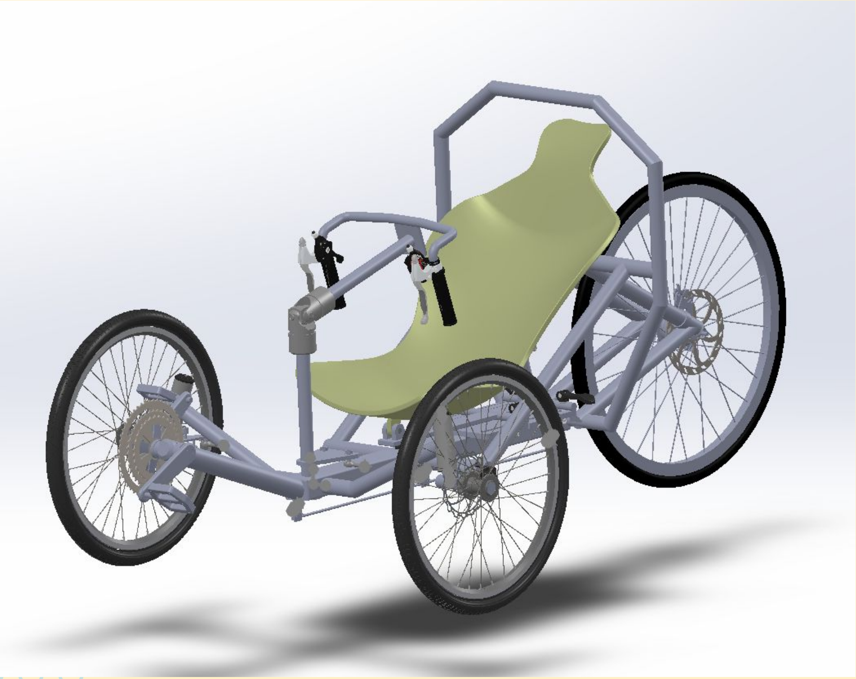
DESIGN PORTFOLIO

Dixun Cui {Fall 2020}

Contents

Recumbent Tricycle Design

Berkeley Human Powered Vehicle Team | 2020 - 2021



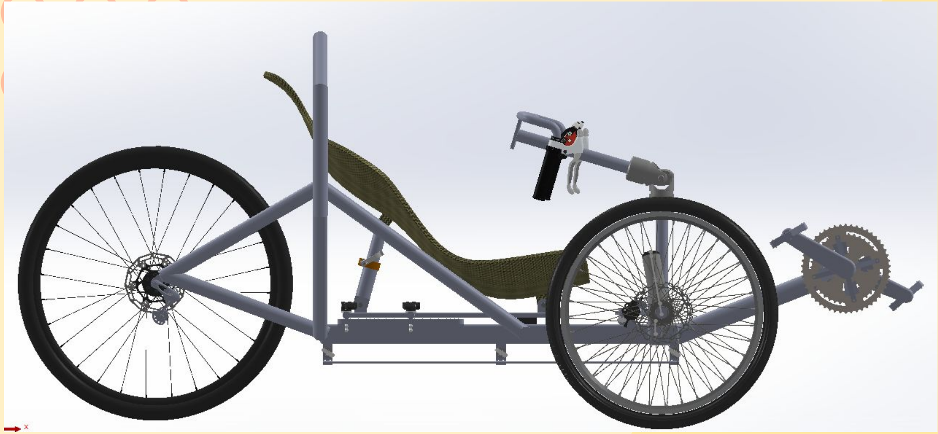
[interior assembly]

Our goal was to design a recumbent bicycle to compete in the 2021 ASME Collegiate Human Powered Vehicle competition, a virtual event involving a design report, simulation testing, and a presentation.

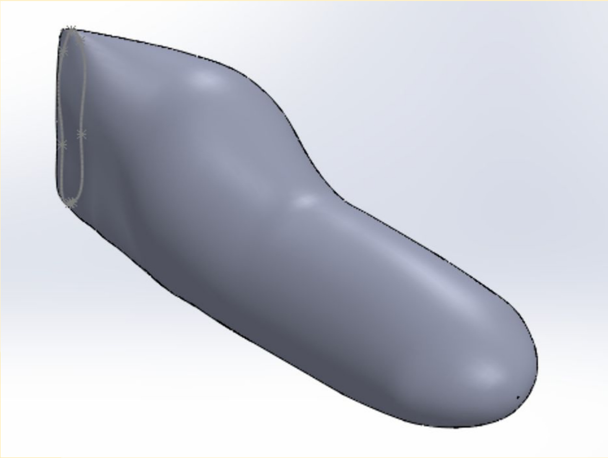
As the team lead, I am responsible for building and managing the overall assembly, while coordinating the design and integration of our chassis, steering, drivetrain, braking, fairing, and safety elements.

[1]: HPV Recumbent Bike

Our tadpole configuration tricycle was design for optimal control and flexibility, with an adjustable seat and a compound chainring and internal hub drivetrain to allow for static shifting and a variety of speeds. The aluminum chassis is lightweight and designed for ease of manufacturing.



[side view]



[fairing shell]

All parts and assemblies were designed in Solidworks. Simulation testing will be performed in January 2021 using Solidworks and Ansys.

For the 2019-2020 competition, I led the frame subteam, designing, ordering parts, and machining and assembling the frame. We managed to assembly the jig for welding before the facilities shut down and the event was cancelled due to COVID.

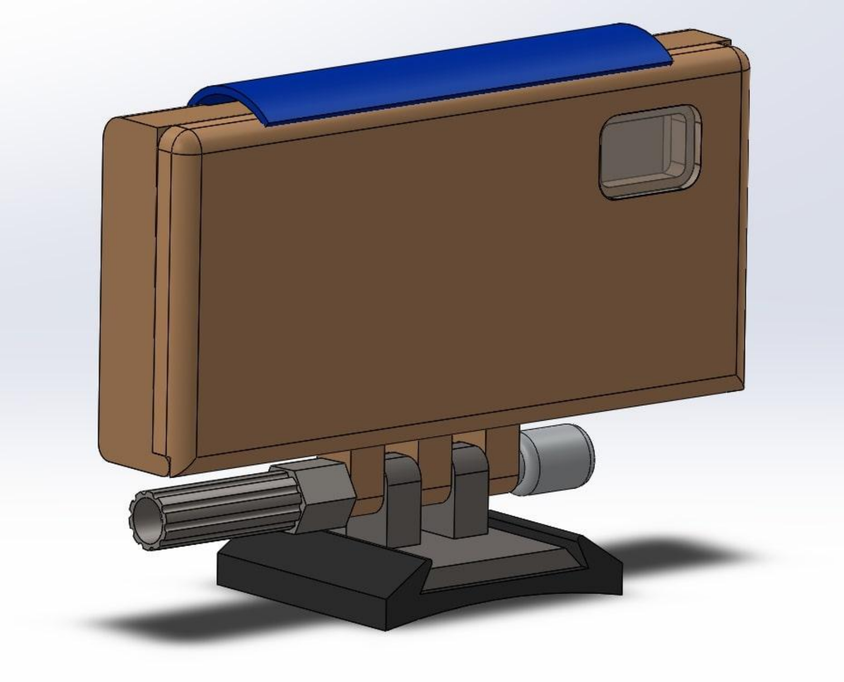
[2019-2020 frame jig]

[welding practice]

I learned TIG welding for steel and aluminum in order to build our frame. Here I was practicing welding tubes and joints.

Snowboard Helmet Phone Mount

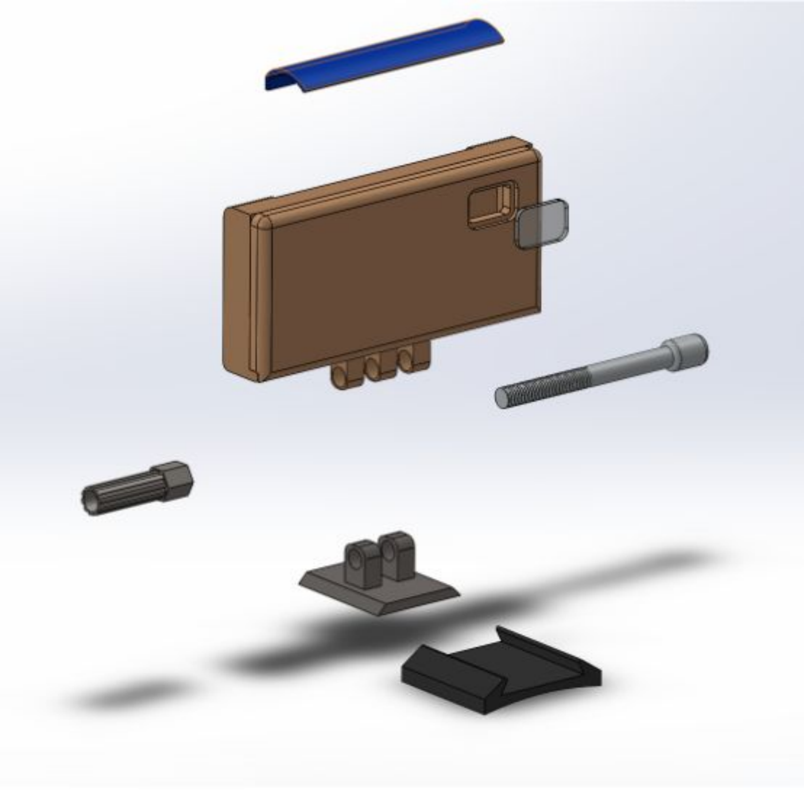
Manufacturing & Tolerancing Class Project | Feb - May 2020



[closed helmet mount]

In a team of five, our goal was to design and fully dimension and tolerance a consumer product that interfaced with a smartphone to expands its capabilities.

Our product was a snowboard helmet mount that allowed a smartphone to be used as an action camera. I was individually responsible for the product design and CAD models while working with my team on dimensions, fits, tolerances, and prototyping/production plans.



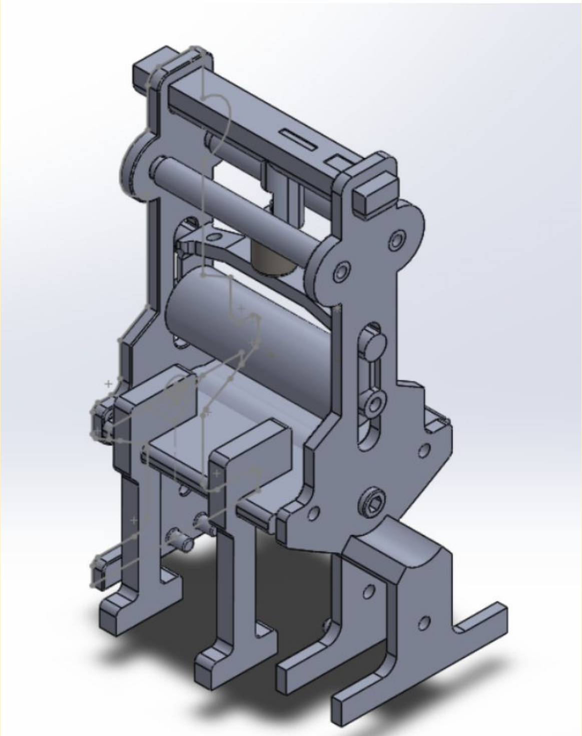
[mount assembly view]

Our product used a combination of snap fits, running fits, and transition fits to allow for secure attachment as well as easy adjustability. All tolerances were specified for the selected fits and were chosen so that they would be achievable using our prototyping methods.

Though we weren't able to build a prototype of the product (due to COVID), we specified our selected manufacturing methods for prototyping (3D printer, laser cutter, lathe) and large-scale production (injection molding, standard parts).

Sheet Roller Machine

Processing of Materials Class Project | Feb - May 2020

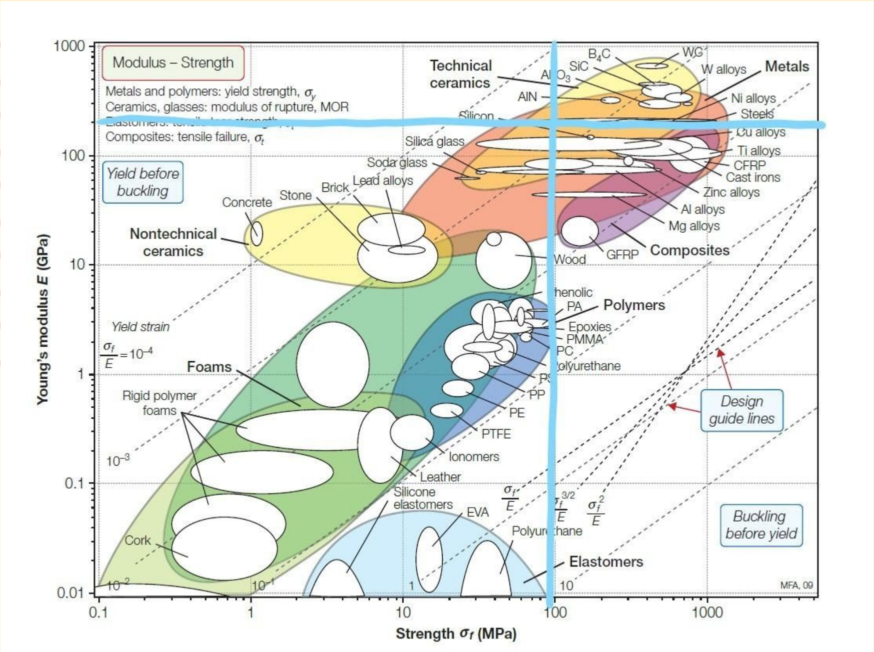


[roller assembly]

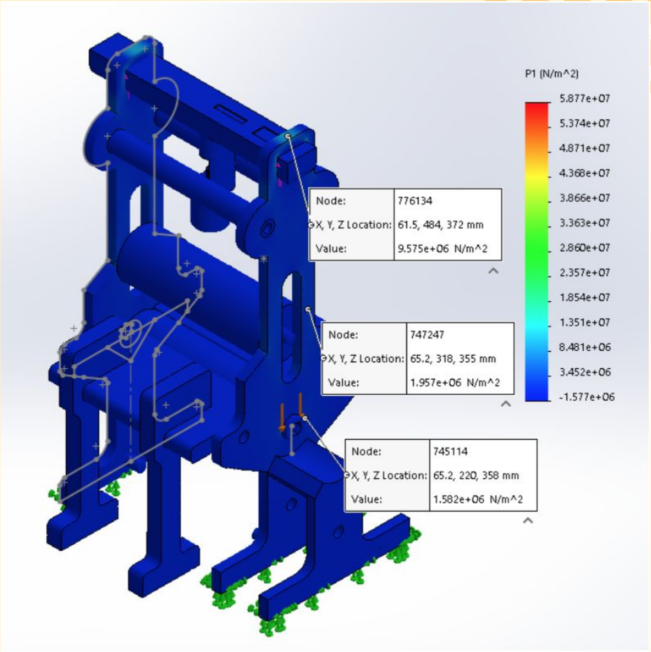
In a team of four, our goal was to design a scaled down hot rolling machine capable of flattening plasticine from 15 mm thick to 5mm, while also specifying the design of the full scale machine for rolling steel.

I was responsible for material selection analysis as well as the design and CAD of the final product. Our project also featured a scientific report deliverable, covering our design process and simulation testing results.

Details and the paper be found on our project website (sites.google.com/view/sheet-roller-project).



[Ashby chart example]

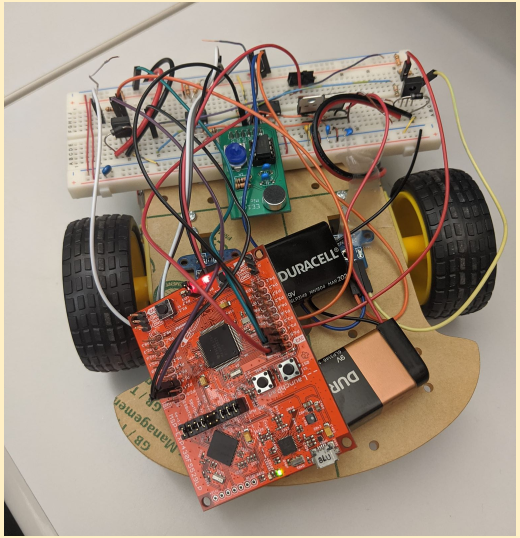


[simulation test]

To ensure the success of our machine, we used various Ashby charts for each machine to narrow down the materials, given the required physical characteristics. We also performed Solidworks simulation stress analysis to verify our hand calculations and ensure that stresses and deflections fell within our factor of safety.

Other Projects

2018 - Present



[1]: 3D Printed Face Shields for Hospitals

[2]: Voice-Controlled Car

[3]: Wind Turbine Prototype

[4]: Piano Rack

{About Me}

When I was young, I was fascinated by Lego sets, disassembling them and putting them back together in different ways to breed whatever fantastical creations I had thought of that day. That same desire is what drives me to be a mechanical engineer today: the love for building things and bringing to life new ideas that can positively impact people's lives.

In my free time, when I'm not tinkering in the machine shop or designing/programming in front of a computer, you can find me swimming, cooking, playing the guitar, running, or watching all sorts of sports. Once in a while, I may also be writing up a short story or trying to learn a new instrument.

site: dixuncui.com
email: dixuncui@berkeley.edu