PORTFOLIO

candacechen

Mechanical Engineering with Product Design

Massachusetts Institute of Technology | Class of 2014

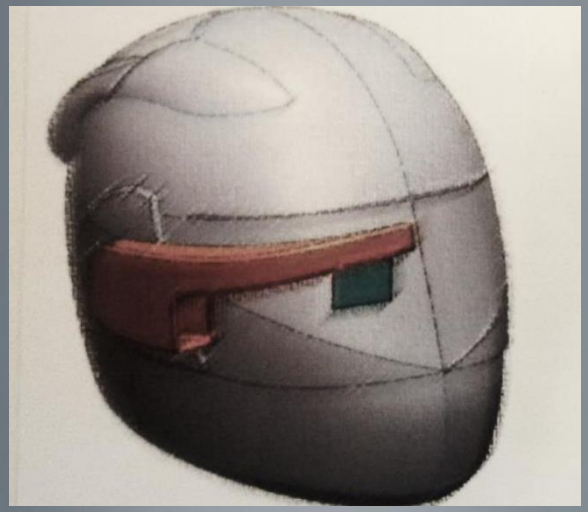
MIRA

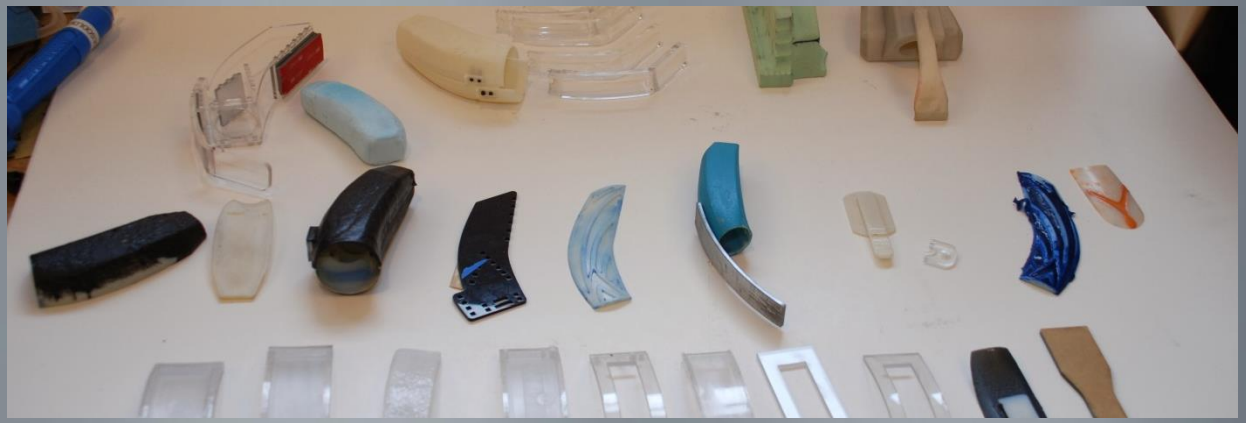
[2.009] Product Design

Fall 2013

MIRA is a navigation system that attaches to motorcycle helmets and features heads up display technology. I came up with the concept and name, and co-led (System Integrator) a team of 19 mechanical engineering seniors through the product design process in order to create an alpha prototype, which we demonstrated in front of a live audience of 2000.

Our finished alpha prototype! The image from the display (inside) is reflected off the semi-clear arm into the user's right eye.





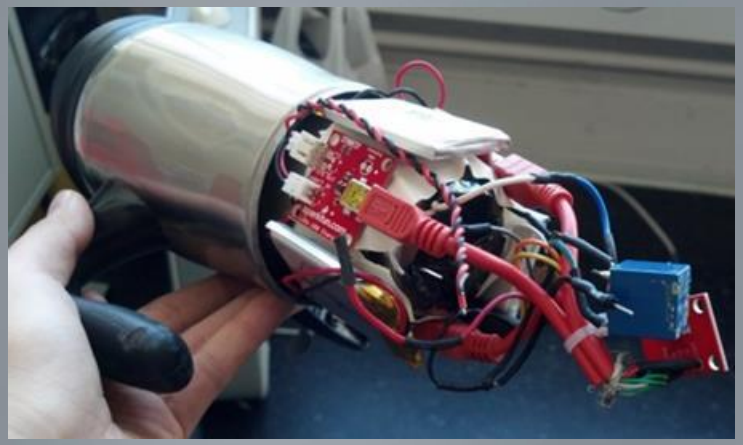
Graveyard of discarded 3D printed and laser cut prototypes

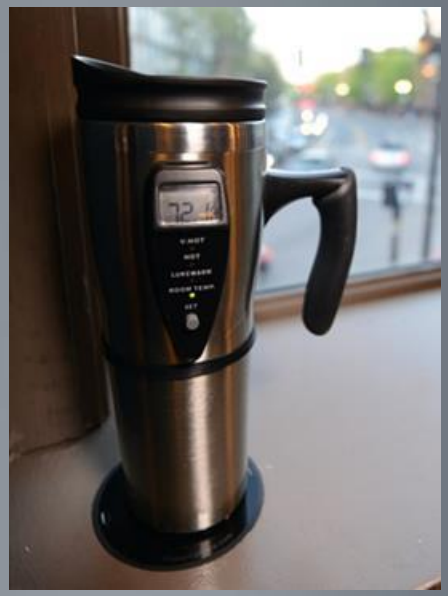
ThinkCup

[ESD.40] Product Design

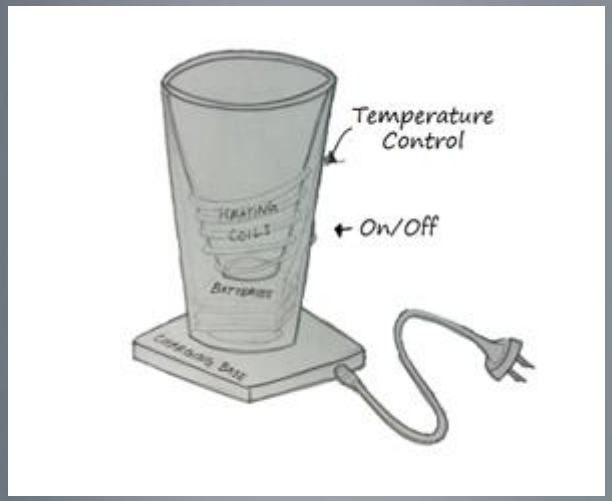
Spring 2013

Coffee drinkers have difficulty keeping their coffee warm for extended periods of time. So for the Systems Design and Management product design class, my 5 teammates and I created a solution: a temperature-controlled inductively charged coffee mug. I led my team (mostly in their 30's to 50's) in fabricating and testing (technical) our models.





After hacking together our prototyping, we tried charging it on the induction chargers at the Harvard Square Starbucks, and it worked! In addition, we conducted user research at Starbucks to improve the experience of using ThinkCup.



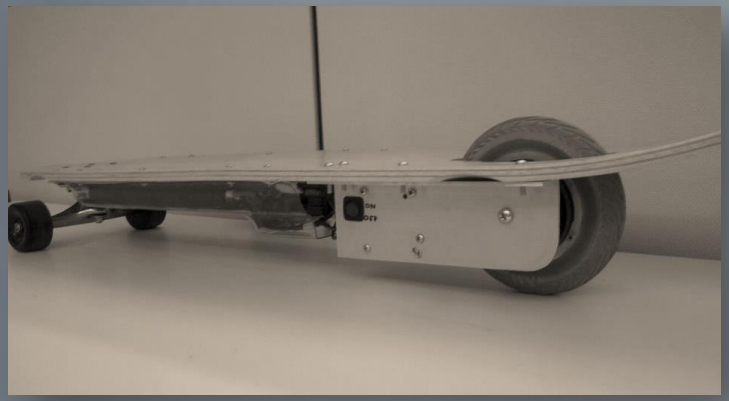
These are some of our prior concepts and sketch models that address keeping coffee warm for a longer time.

Electric Vehicles

Personal Project

Fall 2012

Drawing motivation from an electric vehicle class I took in Spring 2012 (in which I made a remote-controlled electric longboard), I decided to motorize a child's pocket bike. I found an used one on craigslist for $20, and re-engineered the entire drivetrain (throttle, controller, motor, batteries). Even though I have to ride with my knees between my arms, it's still amusing commuting on the streets.

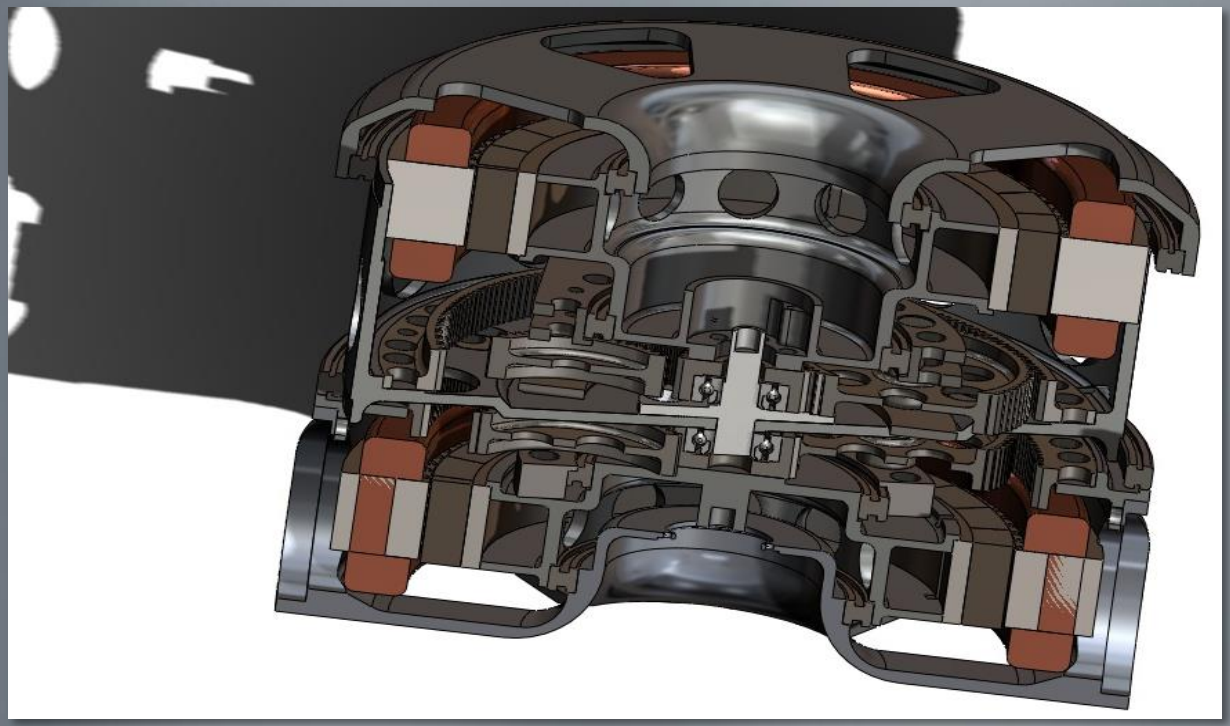


Humanoid Robot

Biomimetics Laboratory (MIT)

Summer 2012

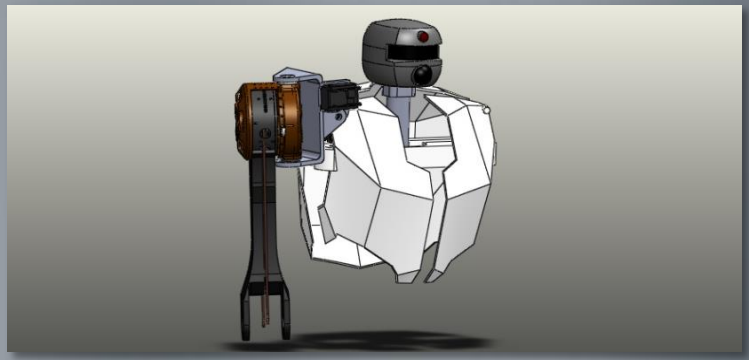
In preparation for the DARPA 2013 challenge, I prototyped a shoulder joint and upper body exterior for a humanoid robot used to conduct humanitarian and disaster relief operations. The robot required the flexibility and strength to perform tasks like driving a truck, operating hand tools, and climbing ladders.



- Repaired and reassembled components of a 2 DOF motor in CAD (cross section shown above)

- Drafted detailed SolidWorks drawings of individual components with proper tolerances to be machined

- Iterated through multiple shoulder joint designs using FEA analysis and optimization calculations.

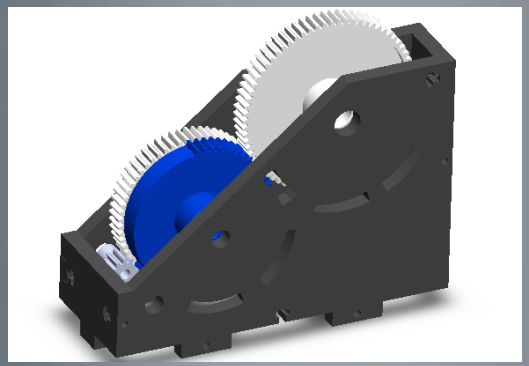


StrikerBot

[2.007] Robotics Competition

Spring 2012

This robot is for the 2.007 competition, themed “Tech County Fair”. The plan was to drive up to the high striker, wedge under the lever fulcrum, pull back the hammer, and let it crash down on the lever. During the competition, StrikerBot rung the bell four times, the most of any robot.



- Gearbox with two stages of reduction increased nominal torque of servo 5X

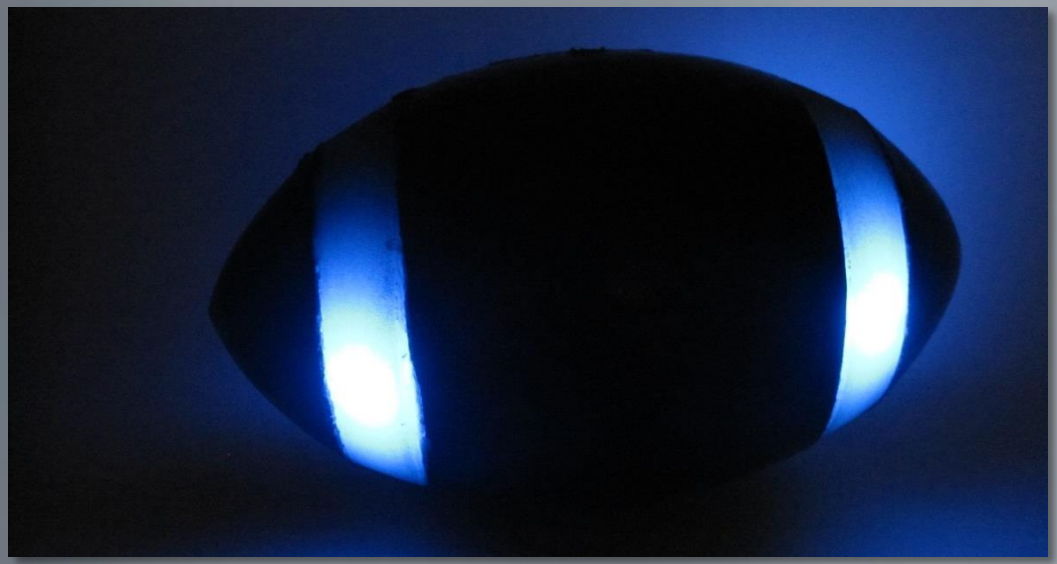
- Features a half gear (blue) that slips after the hammer winds back, allowing the 10 torsion springs to bring the hammer head crashing down

Firefly

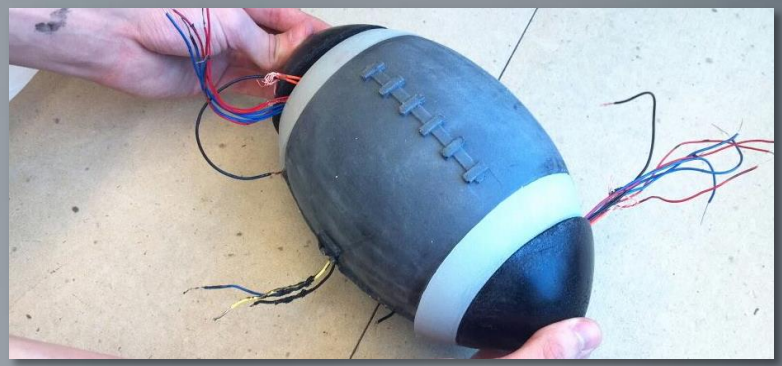
[2.00b] Toy Design

Spring 2012

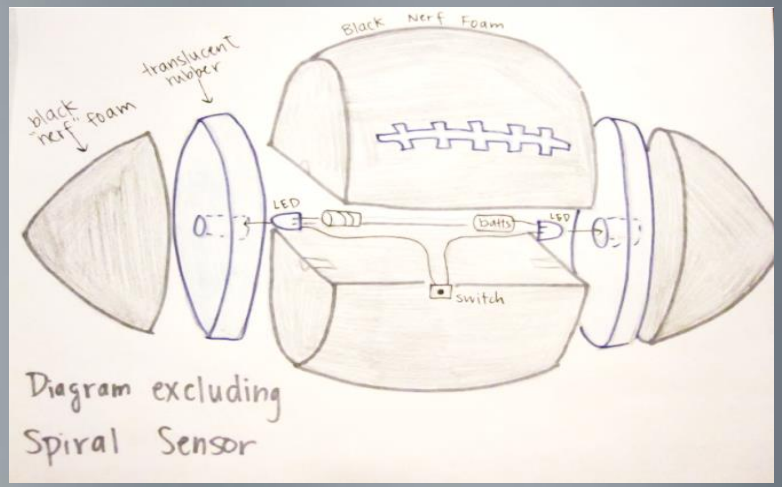
Firefly is a smart football that lights up depending on the speed of its rotation (blue, purple, red). It is intended for nighttime play, and motivates users to improve their spiral. I contributed to this five person project by CADing the molds, choosing most of the material including electronics, and determining the process for casting and assembly with the electronics in mind (explained on next page).



• Firefly is both rechargeable and re-programmable (ports accessible from outside).
• Inside, an Arduino, accelerometer, and ten LEDs allow for interactive play.

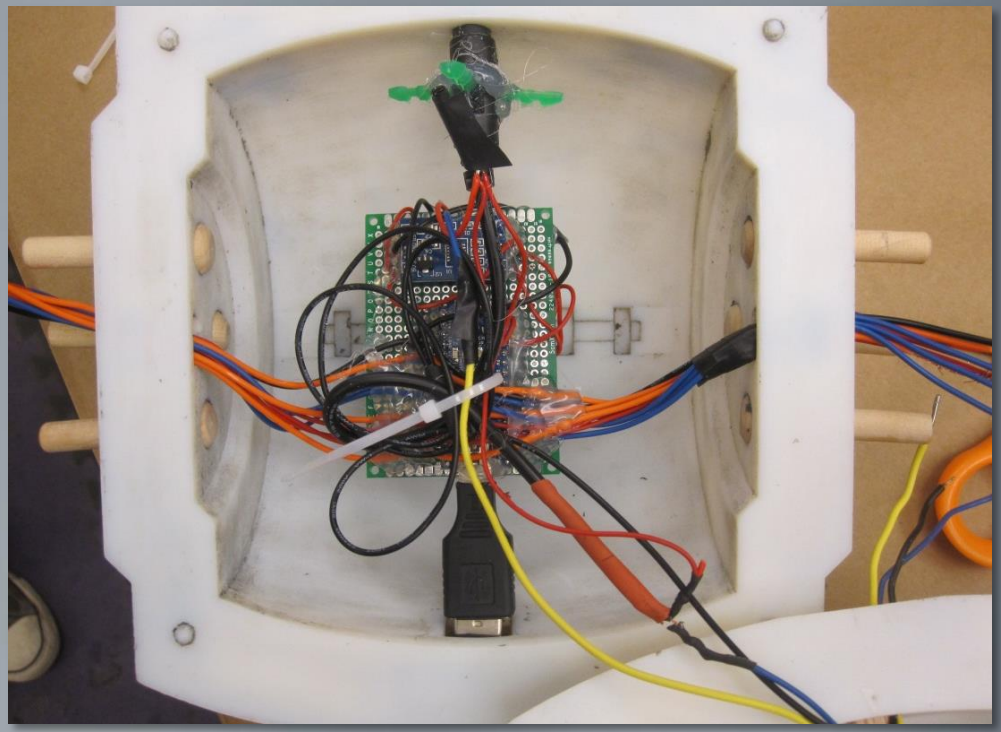


• Shown above is the football before the LEDs were soldered and the ends were attached with silicon epoxy.
• For the finish, PlastiDip was used to touch up the black exterior.

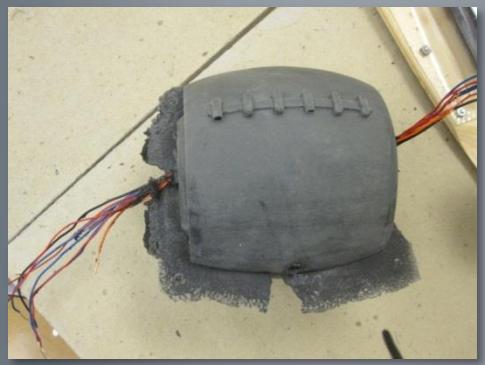


Firefly
[2.00b] Toy Design
Spring 2012

After soldering the wires, the entire electronic assembly was potted with hot glue. The wooden dowels pictured below were plugged in so the liquid foam can fill up all the way; they were removed after the foam started solidifying for pressure relief. The green pieces of plastic glued to the female recharging jack act as an anchor so that the entire circuit isn't pulled out of the foam easily.



In order to make sure liquid foam did not leak into the female USB and recharging jacks, the male jacks had to be connected and pulled tight while the foam was solidifying.



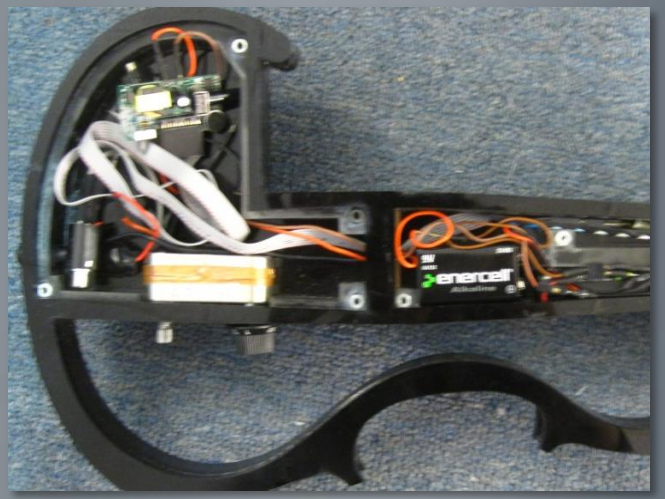
The color-coded wires were soldered to LED's after the middle part had been cast with the electronics inside. The process took several practice runs and it was especially difficult to keep the circuit centered in the mold so it didn't accidentally poke out of the foam.

Electric Instruments

Personal Project

Aug 2011-Jan 2012

I have designed and fabricated two electric violins and one electric ukulele. The electric ukulele introduced me to the machine shop and the world of “making things” using hand tools. Both the clear and black electric violins were laser cut, with the black one containing EL panels along the side that lit up when played (using a microphone sensor).

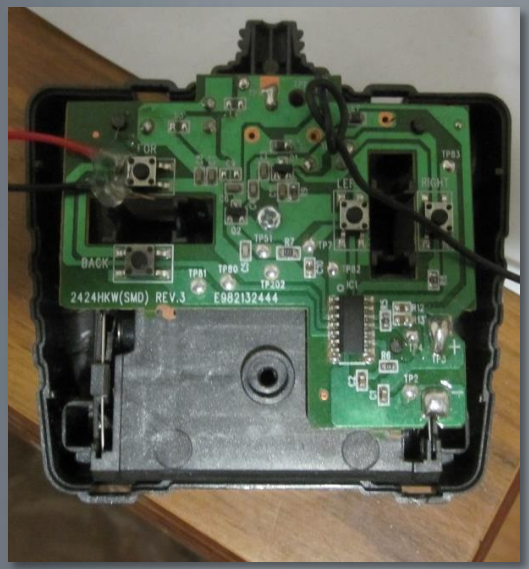


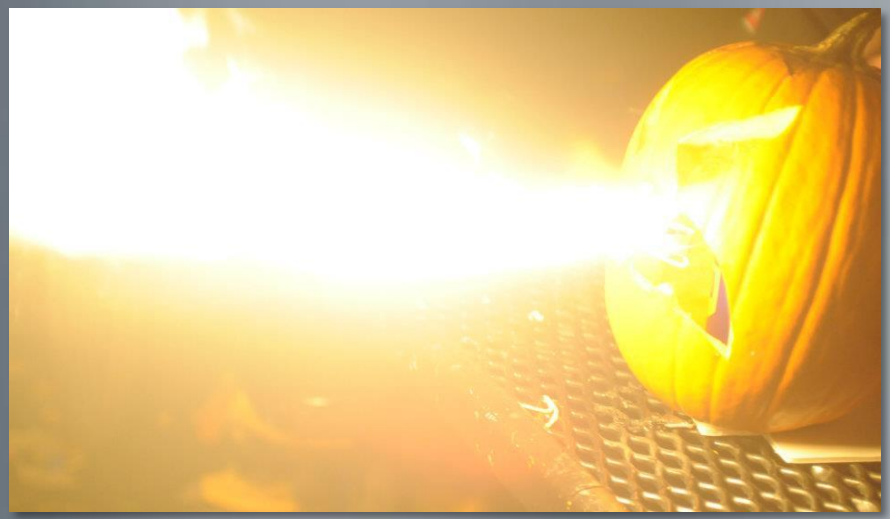
Project FIREPUMPKIN

Personal Project

Halloween 2011

My friends and I decided Halloween wasn't quite scary enough. We hacked a RC car remote and created a circuit with a relay to make an actuator pull down on the can of WD40. The finished "FIREPUMPKIN" was placed upon the Bexley Hall arch and used to frighten tourists and passerby's.





About Me

Hello! My name is Candace and I'm currently a senior at MIT pursuing a BS in Mechanical Engineering with a Product Design focus (2A-PD)

I'm a product designer who applies design thinking strategies to discover niche market opportunities and (literally) fabricate holistic solutions.

Although I am primarily a mechanical engineer, I strive to produce solutions at the intersection of parameters driven by MechE, mfg, EE, ID, PD, UX, and business/marketing strategy. Experience in PD process management and rapid prototyping.

Primary focus in consumer electronics, particularly audio, robotics, and electric vehicles. Interested in wearables, iOt, connected devices.

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