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PROJECT PORTFOLIO

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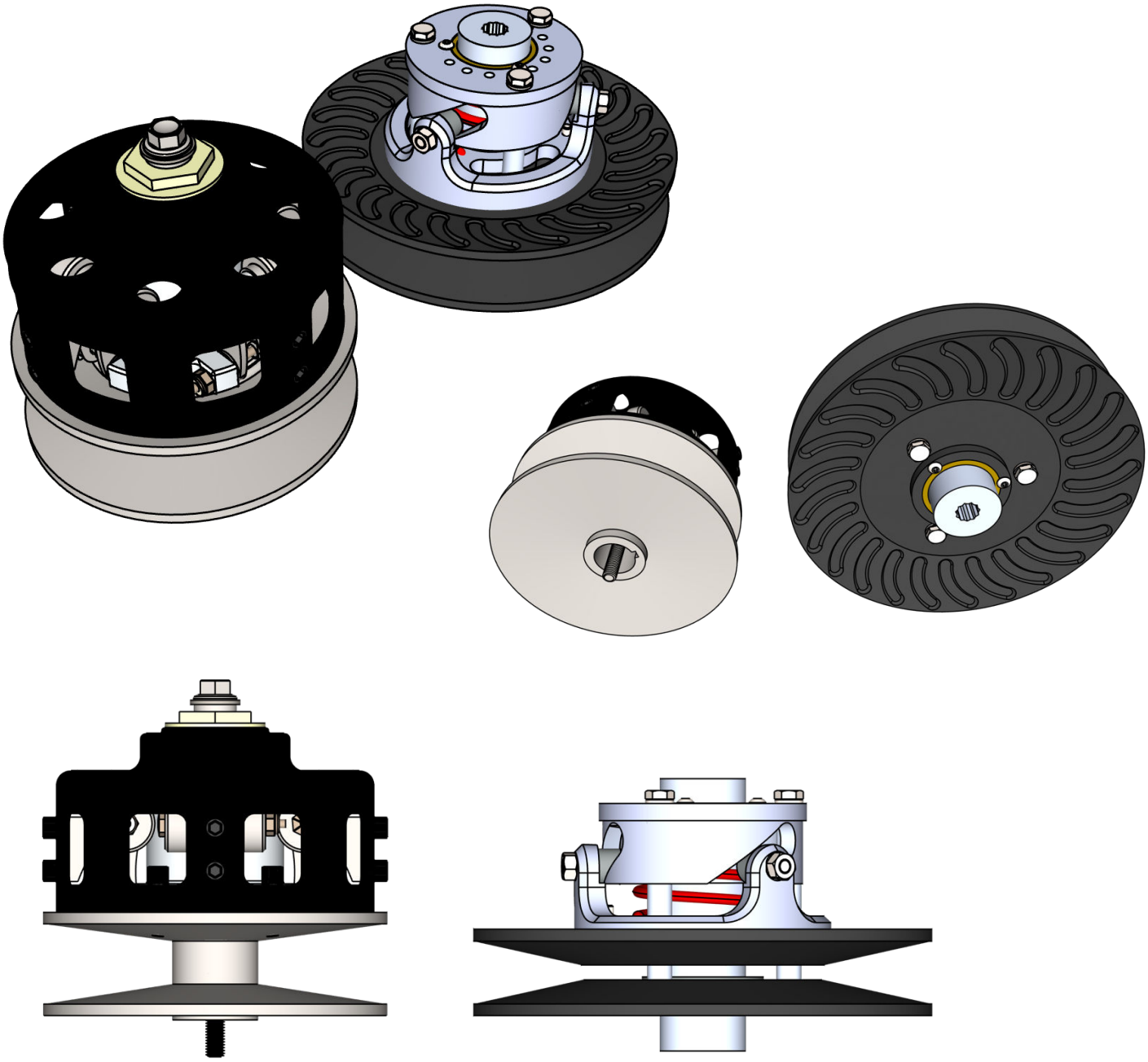
BAJA SAE TRANSMISSION CAD

July 2021

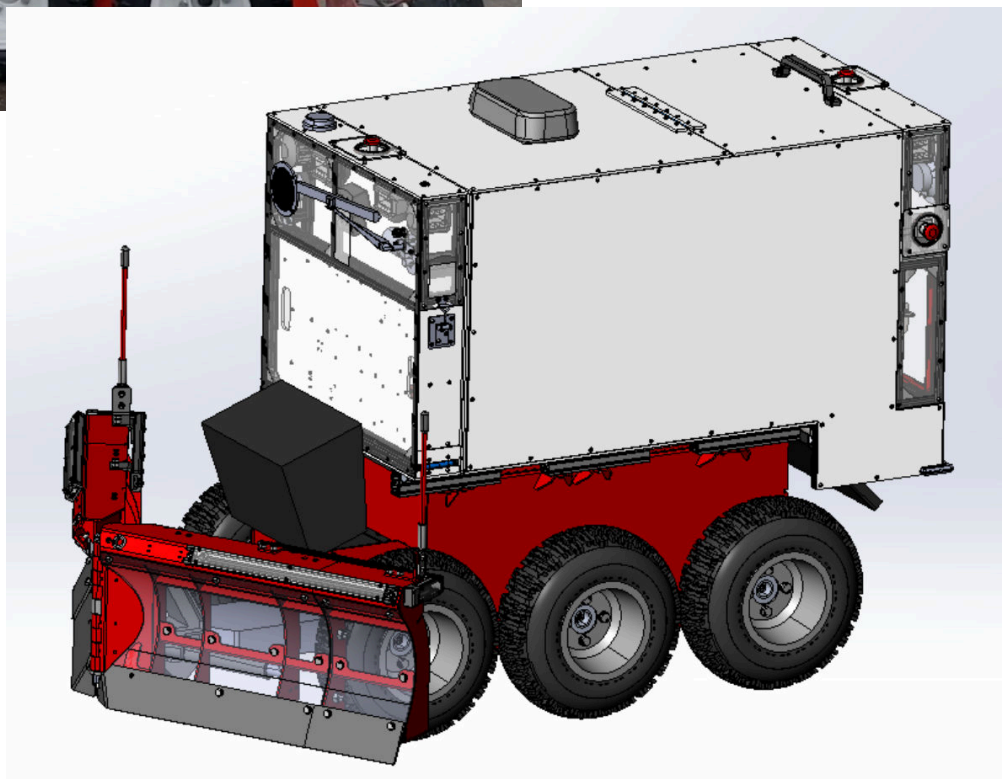
As the powertrain lead of the Baja SAE design team at my university, I am responsible for the design and assembly of the vehicle's powertrain, whether I delegate or do the tasks myself. Early into the design process, I created a CAD model of a continuously variable transmission (CVT) for the team to use in a complete assembly.

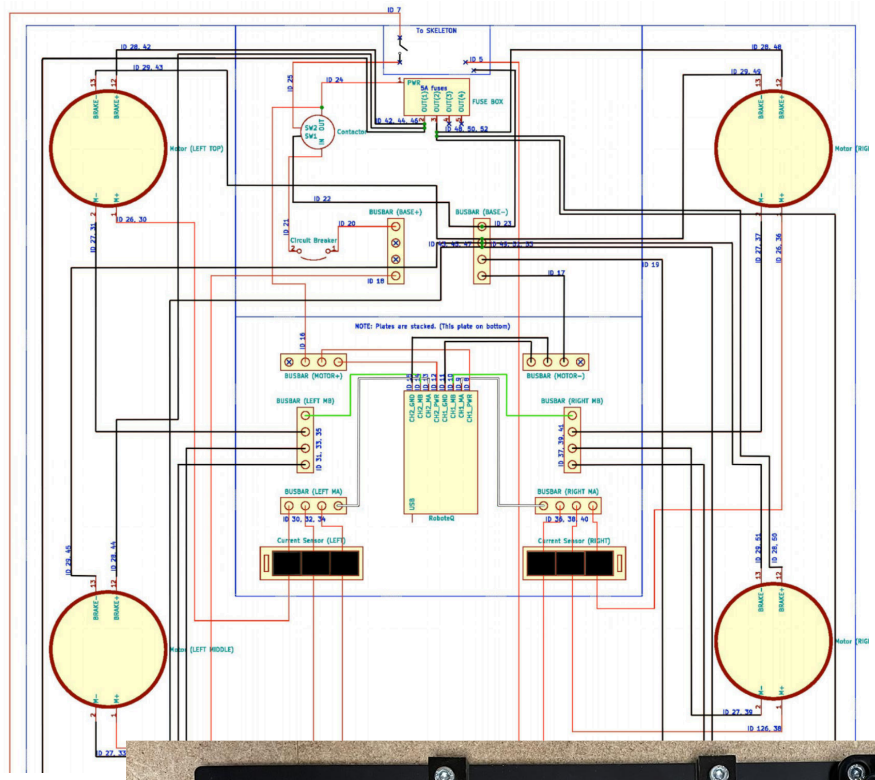


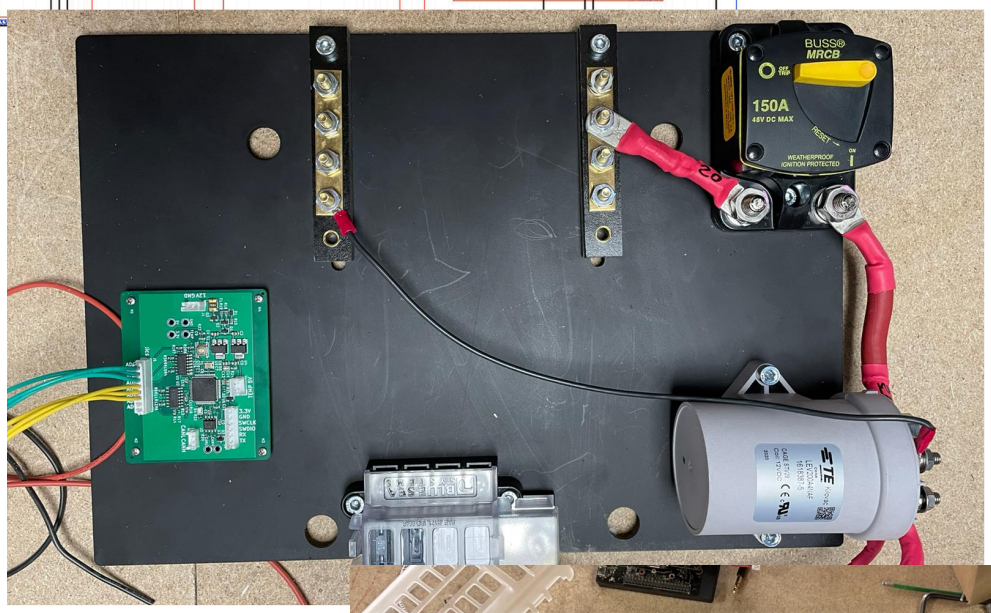
SIDEWALK SNOWPLOW ROBOT

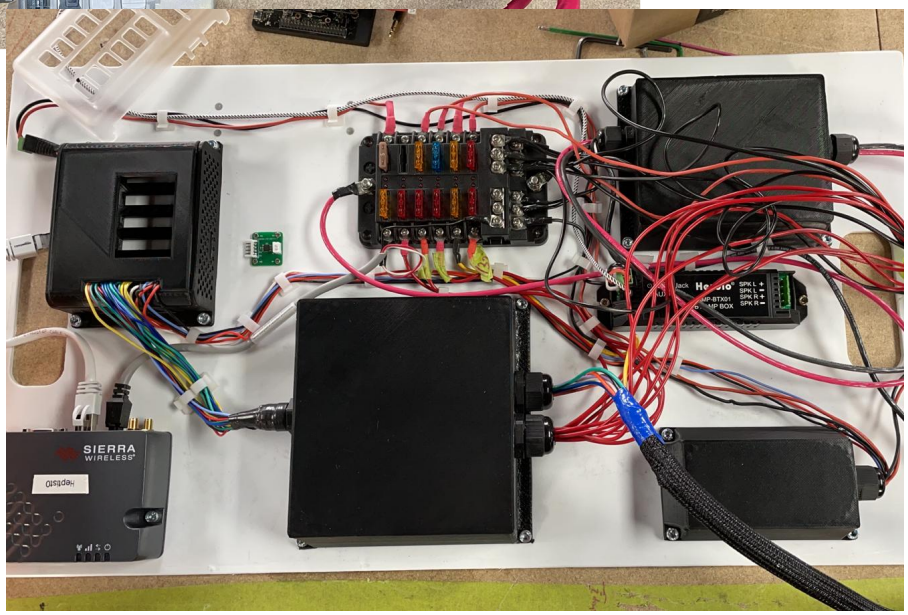
November 2020

With winter fast approaching, I worked with a team to create a robot to simultaneously plow snow and spread salt on the sidewalk. This robot has built in speakers and a microphone so that the remote operator can interact with pedestrians. The robot is also equipped with four emergency stop buttons to provide a fail-safe stopping system. The plow was built from scratch and is able to fold in the center to create a scoop or V shape. I worked on all aspects of the robot, from painting to soldering the PCBs. I also created the wiring schematic for the robot.




To SKELETON
FUSE BOX
Contactor
Circuit Breaker
BUSBAR (BASE+)
BUSBAR (BASE-)
NOTE: Plates are stacked. (This plate on bottom)
BUSBAR (MOTOR+)
BUSBAR (MOTOR-)
BUSBAR (LEFT MB)
BUSBAR (RIGHT MB)
BUSBAR (LEFT MA)
BUSBAR (RIGHT MA)
RoboteQ
Current Sensor (LEFT)
Current Sensor (RIGHT)
Motor (LEFT TOP)
Motor (LEFT MIDDLE)


BUSS
MRCB
150A
48V DC MAX
WEATHERPROOF
IGNITION PROTECTED


SIERRA
WIRELESS

SMARTCHESS

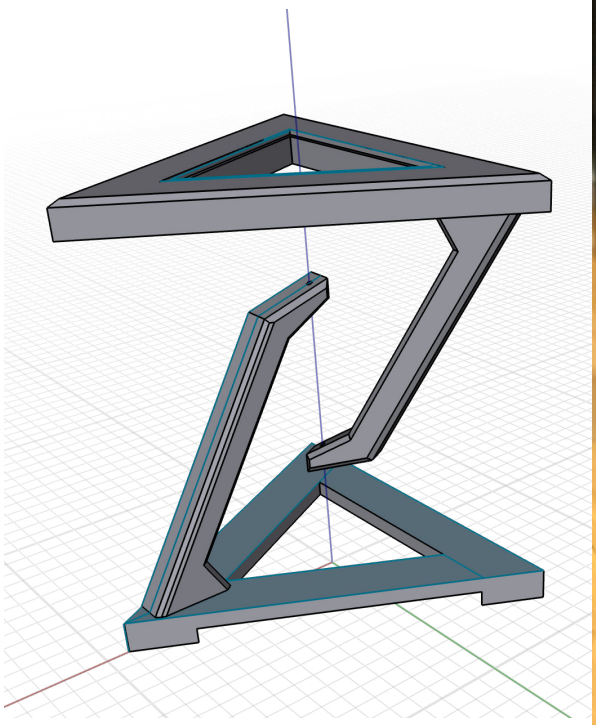
August 2020

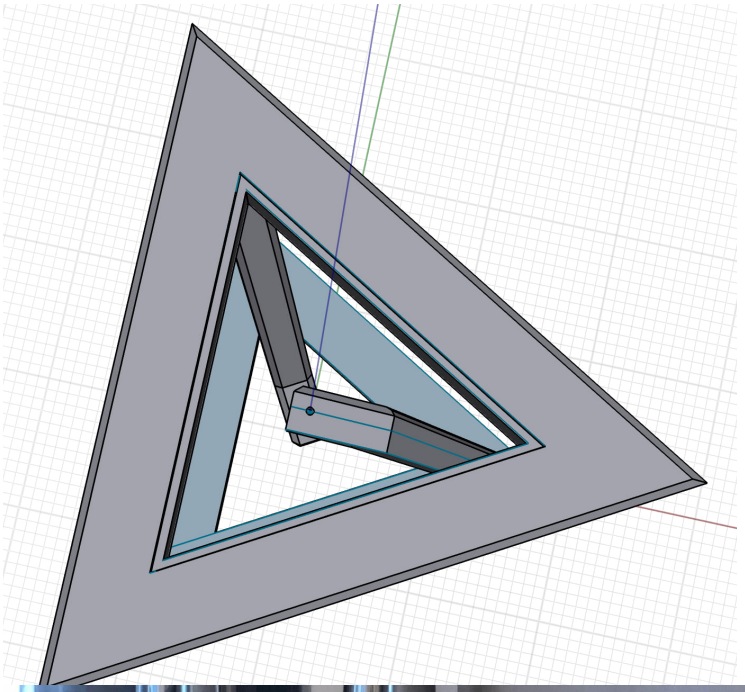
I created a Bluetooth enabled, smart Chessboard. SmartChess utilizes an integrated circuit to recognize where there are pieces on the board. That information is sent to the accompanying app, which provides the user with a live view of the board. The app can give hints, recommend moves, and enforces legal moves. Before building the board and frame, the internal circuit was created. An 8x8 matrix of reed switches was soldered together, creating a logic circuit to detect pieces with embedded magnets. This circuit, along with the Bluetooth module, and various other components, were soldered to the Arduino. The entire board was handmade with the frame built from walnut wood, and the board was built from a combination of walnut and maple.

TENSEGRITY TABLE

Spring 2020

Tensegrity or tensional integrity is a structural principle that allows objects that are attached to each other to remain in place due to the tension placed on it rather than the compression of it. I first thought of this when I saw a picture of a floating lego platform which used tensegrity. When I saw that, I immediately started wondering if it would be possible to make a full sized table using this principle. After some research, I was able to find that other people have done this so I decided to build one. I first designed the table on SolidWorks to ensure that the supporting arms would perfectly line up with each other. I built the table out of dimensional walnut, glass, and 300 lb rated wire.

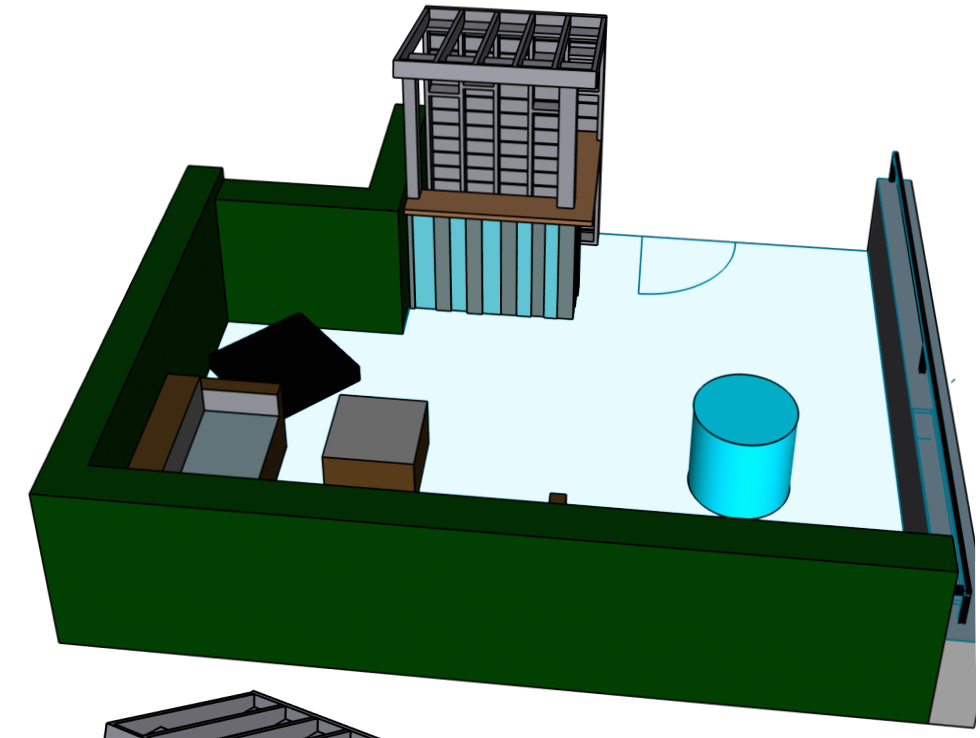


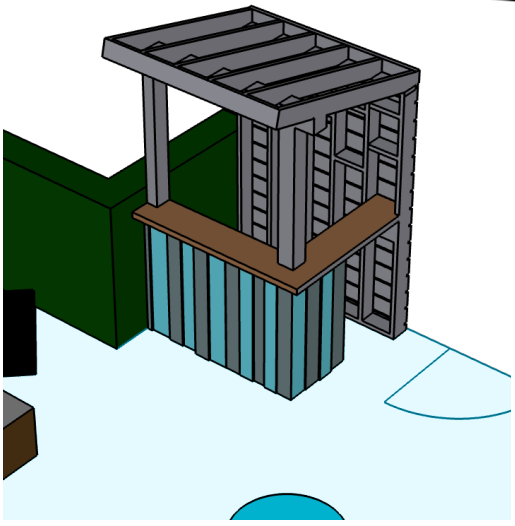


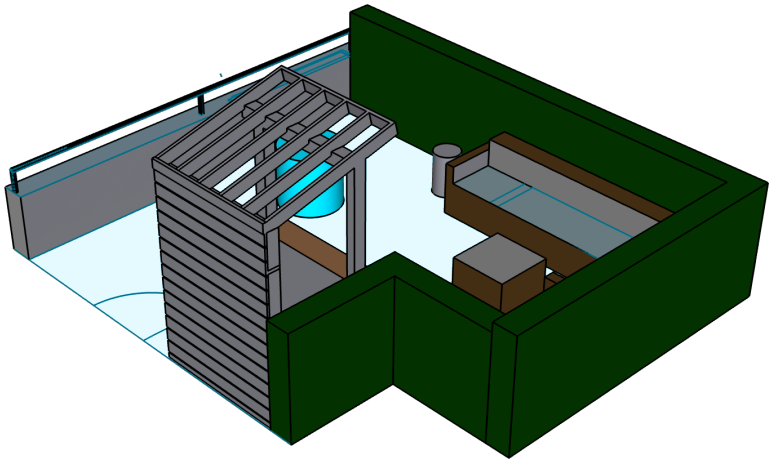
CUSTOM TIKI BAR

Spring 2020

I was in quarantine for my 19th birthday so I wasn't able to go to a bar with my siblings to celebrate. Instead, I designed a bar to go on my patio and built it with my brother. I used SolidWorks to create a scaled model of my patio and then I created a bar design from that which you can see below. The bar was built out of some pressure treated pine, but a large amount of reclaimed pallet wood. I was able to up-cycle my old dining room table as the bar top as well. The bar is rightfully called QuaranTiki's.





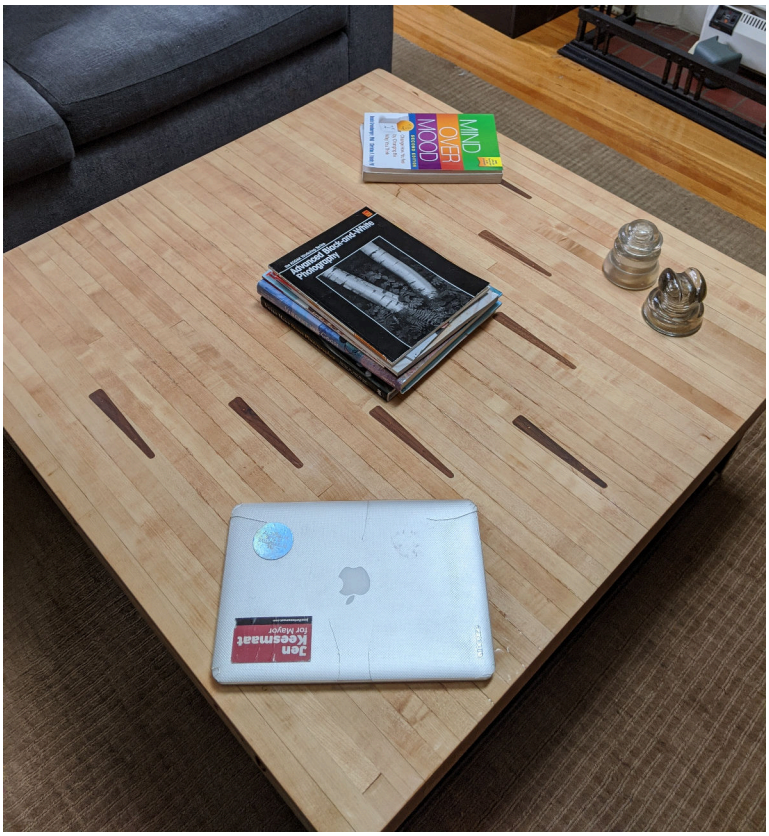


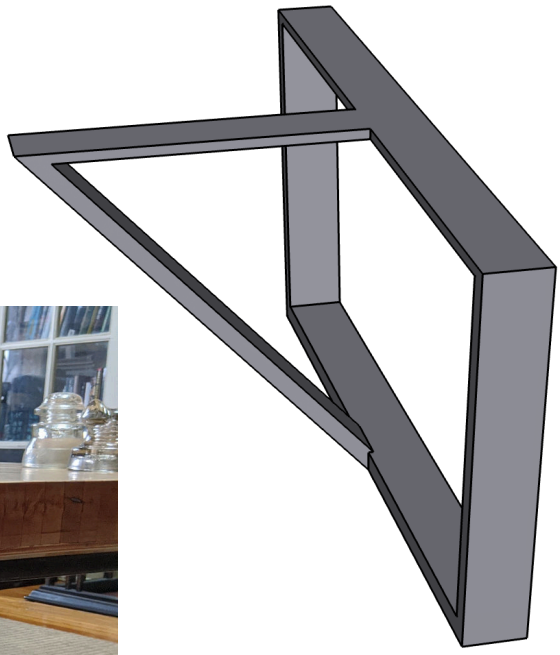

QuaranTiki's
BACARDI
MALIBU

TORONTO CUSTOM WOODWORKING

Summer 2019-Present

After I finished high school, one of my close friends and I decided to start a business making custom tables. Our first two projects were river tables which were made from two pieces of live edge black walnut with a “river” of epoxy between them. After we completed these tables, interest in our work started to build. We started making custom charcuterie boards for clients who wanted some of our work but were not currently looking for a table.


MIND OVER MOOD
Vote
Jon Keesmaat for Mayor



SELF-LEVELLING TABLE

Summer 2019

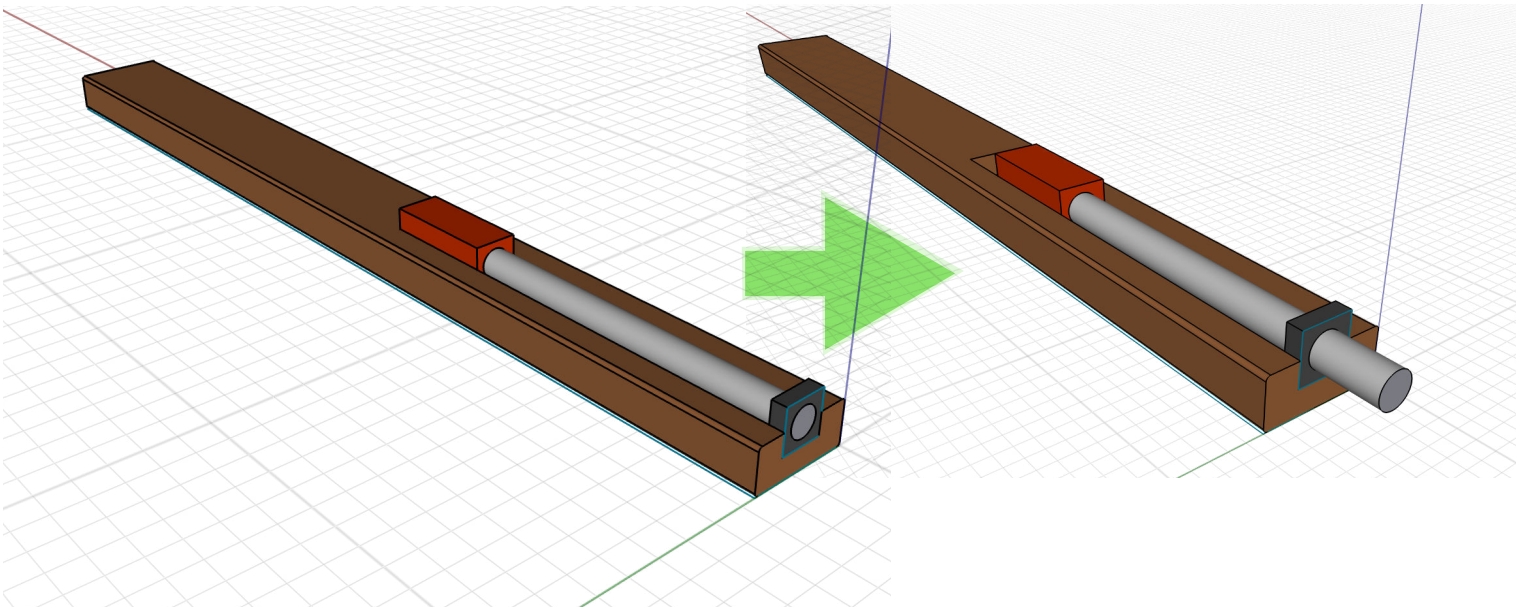
In my summer before first year, I started a business creating custom tables. Epoxy resin is one material that I used. To use resin, you need to pour the liquid into a perfectly level mold for it to set. Doing this in my garage was initially difficult because the ground is far from level. To address this, I started designing a work bench that would adjust its legs to completely level itself with a built in gyroscope. For the gyroscope, I used the MPU - 6050 module which I connected directly to an Arduino Uno. I was able to collect the yaw, pitch and roll(YPR). The Arduino used trigonometric functions to find exactly how much longer each leg should get in order to return to level given the current YPR and set table dimensions. The legs move individually with a motor rotating a threaded rod as shown on the design section below.

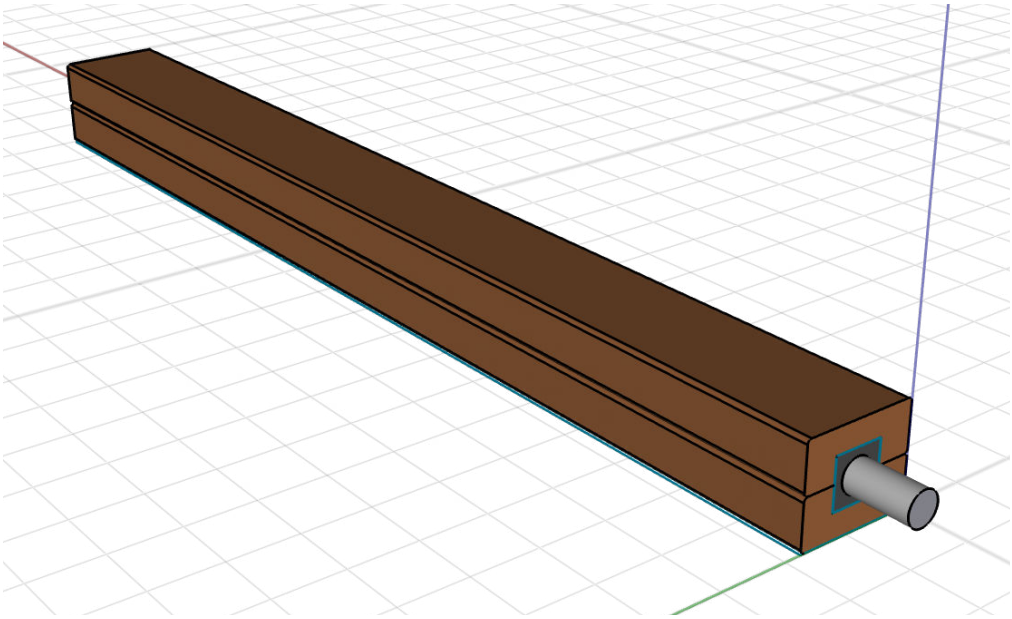
Here is a section of my Arduino code:

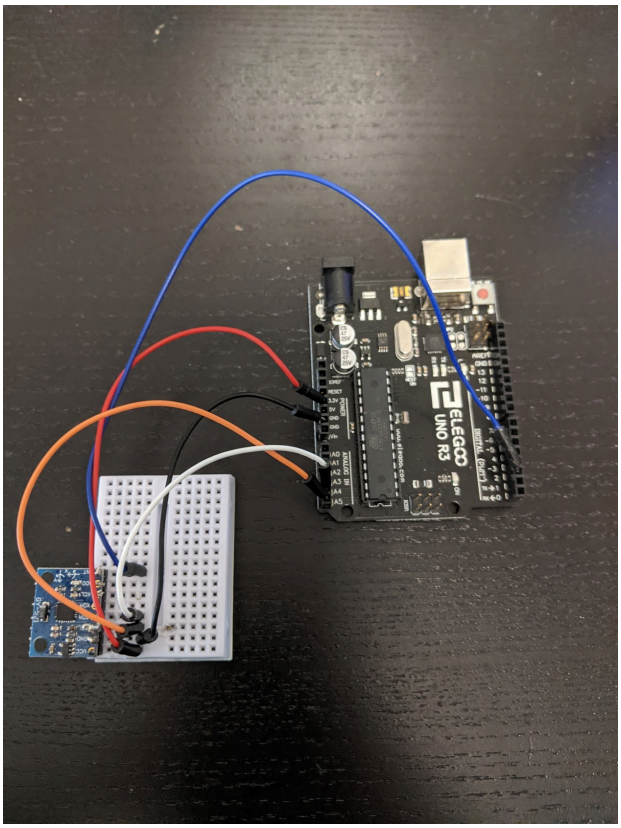
```
mpu.dmpGetQuaternion(&q, fifoBuffer);
mpu.dmpGetGravity(&gravity, &q);
mpu.dmpGetYawPitchRoll(ypr, &q, &gravity);
double w = 3;
double l = 6;
double leg1 = 0;
double leg2 = 0;
double leg3 = 0;
double leg4 = 0;
double pitch = ypr[1] * 180/M_PI;
double roll = ypr[2] * 180/M_PI;
double x = (w*tan(pitch*0.01745329252)*12);
double y = (l*tan(roll* 0.01745329252)*12);

if(x>0){
    leg1=leg1+x;
    leg4=leg4+x;
}
else if (x<0){
    leg2=leg2-x;
    leg3=leg3-x;
```

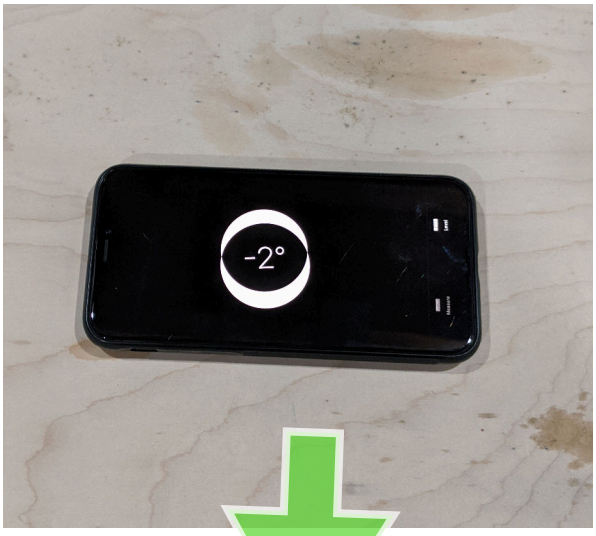
DESIGN

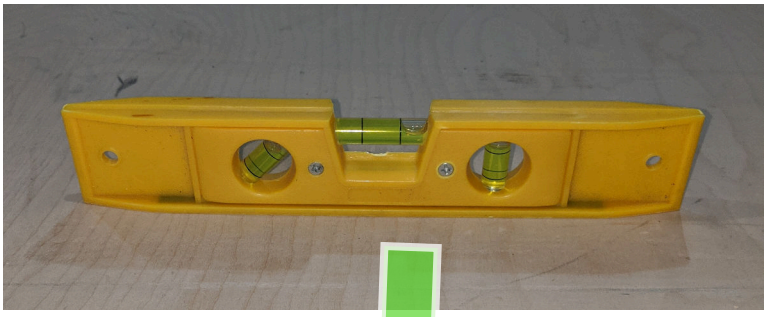


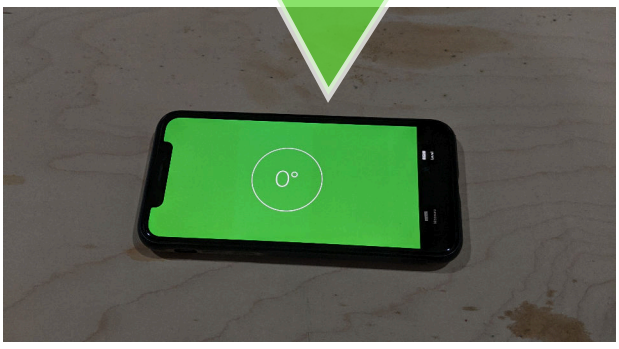


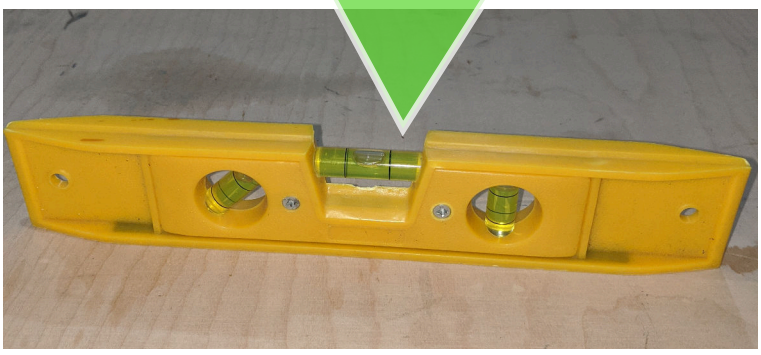

ELEGOO
UNO R3


SMALL BOX


-2°



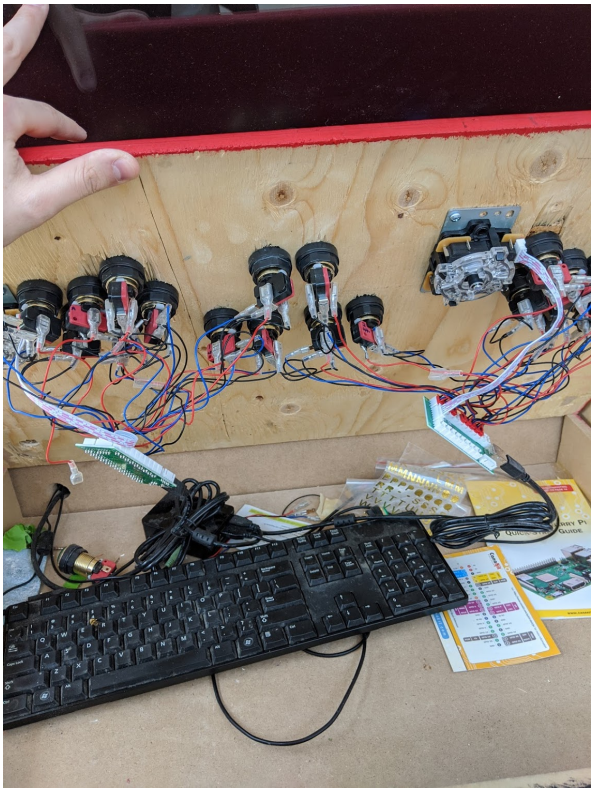

0°



RASPBERRY PI ARCADE MACHINE

Spring 2019

As head of the robotics/engineering club at my high school, I decided to build a retro arcade machine to place in the senior's brake area. The machine is run by a Raspberry Pi with an emulator uploaded into it. I also personally designed the marquee banner with the school's mascot.



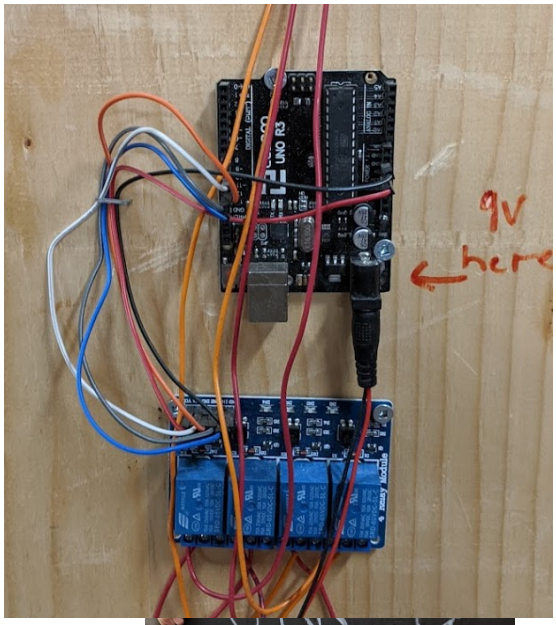
FLASHING PAPARAZZI CUTOUT

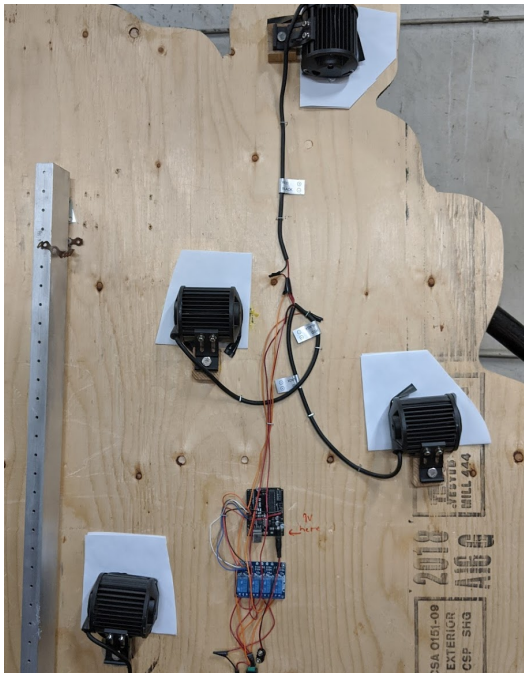
Spring 2019

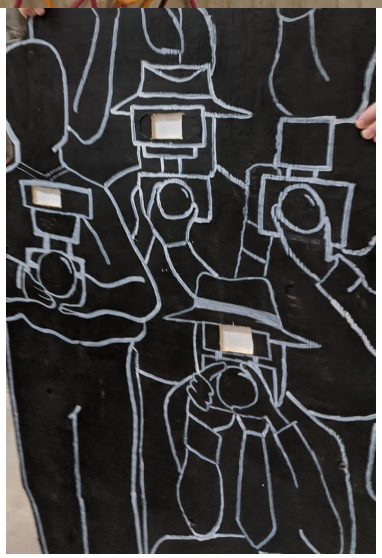
In April of 2019, I produced a student film festival at my high school. In order for the pre show to feel like a true Hollywood premier, I built a wooden cutout of a group of paparazzi.

I used an Arduino Uno and a relay board to control four LED headlights. The lights are programmed to flash on, separate from each other, at random times to mimic the flashes of the paparazzi cameras.

This prop was a hit and will be used at my school's film festival for many years to come.







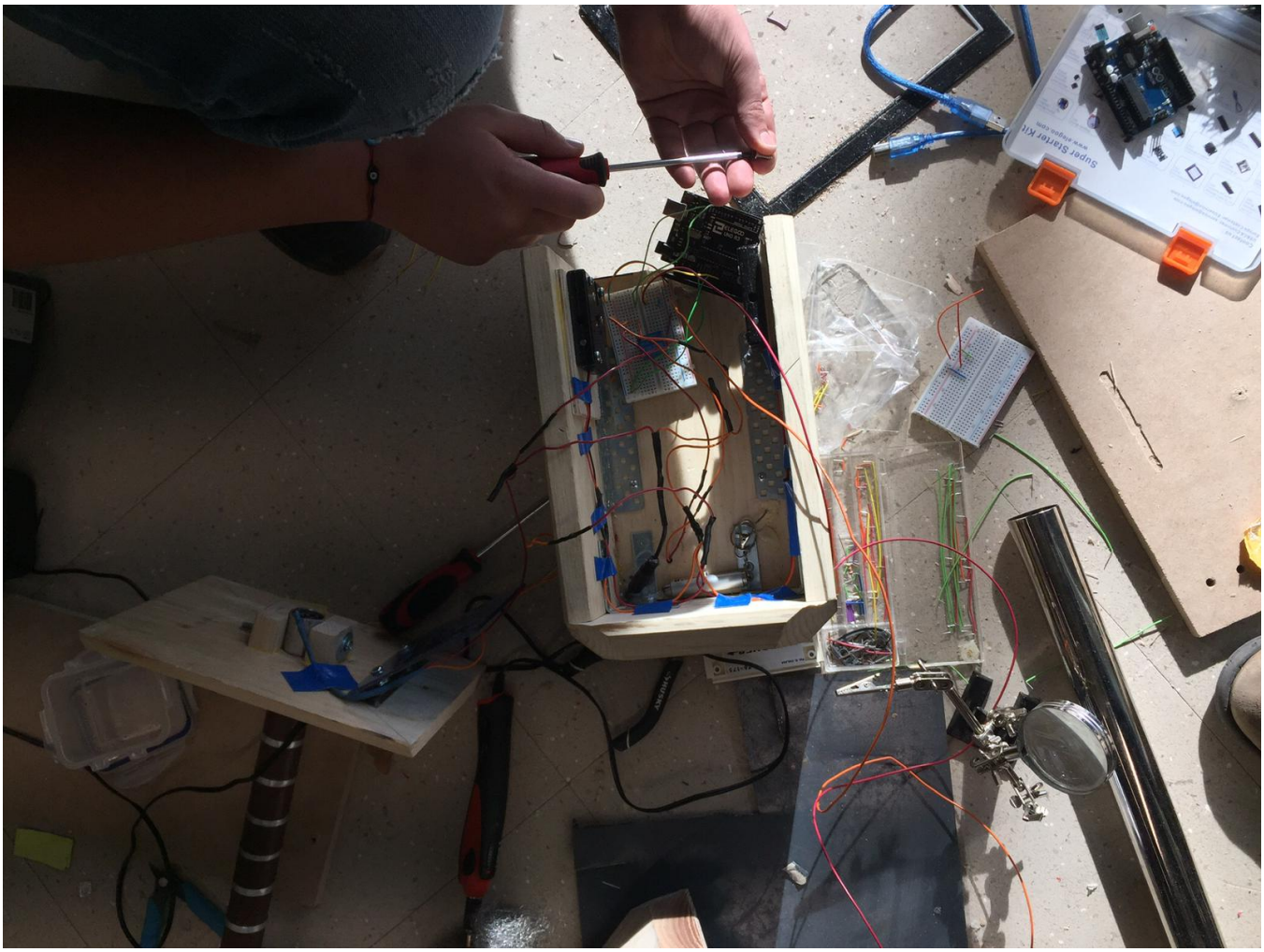
WEIZMANN PHYSICS COMPETITION ENTRY

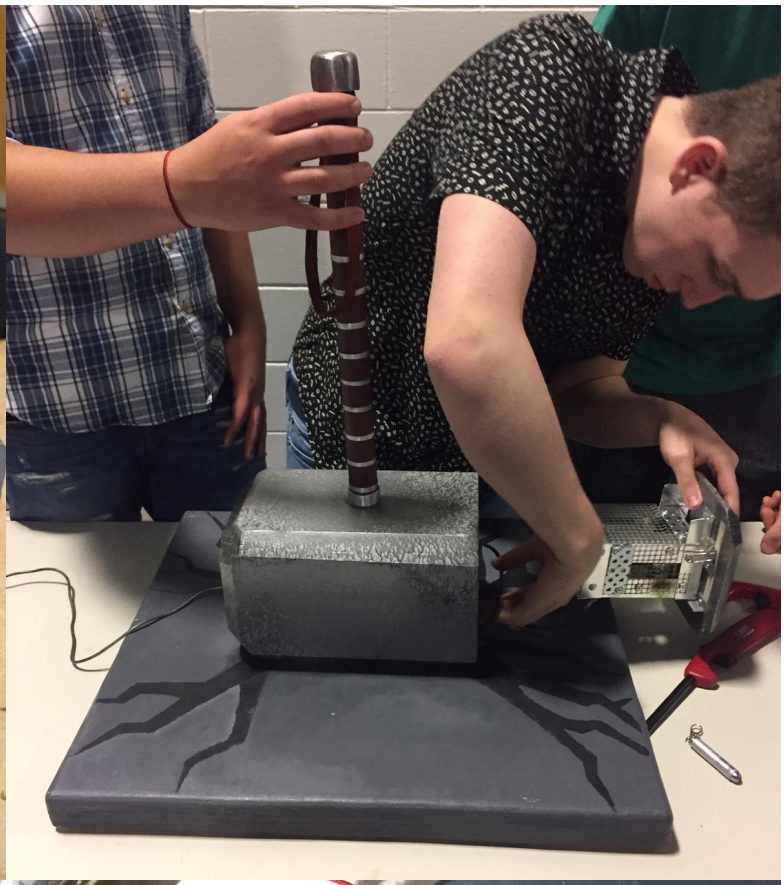
Fall-Spring 2019

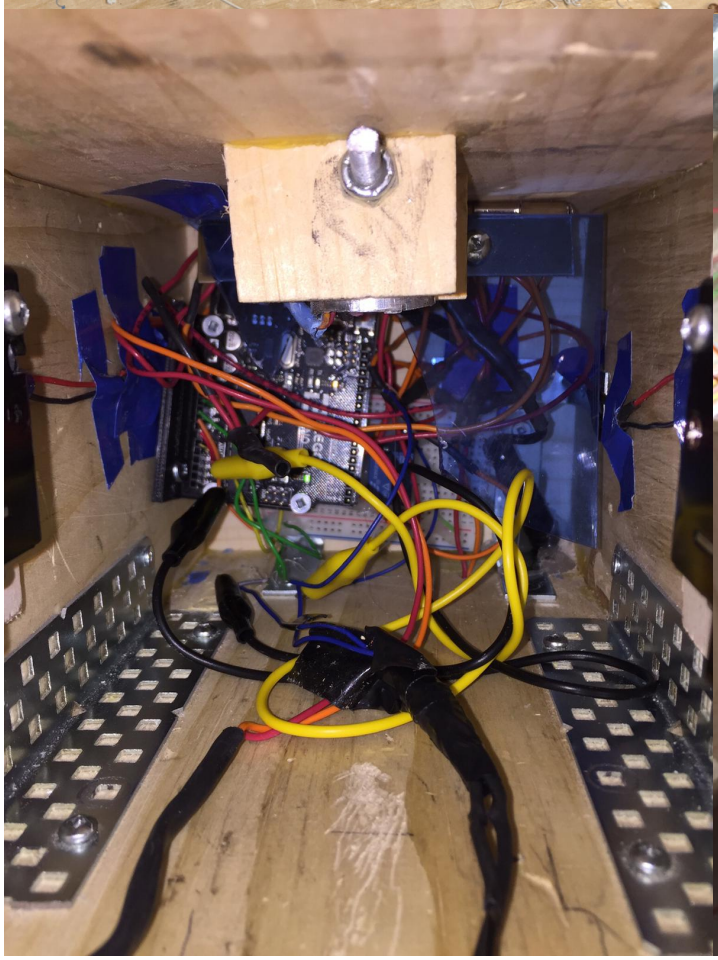
In my last year of high school, myself along with three classmates competed in the Weizmann International Physics Competition. The goal of the competition is to create a themed safe that can only be unlocked after the opposing team completes two puzzles based on physics principles. We designed our safe to be Thor's hammer; there was a 600 lb electromagnet fixed to the bottom so that the opponents couldn't lift it until they solved the puzzles. My team moved on from the national competition in Montreal to compete in Israel for the International competition where we came in first.

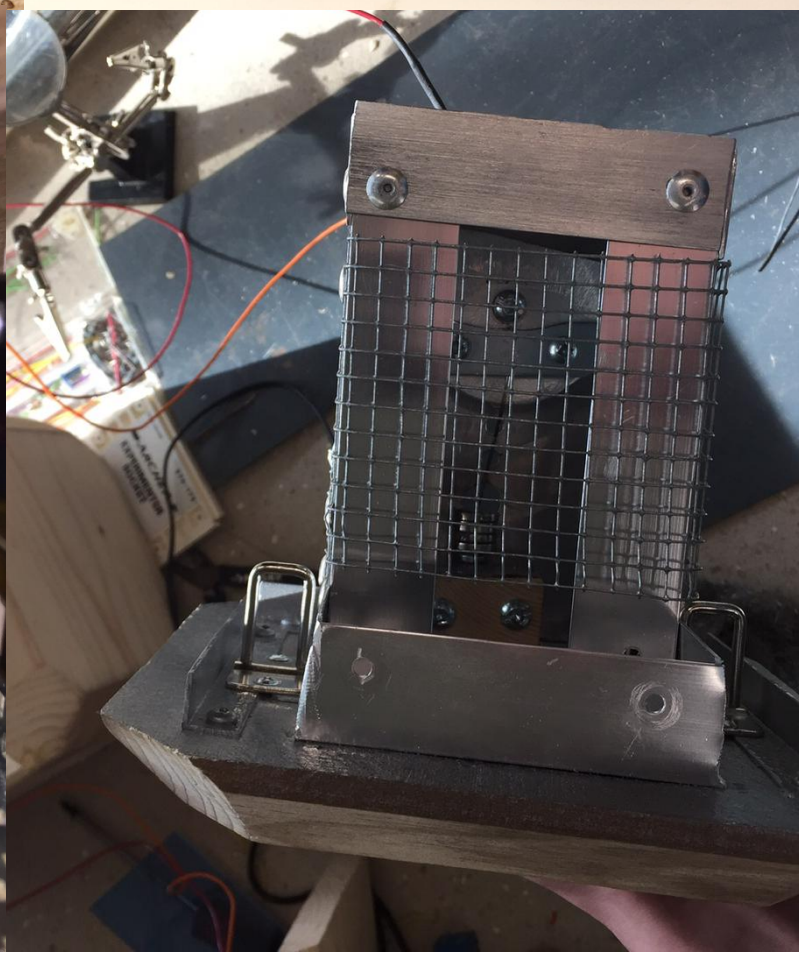
See the attached article:

https://www.weizmann.ca/champions-of-safe-cracking/









TOTAL WARFARE GAME

LANGUAGE: JAVA

Spring 2018

Total Warfare is a game that I made for my senior computer science course final project. This program has 10 different java files with a total of 2,794 lines of code.