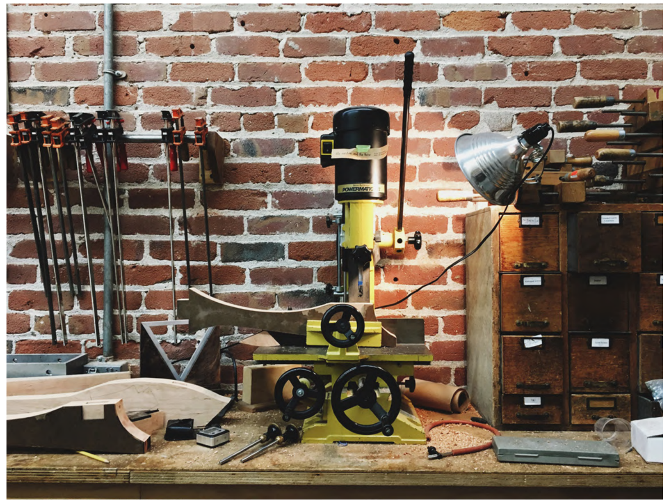
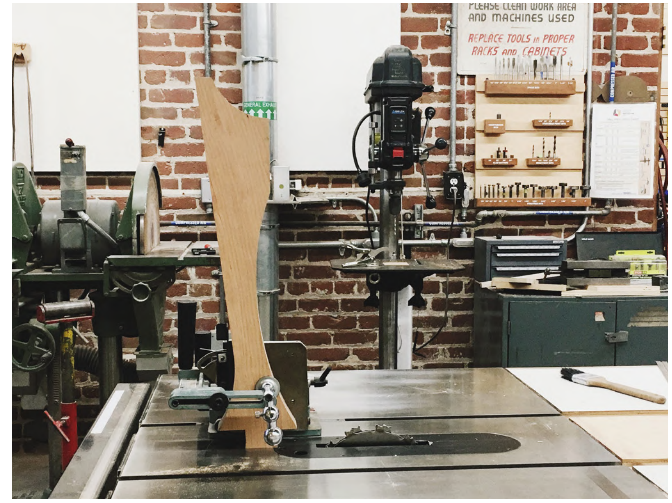
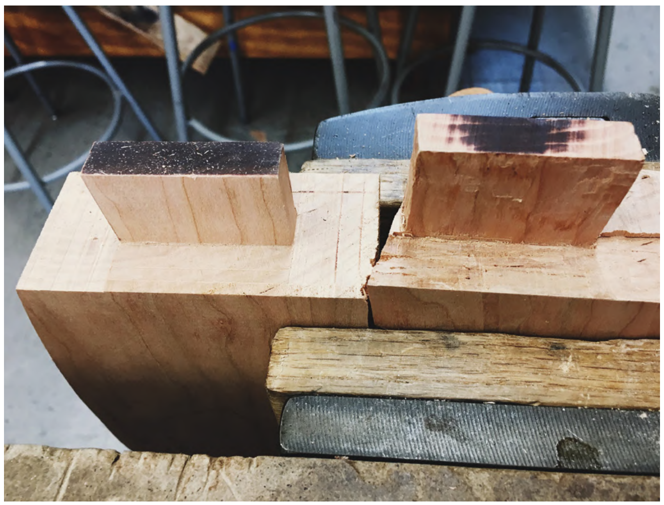
Before jumping in to CAD, I try to flesh out as many details as possible in sketches on paper. Then, I create a master sketch file, which consists of sketches, planes, surfaces, and other reference geometries. When my master sketch is complete, I use “INSERT PART” to place this master sketch into each child part. Then I create each child part based off of the geometry detailed in the master sketch. This method allows me to make rapid and iterative model changes because all child parts update automatically when I edit the master sketch file.

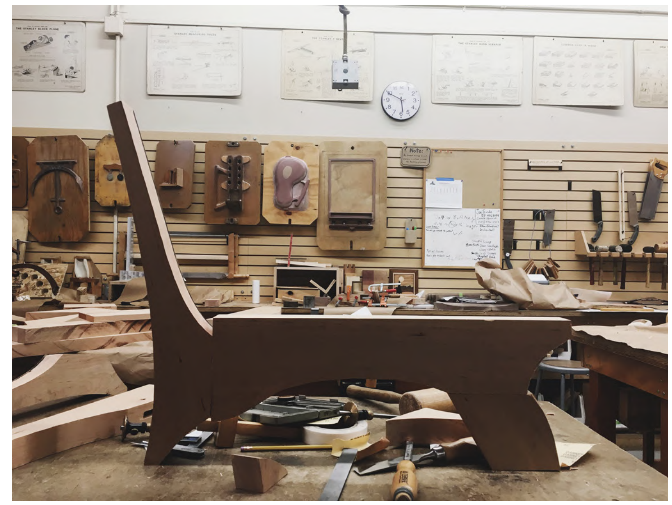
CAD RENDERINGS

PROTOTYPING

I used prototyping as an opportunity to answer questions. For the Guava Chair, I wanted to better understand the measurements, fit, ergonomics, scale, and shape of a chair. I used cheap materials like OSB board and scavenged Steelcase moving blankets to create this prototype's frame and upholstery. When I initially sat in the prototype based off of general chair measurements, the chair did not feel warm and welcoming to my petite body size, something felt off. I ultimately decided to design this chair for my body size instead of the general population, and that was one of the many learnings I gained from this prototype.

FRAME CONSTRUCTION


DEWALT


PLEASE CLEAN WORK AREA
AND MACHINES USED
REPLACE TOOLS in PROPER
RACKS and CABINETS


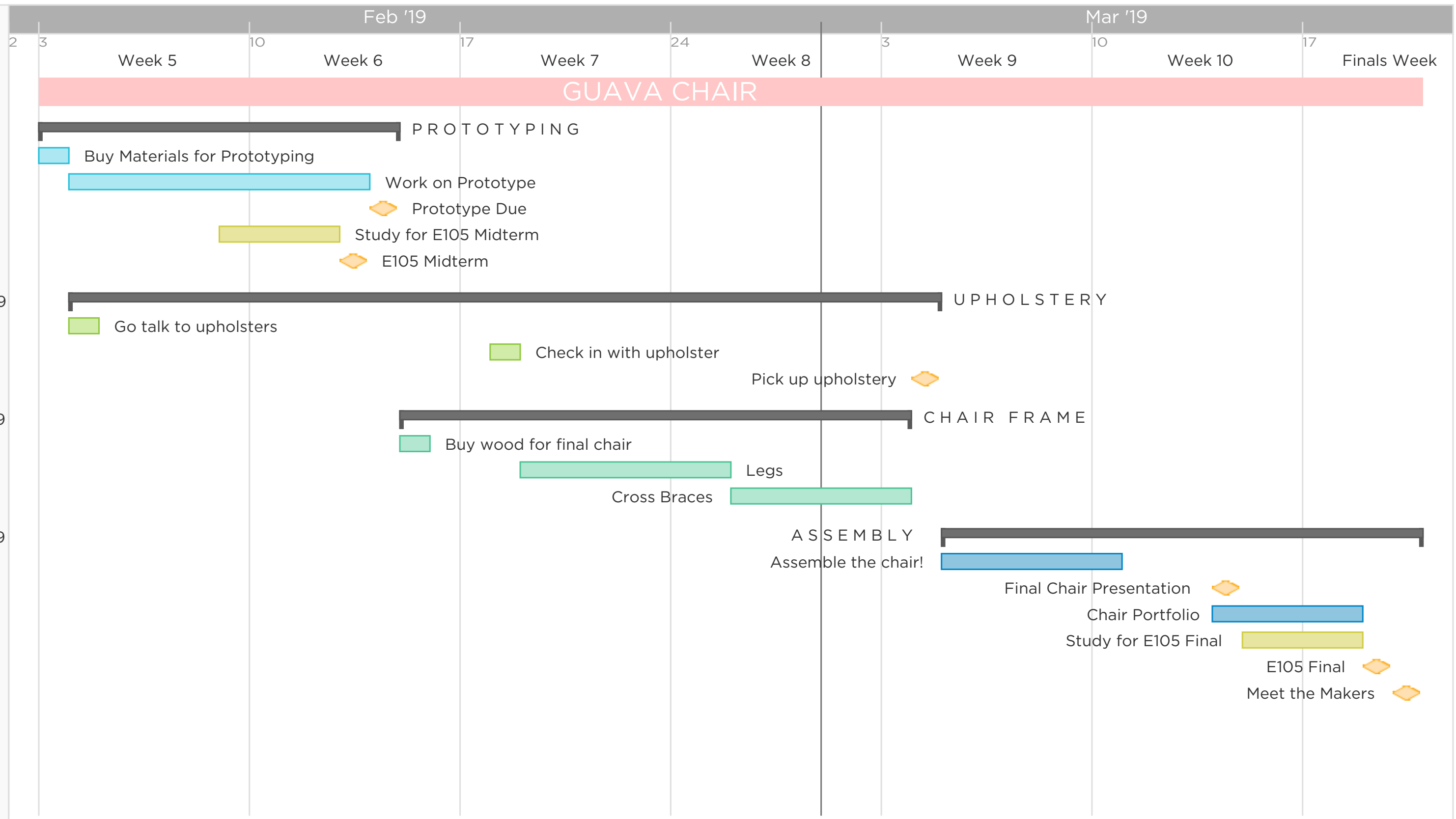




WOODGLUE

GANTT CHART

GUAVA CHAIR	start	end
PROTOTYPING	02/03/19	02/14/19
Buy Materials for Prototyping	02/03	02/03
Work on Prototype	02/04	02/13
Prototype Due	02/14	02/14
Study for E105 Midterm	02/09	02/12
E105 Midterm	02/13	02/13
UPHOLSTERY	02/04/19	03/04/19
Go talk to upholsters	02/04	02/04
Check in with upholster	02/18	02/18
Pick up upholstery	03/04	03/04
CHAIR FRAME	02/15/19	03/03/19
Buy wood for final chair	02/15	02/15
Legs	02/19	02/25
Cross Braces	02/26	03/03
ASSEMBLY	03/05/19	03/20/19
Assemble the chair!	03/05	03/10
Final Chair Presentation	03/14	03/14
Chair Portfolio	03/14	03/18
Study for E105 Final	03/15	03/18
E105 Final	03/19	03/19
Meet the Makers	03/20	03/20



MATERIALS/COST

Component	**Vendor**	**Num**	**Unit**	**Cost/Item**	**Cost**
Upholstery Labor	Mario's Bon Decor				$225.00
Fabric, taxes, shipping	Mario's Bon Decor	2	yards	$75.00	$182.50
Cherry Wood	Aura Hardwoods, Inc.	13	board feet	$4.93	$70.50
Fasteners	Ace Hardware			$5.72	$5.72
Prototyping	1/4" 24"X48" Duron	2		$8.00	$16.00
				Total	**$499.72**

The Guava Chair

PAJNUCCI VUE | THE CHAIR | WINTER 2019

DESIGNER STATEMENT
With the intention of creating a creamy, sturdy, sassy chair, this chair is meant to be a place where I can pause, take a break, and breathe. Through the smooth solid cherry frame and plush pink cushions, the chair has a playful, inviting softness to it. The chair is intentionally short in order to fit my petite figure. Similar to guavas, this chair is small, sturdy, and sweet.

DIMENSIONS
H 27.5” W 27” D 28”

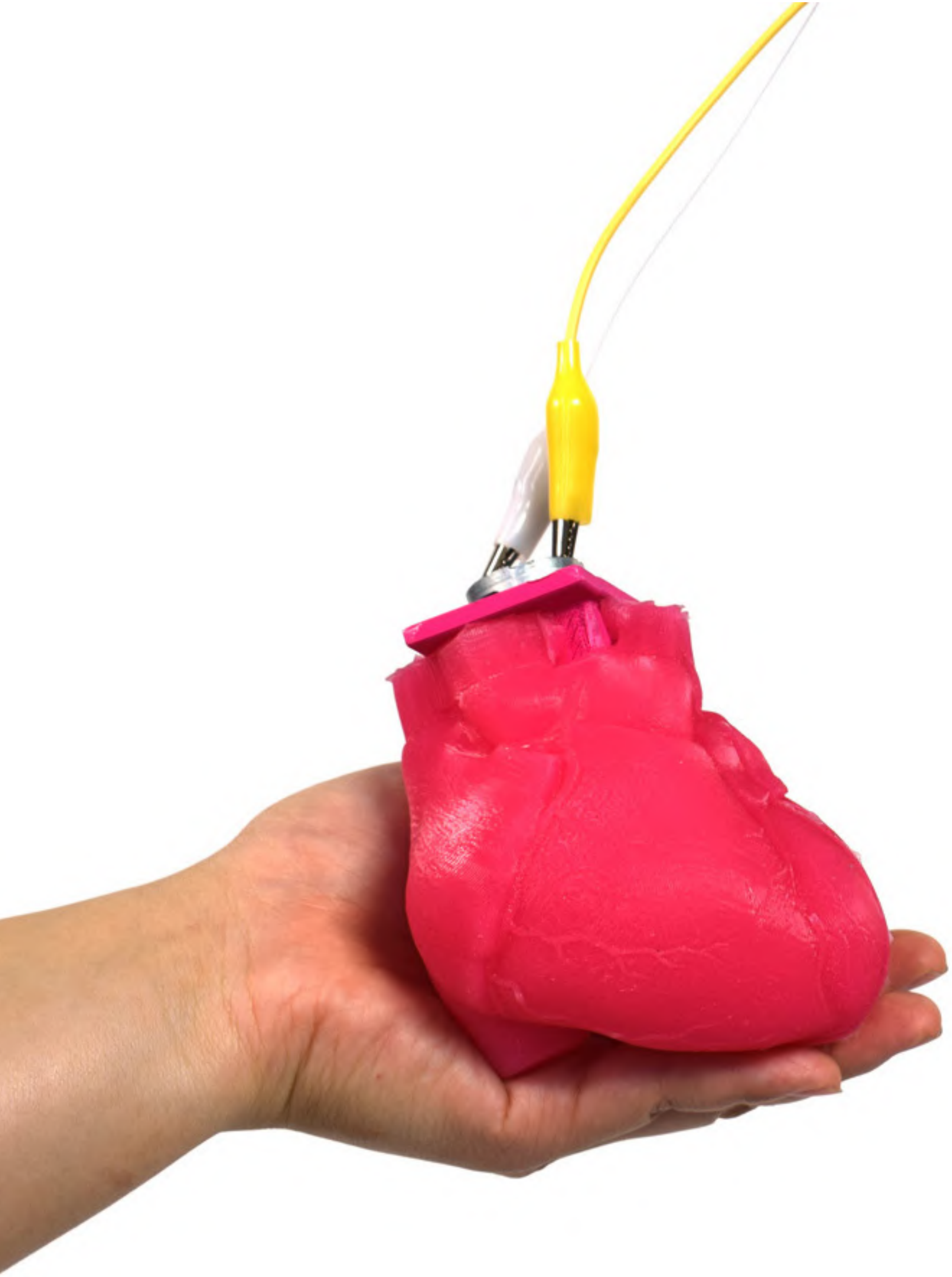
MATERIALS
Solid cherry frame; Foam cushion and padding; Peach fabric upholstery







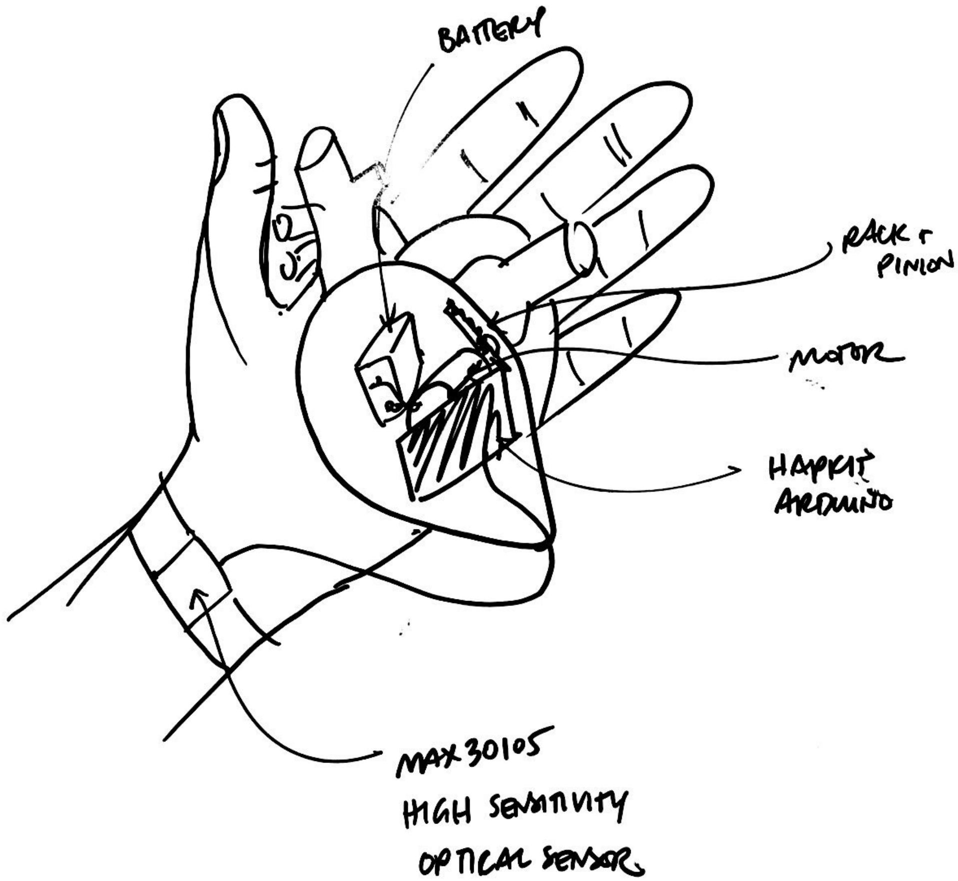




HeartBeat

Pajnucci Vue | June 2019

A bio-haptic feedback device that allows users to feel their heartbeat in their hand.

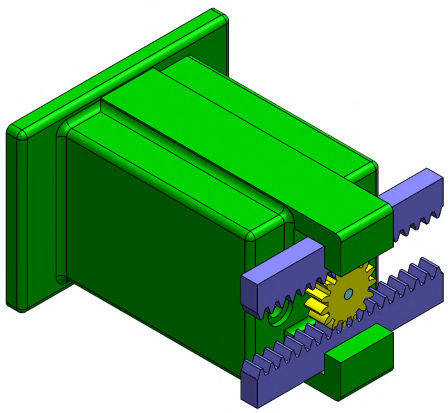


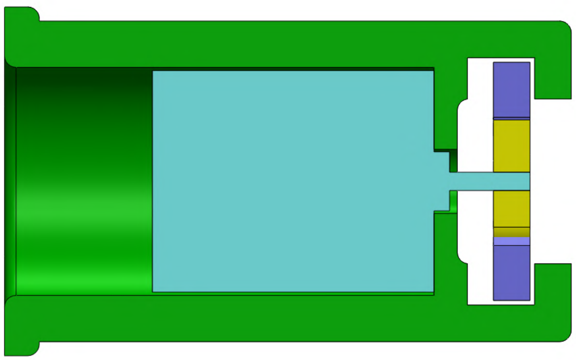
HeartBeat is a haptic feedback device that allows users to feel their heart beat in their hand. The user attaches a sensor to their wrist or their finger that tracks their heart beat. Through an arduino, this signal is then echoed into a realistic silicone heart which the user can hold and feel expanding and contracting in the same rhythm as their own heart.

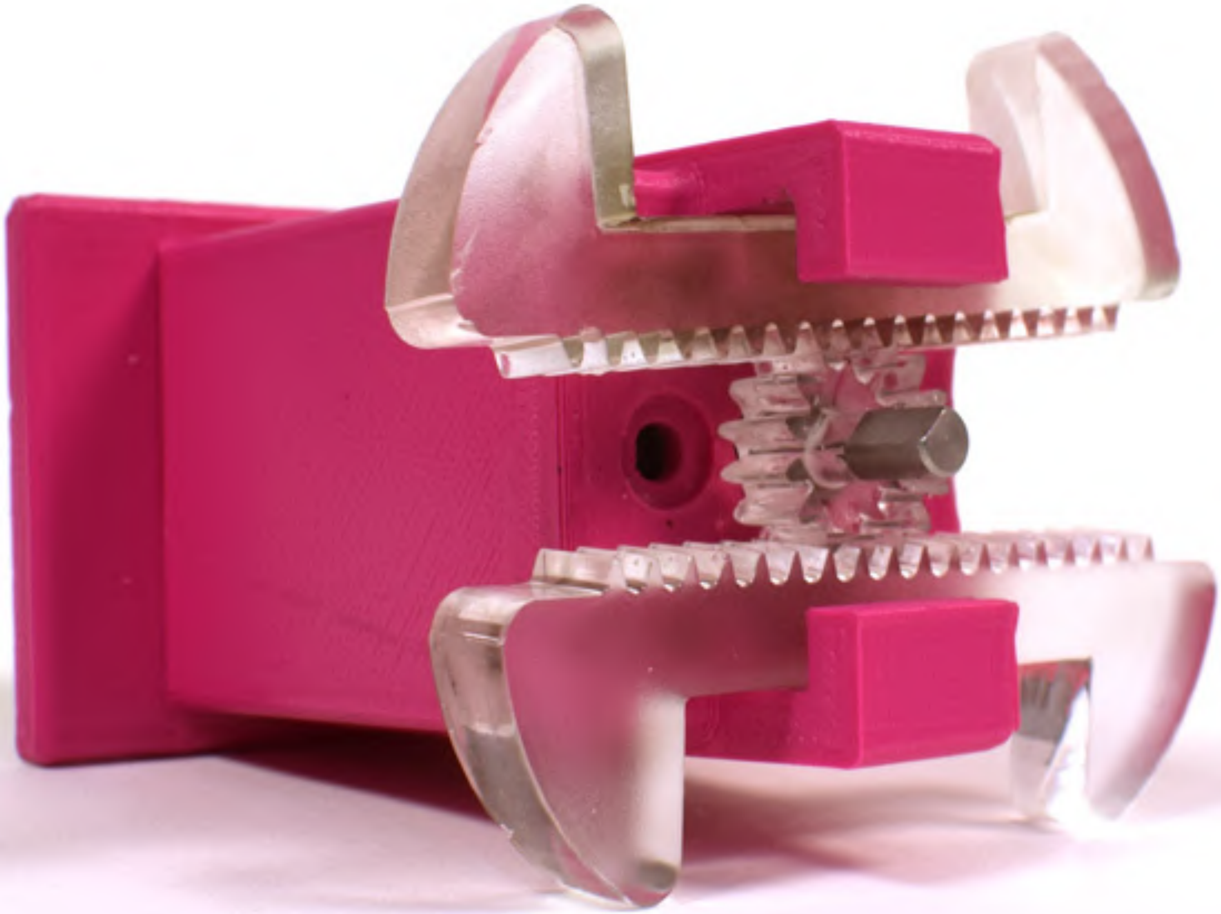
MOTOR MOUNT

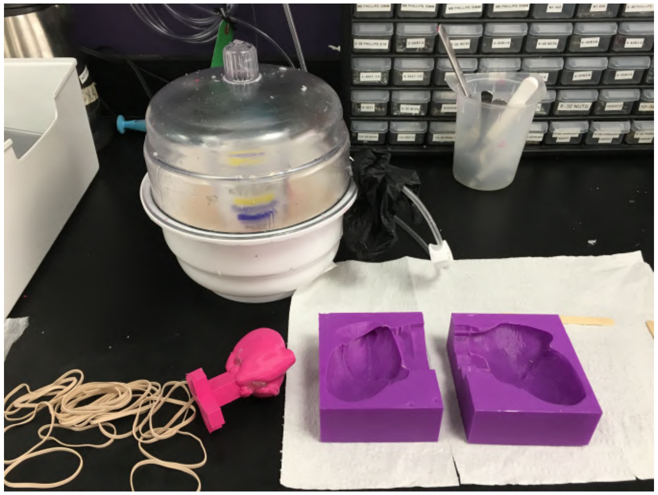
We developed a motor mount that sits at the opening of the silicone heart. I helped create the CAD for the mount system. We decided on a **flange** at the end in order to maintain the motor's position inside of the silicone cavity. The **rack and pinion mechanism** was lasercut and dropped in/press fit into our assembly. The racks include stops that prevent them from over-travel.

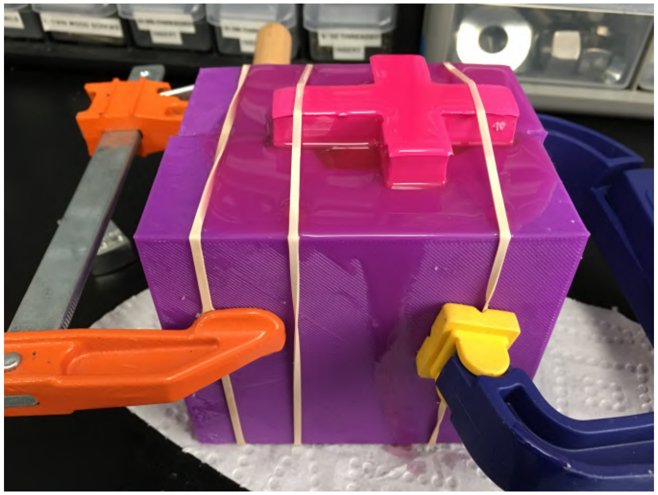
We chose to use a 170 rpm motor with integrated planetary gear train because of its high torque and because the rack and pinion mechanism involved very few motor revolutions. Another reason we chose to use this motor is because it has a **d-shaft** which prevents the pinion gear from slipping.











SILICONE HEART

For the physical silicone heart model, we silicone cast the heart to have a ~0.75" thickness using a 3D printed mold with an undersized core.


Professor Allison Okamura testing out HeartBeat

Team photo with HeartBeat
Aziz, Anna, and I

MATE

Integrating ceramics and aluminum
Pajnucci Vue
December 2017

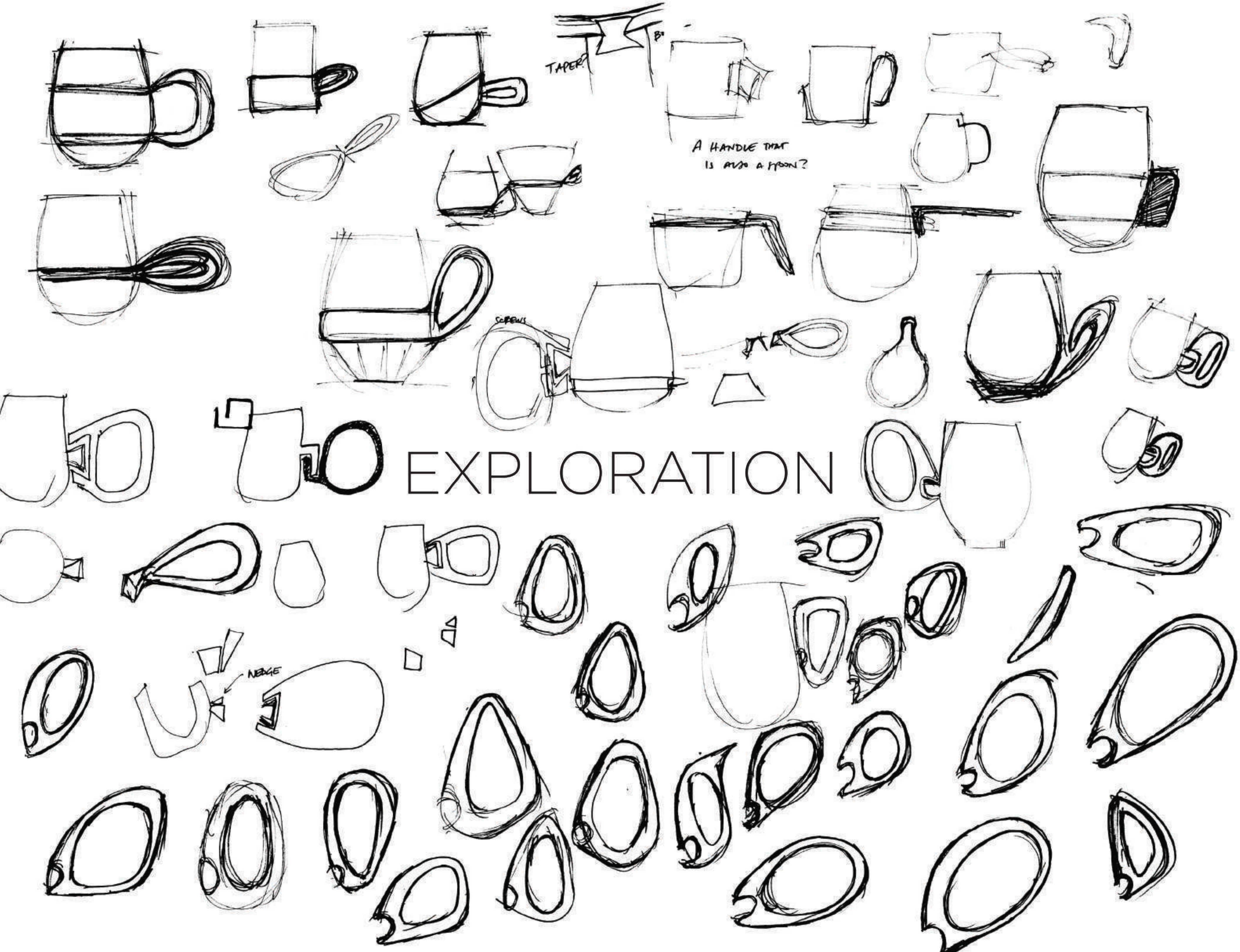
MATE

Intrigued by the integration of ceramics and aluminum, I wanted to make something that would beautifully mate the two materials together.

The compelling challenge of this integration is that the ceramic piece changes and shrinks over the course of the multiple firings it needs to go through in order to be vitrified and glazed, whereas the aluminum will most definitely not change when it is machined. Therefore, when designing Mate, I should make the ceramic piece first because it is more unpredictable so that I can then design the handle to make up for the variability in the ceramics.

INSPIRATION

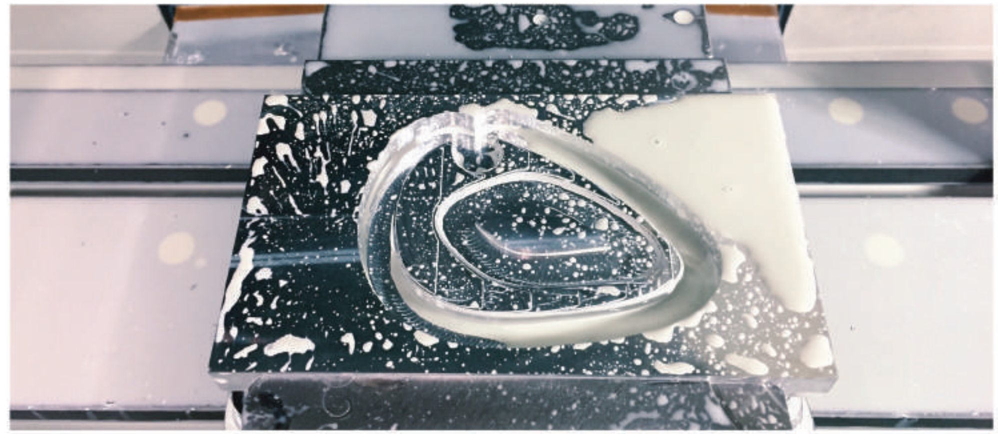
EXPLORATION

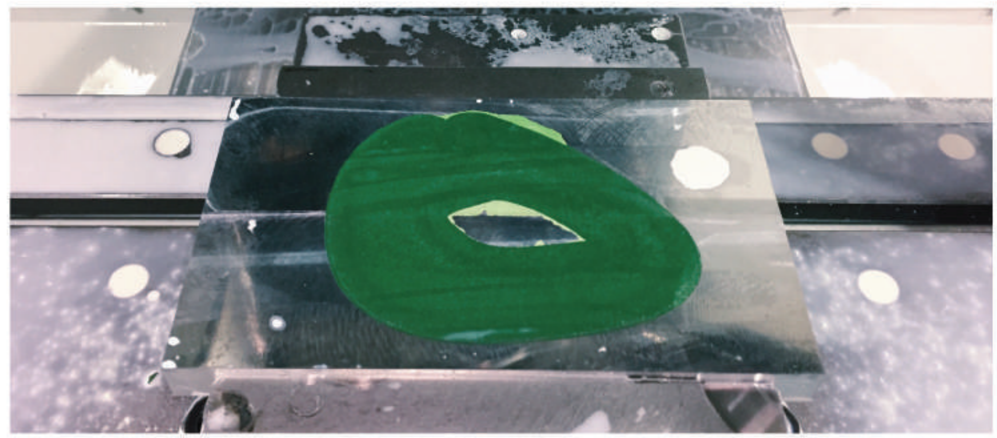


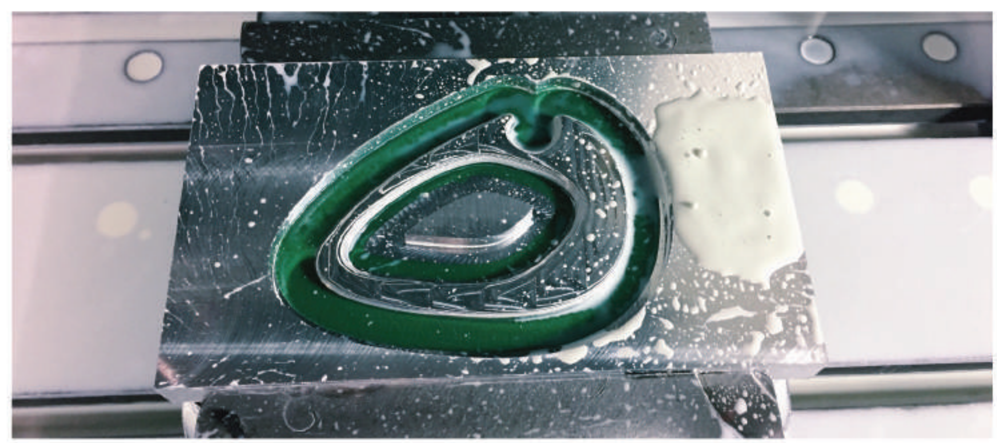
MANUFACTURING

The ceramic cup was hand thrown, and the nub was hand built.

The aluminum handle was made using a CNC Vertical Mill. The CAD was modeled in Solidworks and the CAM was produced in HSMWorks. Since the part was 3D and I wanted a machine finish, the part required a part flip half way through the machining process. Using parallels and a vise on the CNC bed as my fixturing, I machined the first side to 75% depth, filled the cavity with green machinable wax, flipped the part along the y-axis, then machined the other side of the part, melted off the wax, and had a finished part.







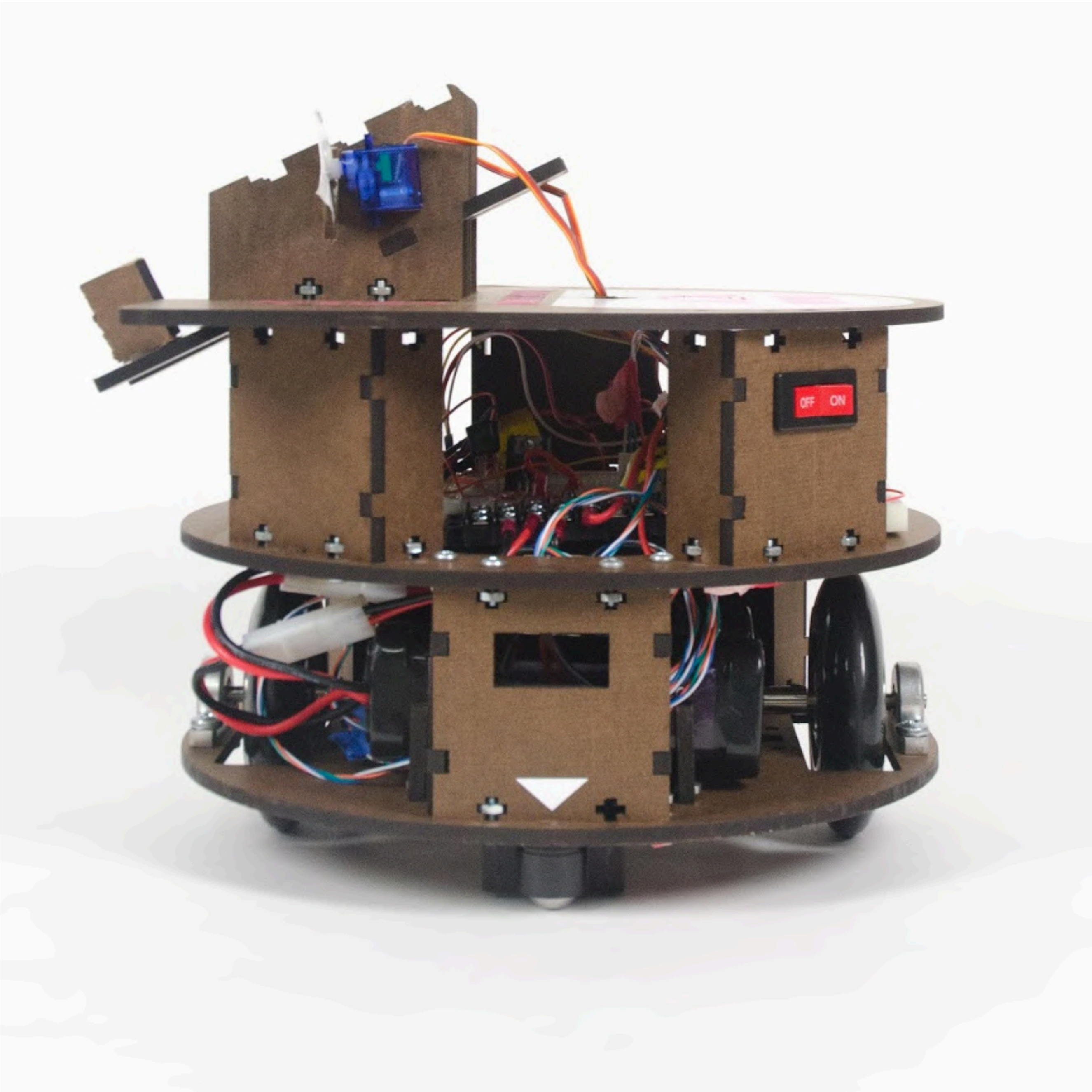
MATE

Integrating ceramics and aluminum.

Pajnucci Vue

December 2017

MECHATRONICS



Pajnucci Vue | March 2018

In Stanford's ME210: Introduction to Mechatronics, I worked on a team of four to create an autonomous robot that played a game against another autonomous robot.

The project integrated software, electronics, and hardware. We developed an event-driven software framework for the robot to follow the game play, incorporated multiple sensing modalities including IR proximity sensing and a signal receiving sensor, and mechanically integrated moving parts into a housing. This project culminated in a final class competition.

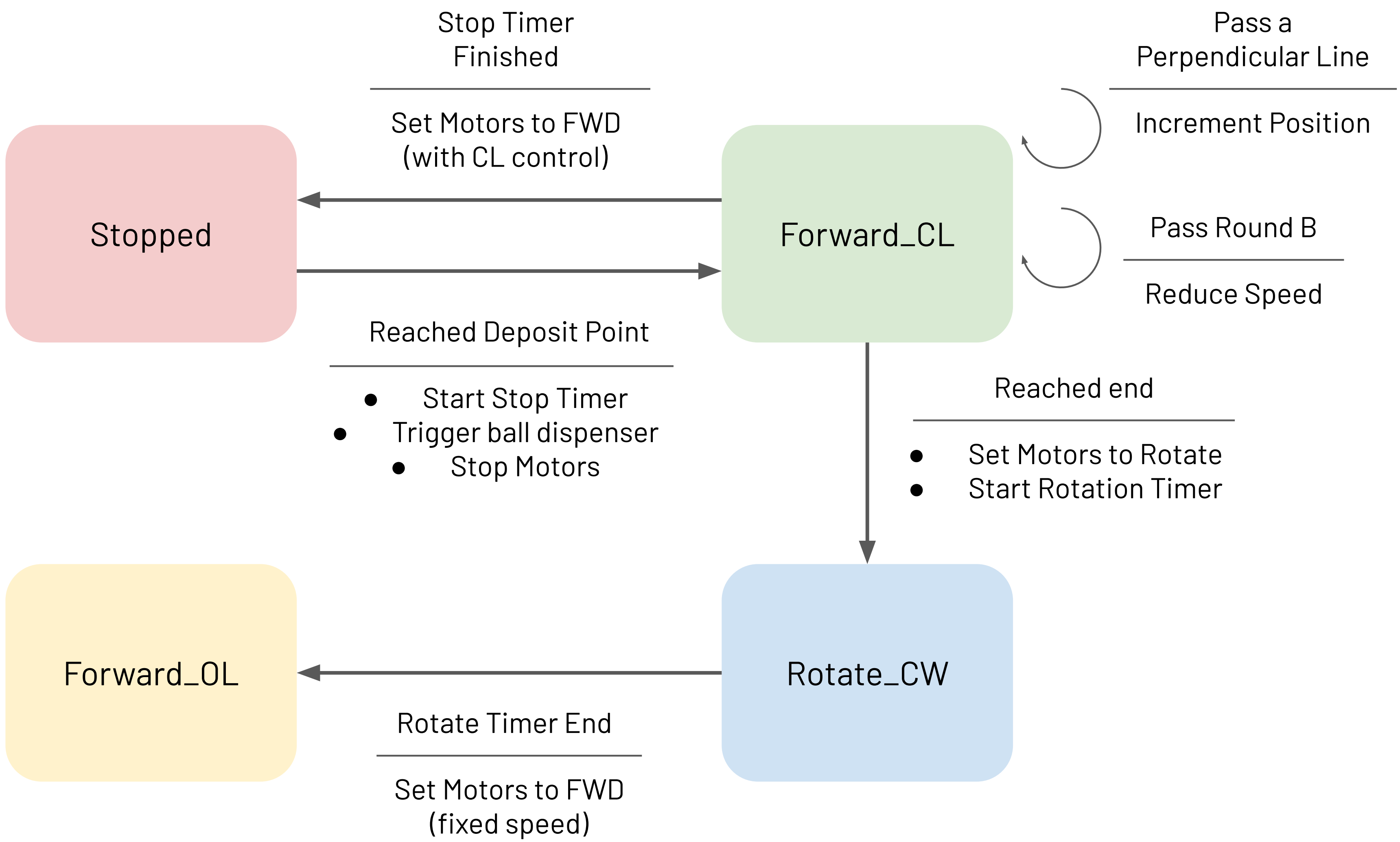
If you would like to see the robot in action, watch this video:

https://tinyurl.com/pvue-mechatronics

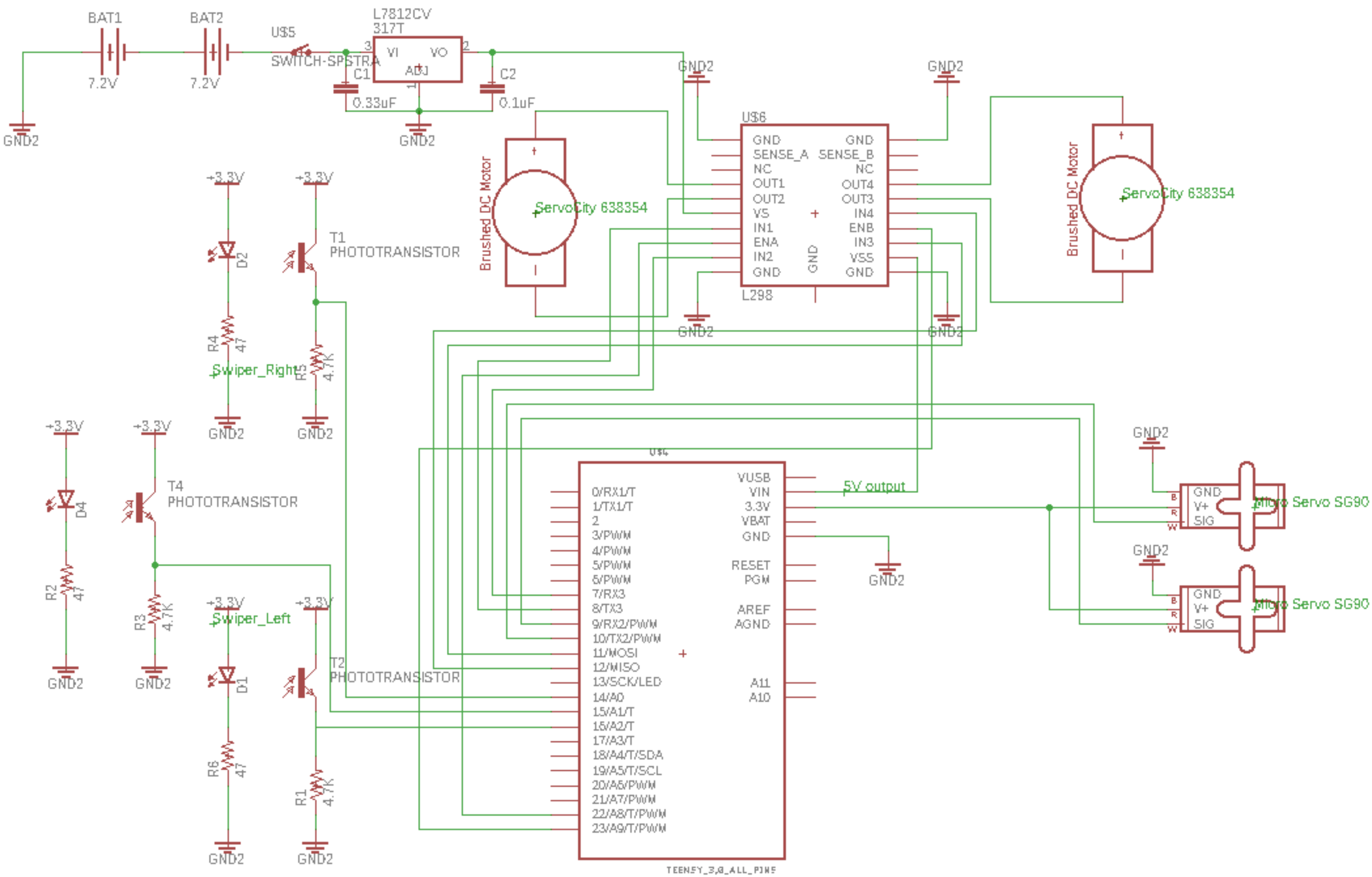
If you would like to read about our work more in depth, read our blog:

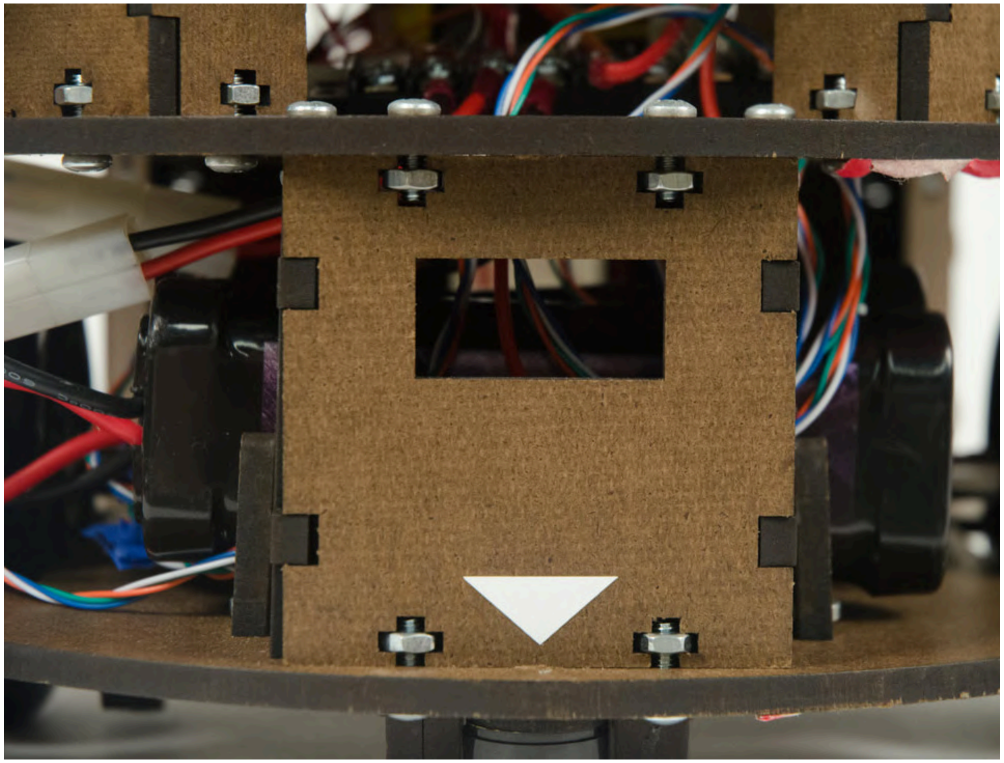
https://love-socks.weebly.com/

EVENT-DRIVEN STATE MACHINE



ELECTRONICS SCHEMATICS



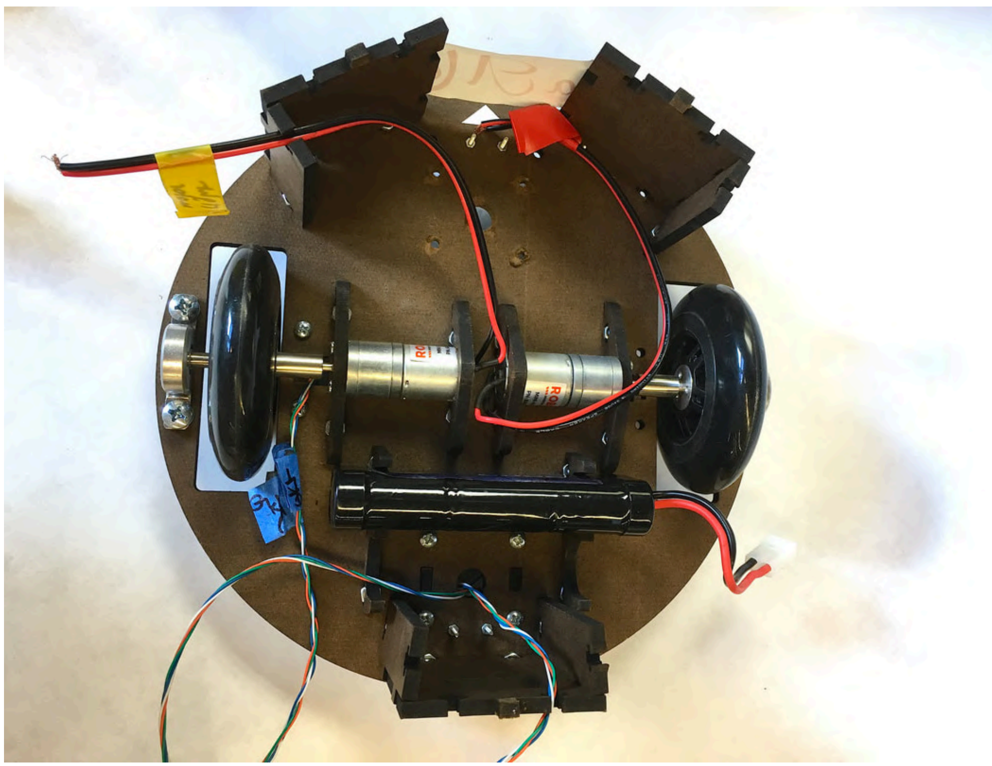


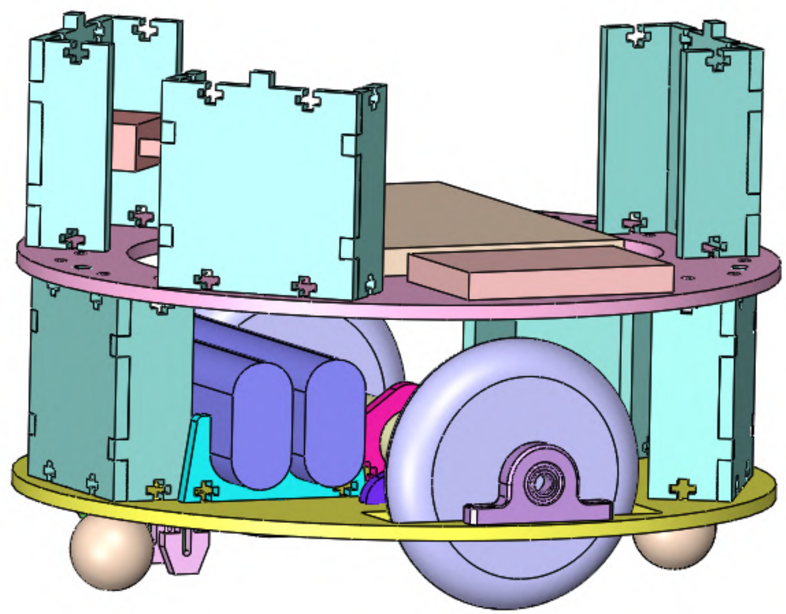
HARDWARE

The mechanical structure was designed for easy assembly and disassembly with robustness with regard to vibrations and torsional loads.

The structure is composed of a three layer cylindrical design. The lower layer housed the drivetrain, IR sensors and the batteries. The second layer housed the breadboards. The third layer held dispatch system.

This design allowed for us to have a sturdy structure that did not wobble, and for robustness that could withstand testing.





Want to chat?

Pajnucci Vue

650-283-6530
pajnucci@gmail.com
http://www.pajnucci.com/