Alex Friedman's Portfolio

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Class of 2018

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Engineering and Design

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ASSIST soccer training system

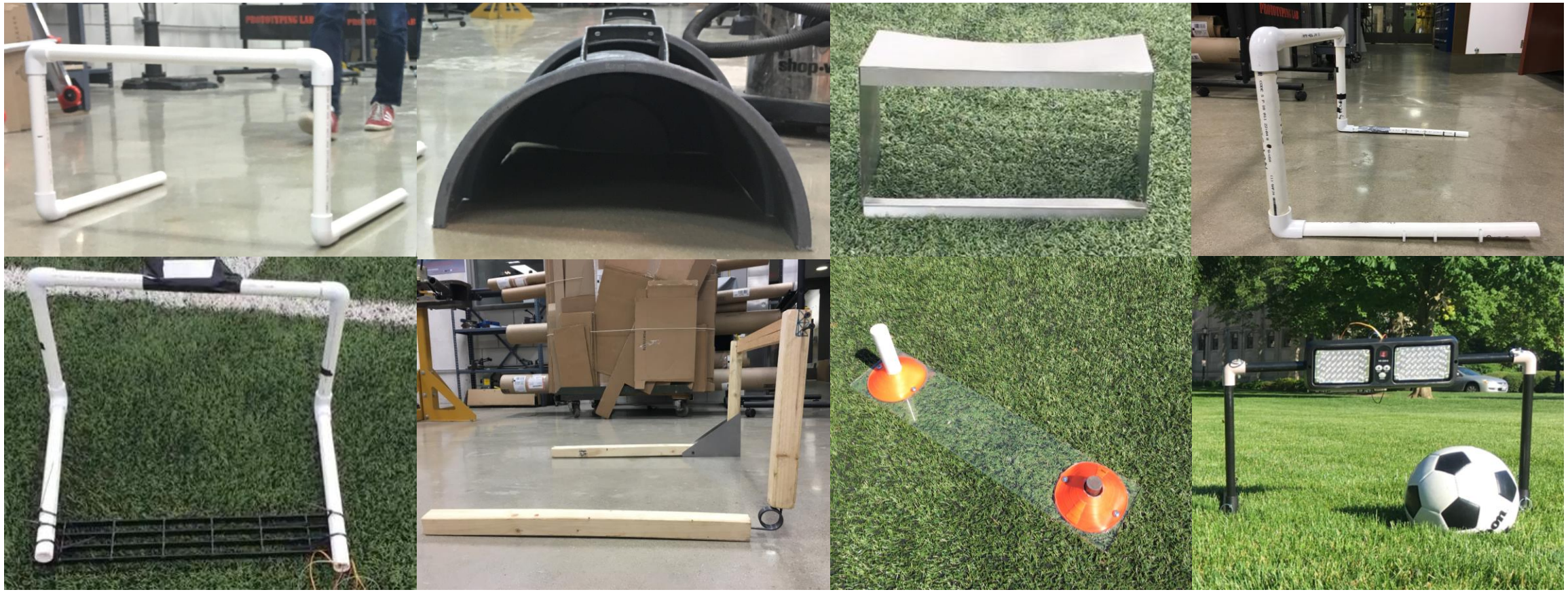
Autonomous soccer training for passing and awareness

All soccer skills can be practiced alone except for passing. Our challenge was to design a system to train awareness, touch time and pass accuracy with only one or two players.

Our system is an arrangement of “smart” targets which alert the user to where to pass and when. The system then tracks data on the user and sends the information to their phone.

Prototype Iteration

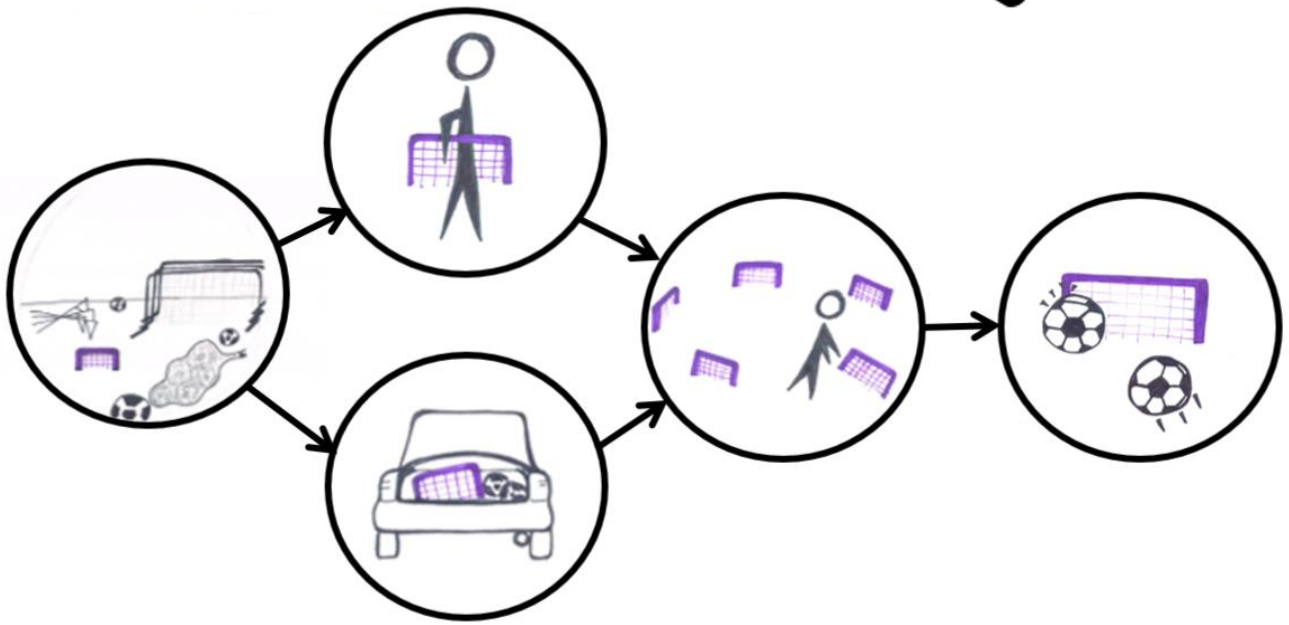
As the lead mechanical engineer, I was in charge of designing and iterating the frame of the custom goals to prevent knockback on turf. I worked with the lead electrical engineer and back end developer to build the circuits and logic needed for the system.



User Experience Testing

We have done extensive testing not only on the actual product, but on the experience the user has with the product. Testing the setup, use and cleanup of the product produced key insights into how soccer players might interact with objects differently than expected. Lighting conspicuity and portability have been the primary focusses of the testing.

"If you didn't stop, I would have done it at least five times."
-Elo, Varsity Forward

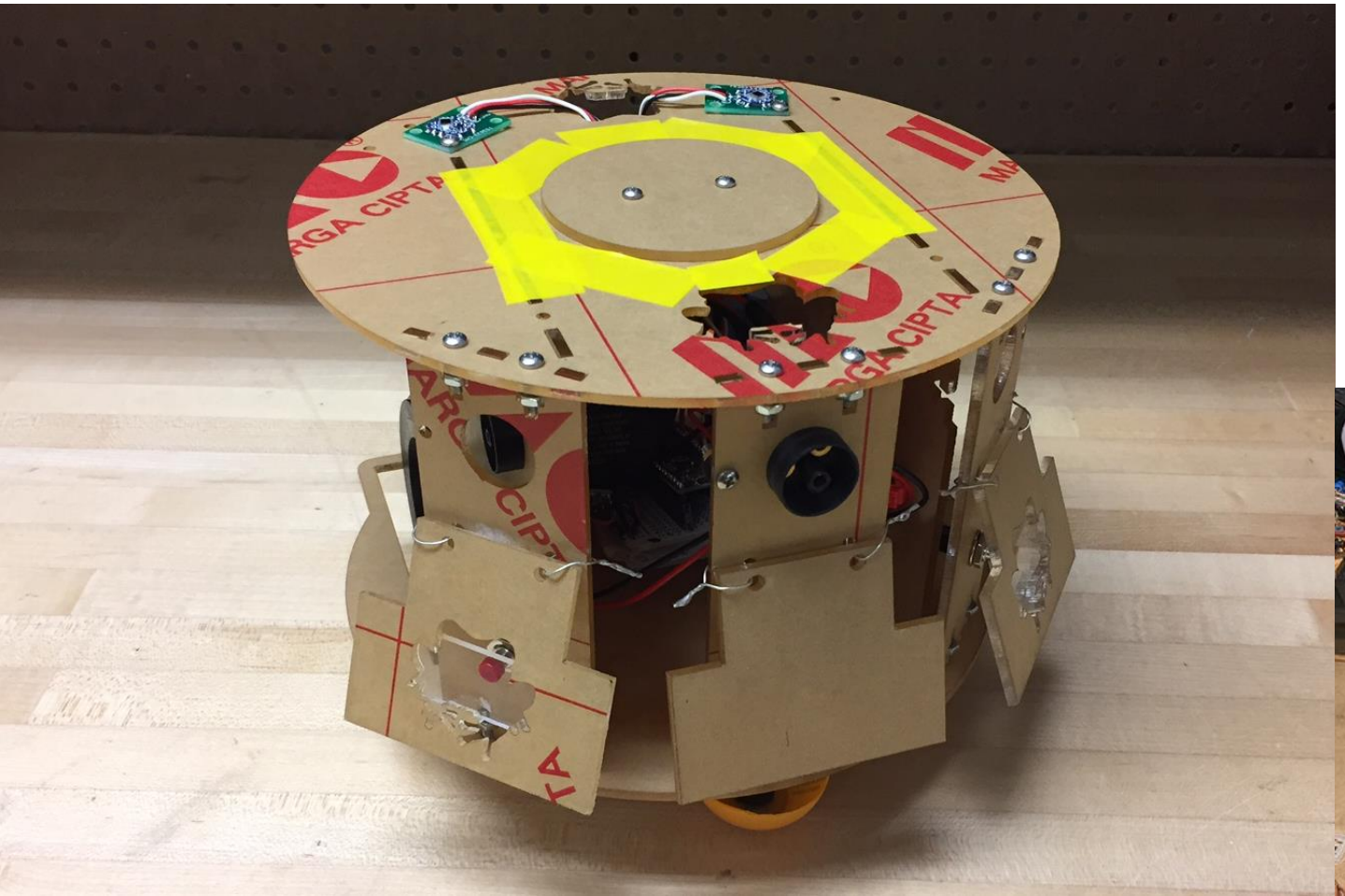


Final Product

Our product was featured on Big Ten Network as well as Northwestern and McCormick marketing materials.

Autonomous Robot Design Competition

Design a robot to autonomously run away from a human controlled hunter robot



My robot, Mr. Toad's Wild Ride, won third place using position tracking, phototransistors and bump sensors to navigate the terrain and strategically avoid the hunter. I was incredibly proud to place in the competition as this was my first solo robot project.

RotoRinse – a look into my process

Design a better makeup brush cleaner for under $30

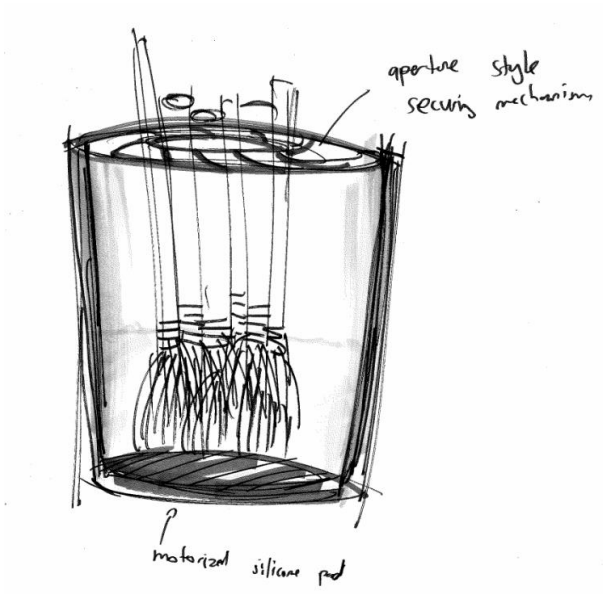
Get to the root of the problem through questioning and user observation

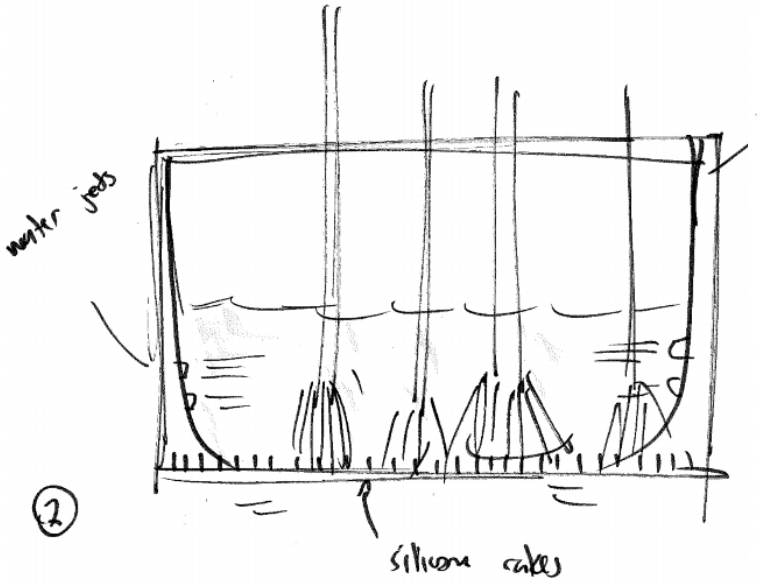
- Why don't people clean their brushes?
- Why is it so hard to clean brushes?
- Where do current solutions fall short?

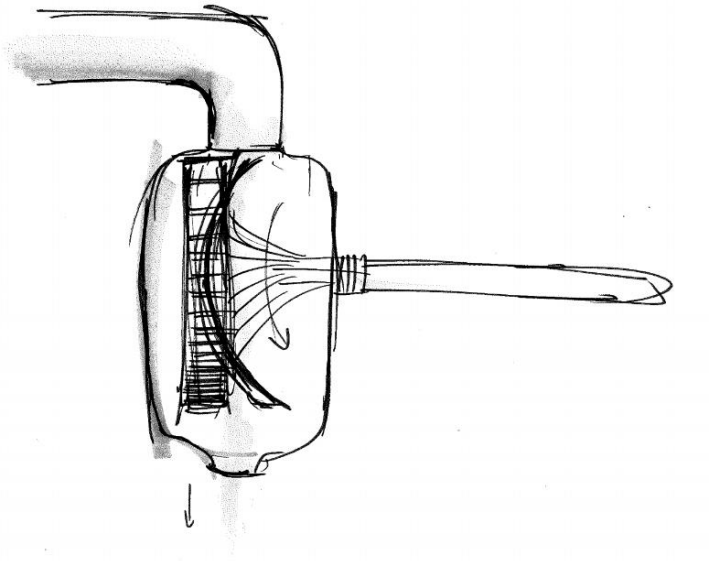
Findings from a survey completed by over 30 users showed that they wanted the process to be quick and easy. This helped us refine our design criteria.

Ideate

I came up with a couple design alternatives by making a morphological table and grouping best options. The industrial designer on the team then sketched the following images before I made rough mockups for each of these concepts. We eventually decided on the third option, a hydraulic-powered, faucet attachment.





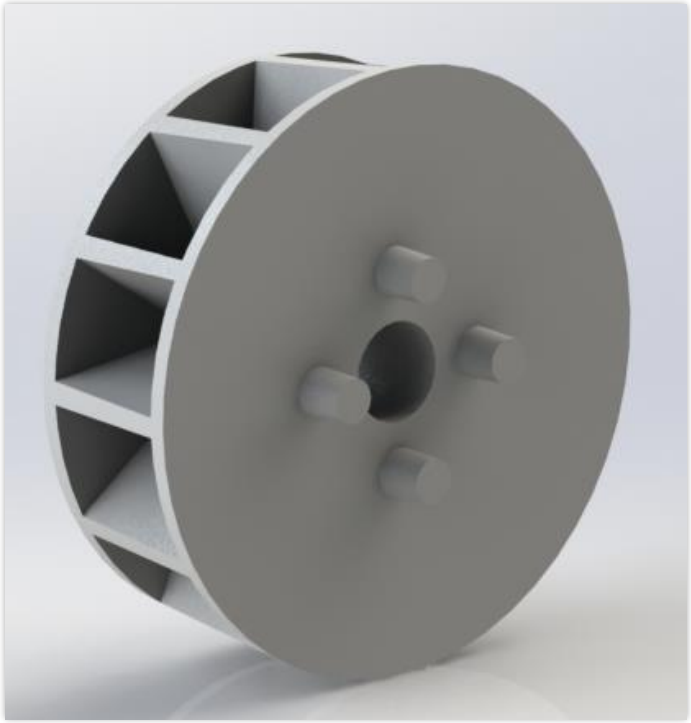


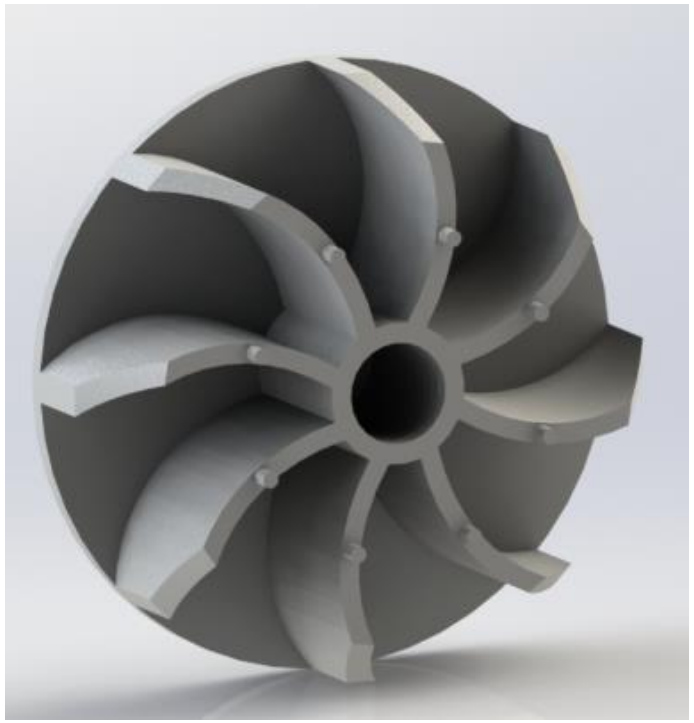
Prototype and Test

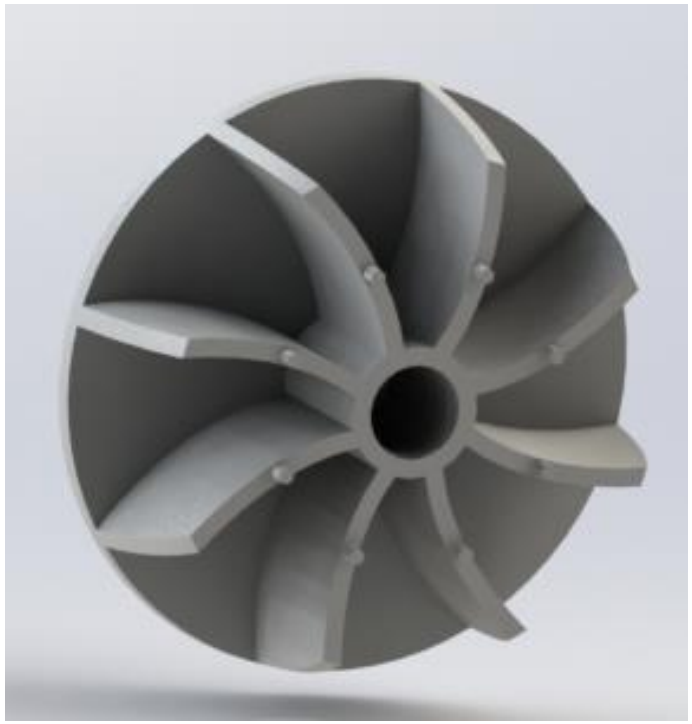
My first works like prototype of the RotoRinse was a makeup brush pad attached to a plastic disk and threaded rod. We could simulate the spinning for initial feasibility testing using a drill.

Iterate

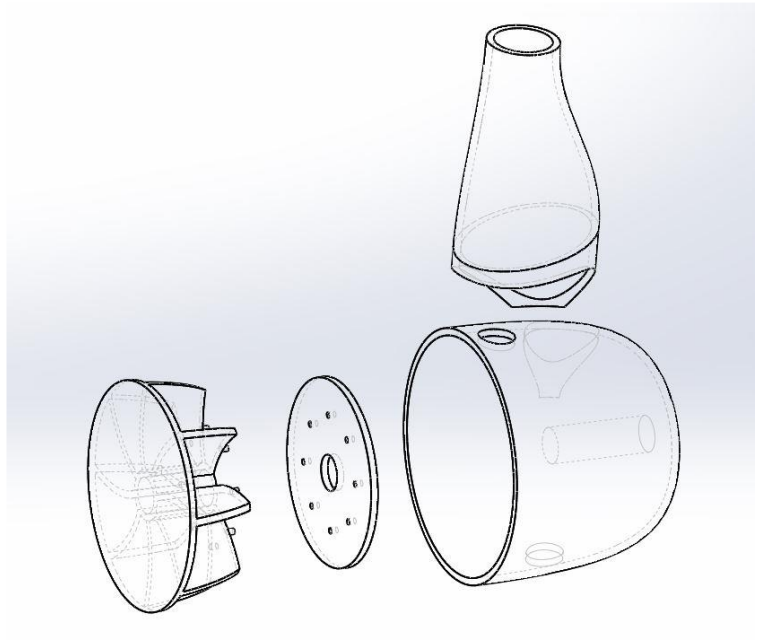
I used rapid prototyping to make small adjustments to the design and see how it affected performance. I had injection molding in mind for some of these parts, so I reached out to a manufacture for a quote and part design advice. I also made a value chain breakdown to find market advantages and saving opportunities.







Final Prototype



Northwestern Baja SAE Motorcats

Design, build, test and race an ATV to be lightweight, strong and safe

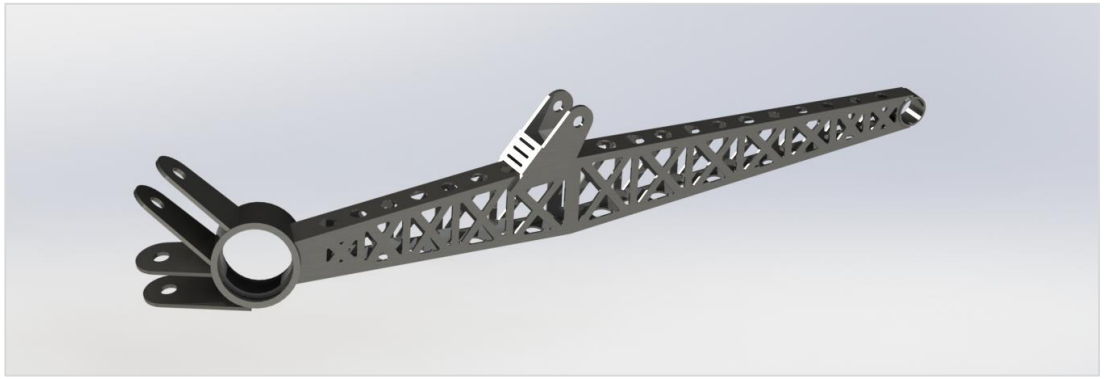
Baja is a student design competition where we build and race ATVs against schools from around the world.

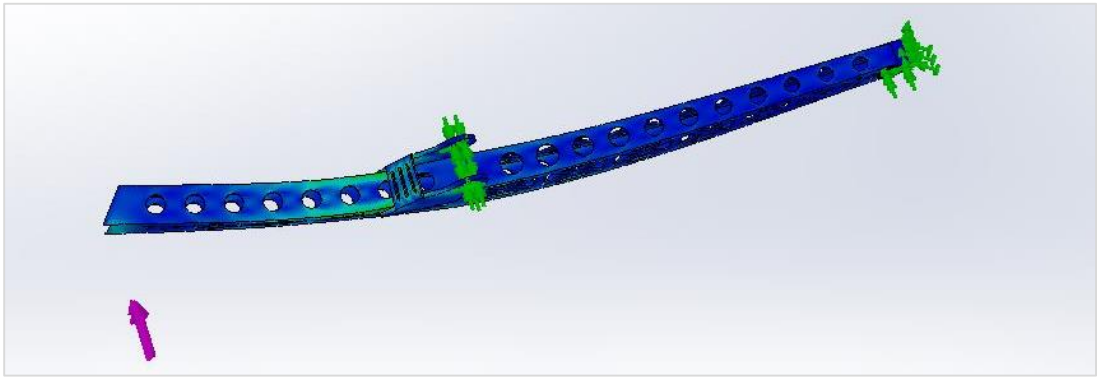
I'm currently the team captain (president and project manager), so I motivate the team of 40, determine the car's design direction and manage the construction of the car.

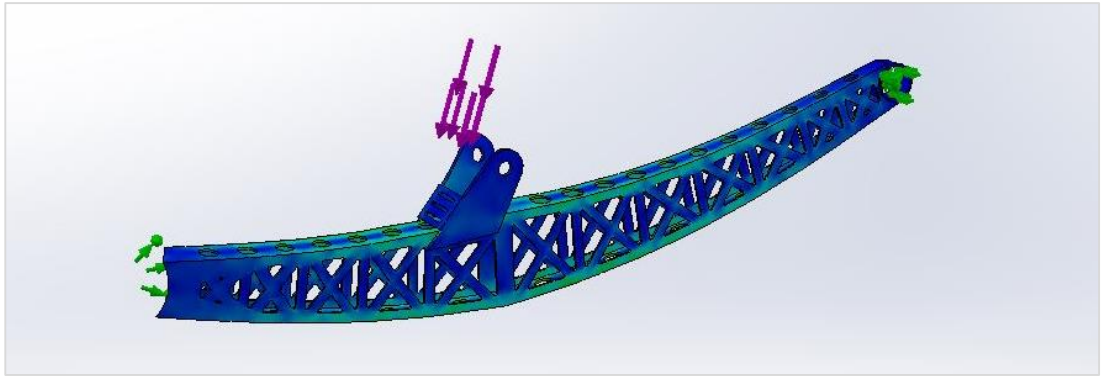
Through Baja I developed a love for manufacturing. As a freshmen, I was known for jumping at any opportunity to use power tools and that passion for building and tinkering has only grown.

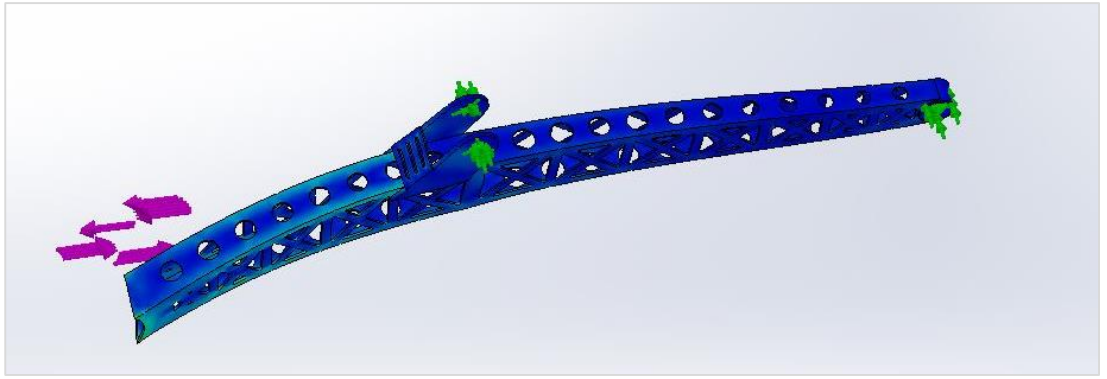
Baja SAE Trailing Arm

Design a strong, lightweight suspension member for ease of manufacturing





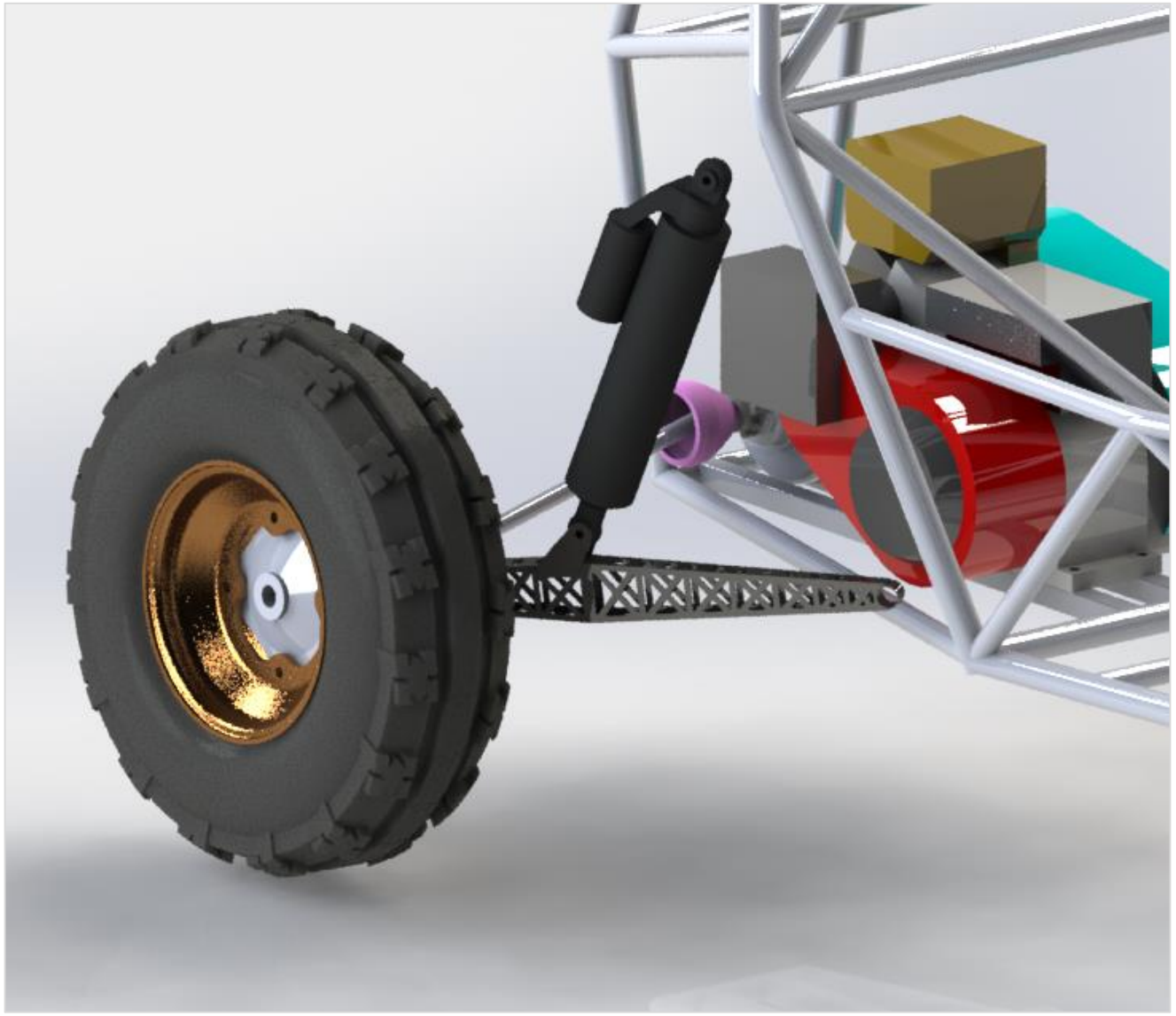




Trailing Arm

My focus for this project was design for manufacturing. I eliminated 4 parts and 12 weld lines, making the team welders very happy.

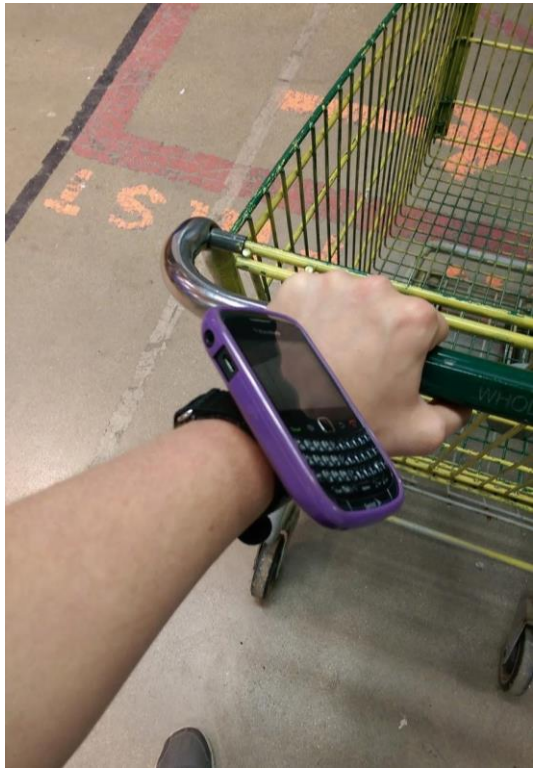
I ran multiple FEA load cases to prevent bending and breaking when the car goes off large jumps. It's an 8% weight reduction from last year's trailing arm.



MagCase

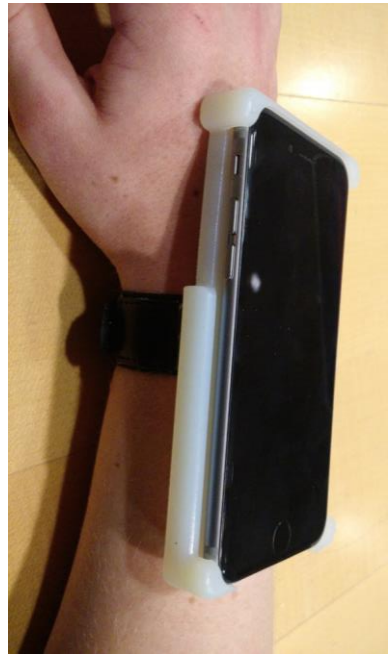
Make the shopping experience easier by freeing up users hands

I made some low fidelity mockups to get some immediate user feedback. We ended up picking the phone case idea because it was the most versatile. This design could be worn on the wrist at all times and could even be used as a phone stand or car GPS holder.

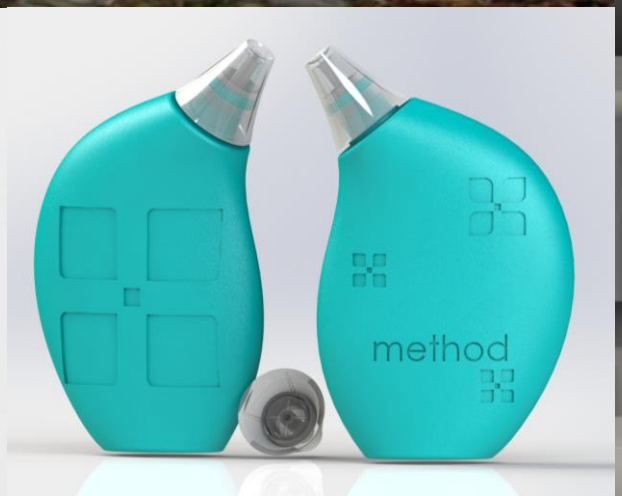


Prototype Progression

Utilizing rapid prototyping for a quick turnaround, I iteratively refined my design from CAD to rough prototypes to a final product.



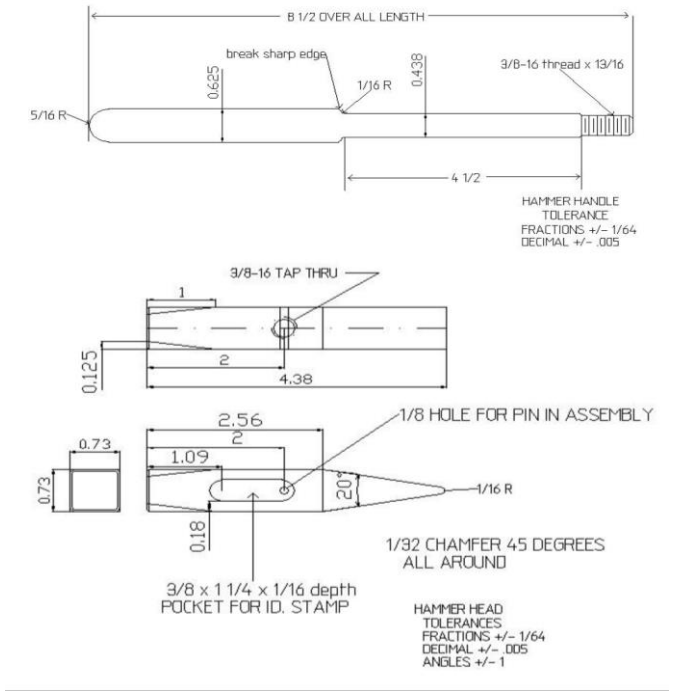
CAD modeling and renders in SolidWorks



Manufacturing Experience

Manufacturing experience with:

- Manual, conversational and CNC mills
- Manual and conversational lathe
- TIG welders
- Waterjets
- Laser cutters
- Sheet metal
- Additive manufacturing
  - Especially FDM printing



High tolerance hammer to practice machining

About Me

Hi, I'm Alex. I am currently pursuing a B.S. in product design engineering (PDE) at Northwestern University. PDE is a combination of mechanical engineering and industrial design, with a focus on mechatronics. After college I want to enter the product design field and help connect users, engineers and designers. I hope to eventually get a master's degree in either product design or mechatronics.

In my free time I like to build things, go fishing and play strategy card games. If you have any questions, please reach out to me at 857-294-4600 or alexfriedman2018@u.northwestern.edu.