Project Portfolio

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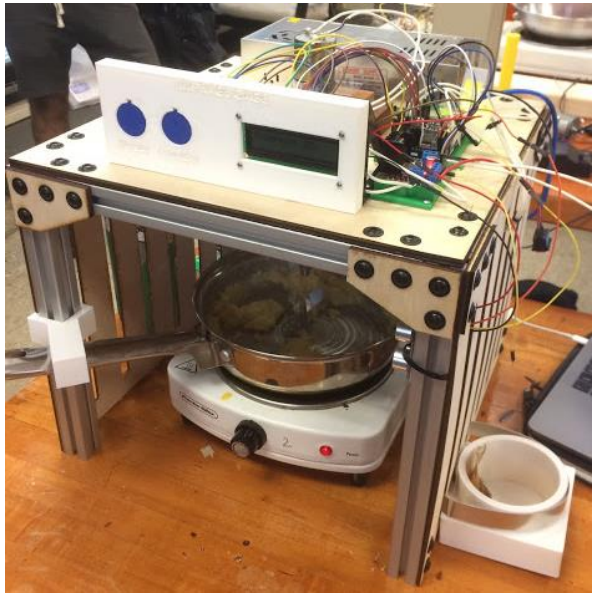
VeganEgg Scrambler

- Objective
  - Design and build a system that whisks, stirs, and monitors consistency and temperature in order to scramble an egg.
- Links
  - Final Presentation
  - Github Repository



Final prototype demonstration.

$$con_i = con_{i-1}(1 - W) + [min(\overrightarrow{cur_i})(1 - \frac{t_i - t_0}{300}) + max(\overrightarrow{cur_i})(\frac{t_i - t_0}{300})]W$$

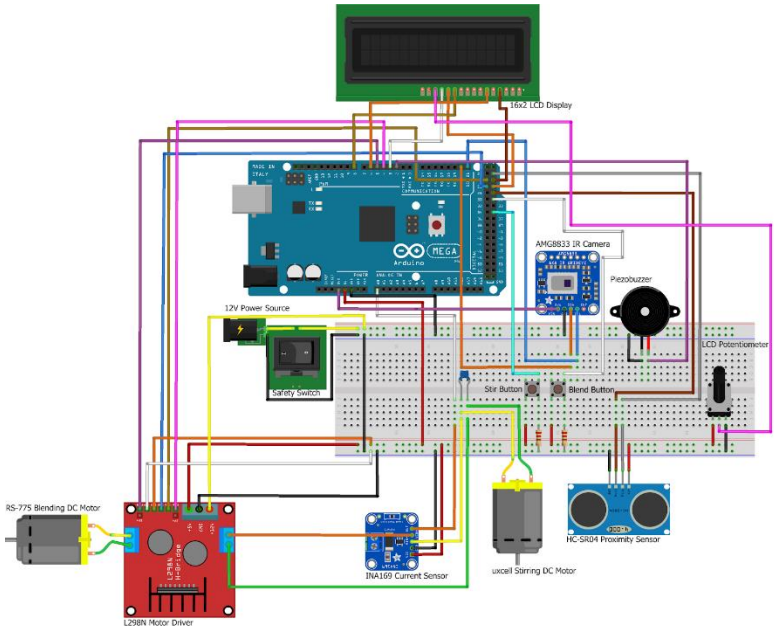
$con = consistency$

$cur = current$

$t_0 = initial\ time$

$W = filter\ weight$

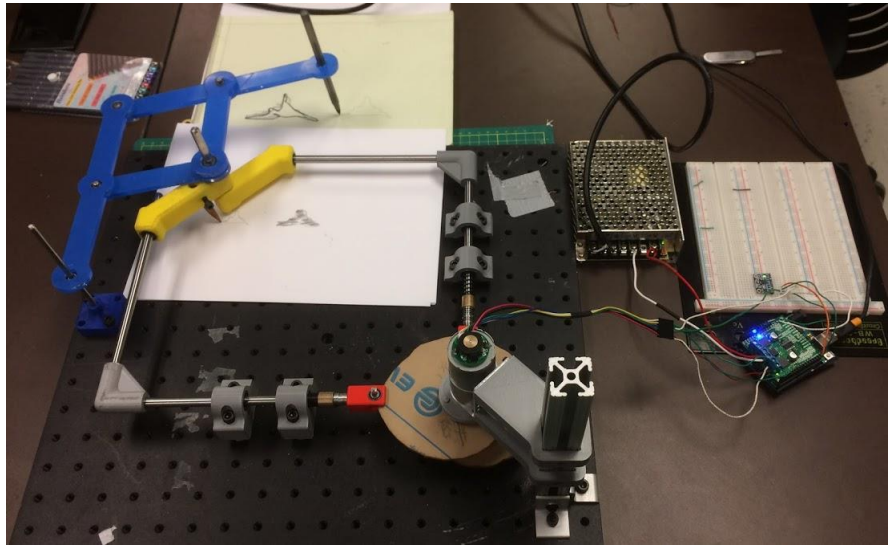
Formed a time-weighted empirical model for egg consistency using motor current.



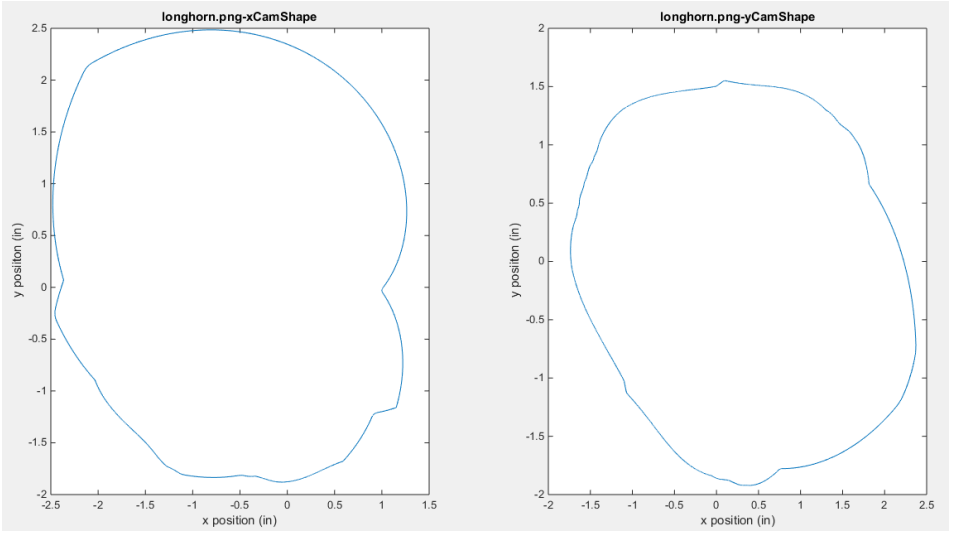
Circuit diagram includes IR camera and current sensor for temperature and consistency monitoring, respectively.

CamSketch

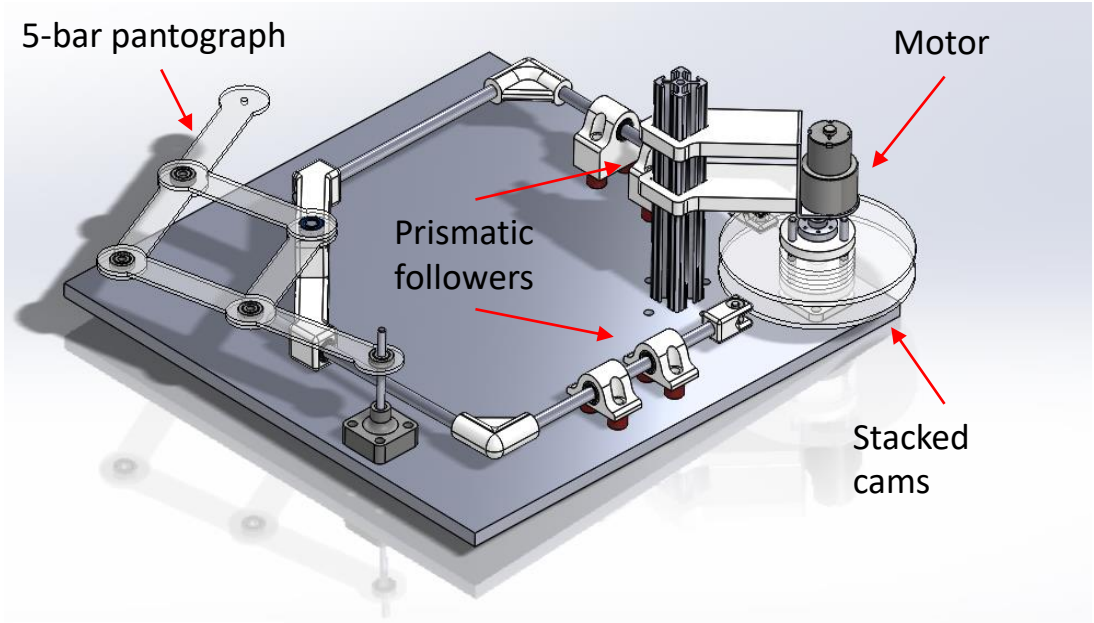
- Objective
  - Engage motor-impaired students in a school art class with an accessible sketching mechanism.
- Links
  - Project Documentation
  - Github Repository



Final prototype demo.



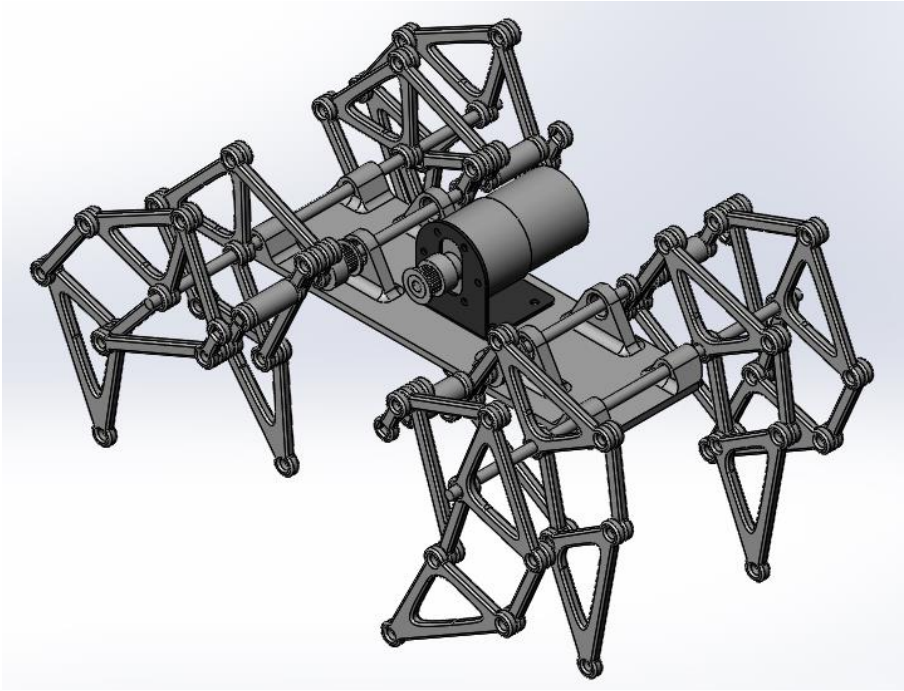
Cam profiles automatically generated from any image using code written in MATLAB.



Full mechanism model in Solidworks.

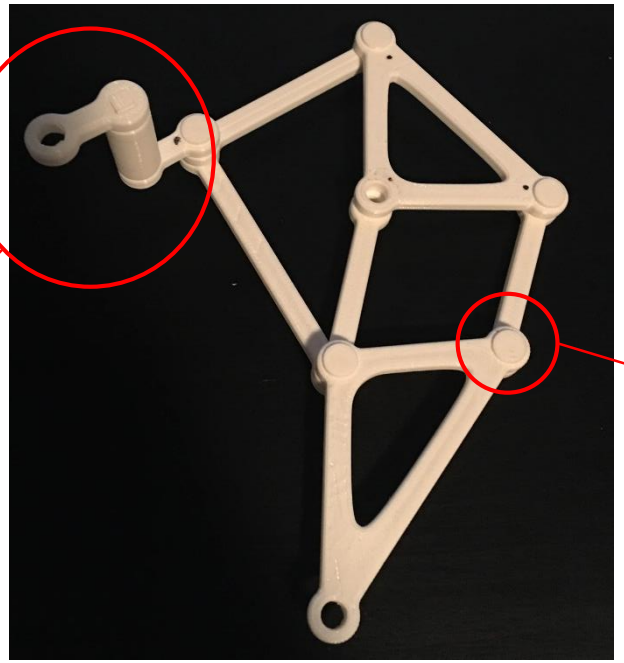
Walking Mechanism

- Objective
  - Design and build a walking mechanism based on Theo Jansen's Strandbeest.
- Links
  - CAD Files

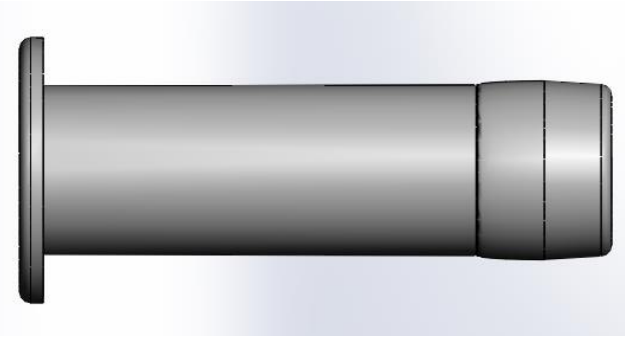


Mechanism design in Solidworks uses 8 Jansen's linkages, 2 driveshafts, and 1 motor to walk.

Quickly prototyped test parts to experimentally determine dimensions for interference fit joints.



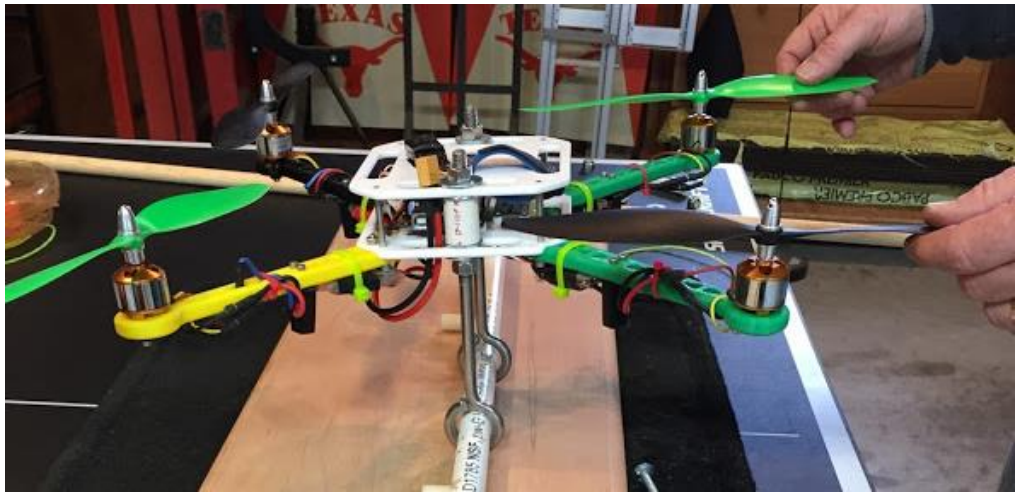
3D-printed Jansen's linkage.



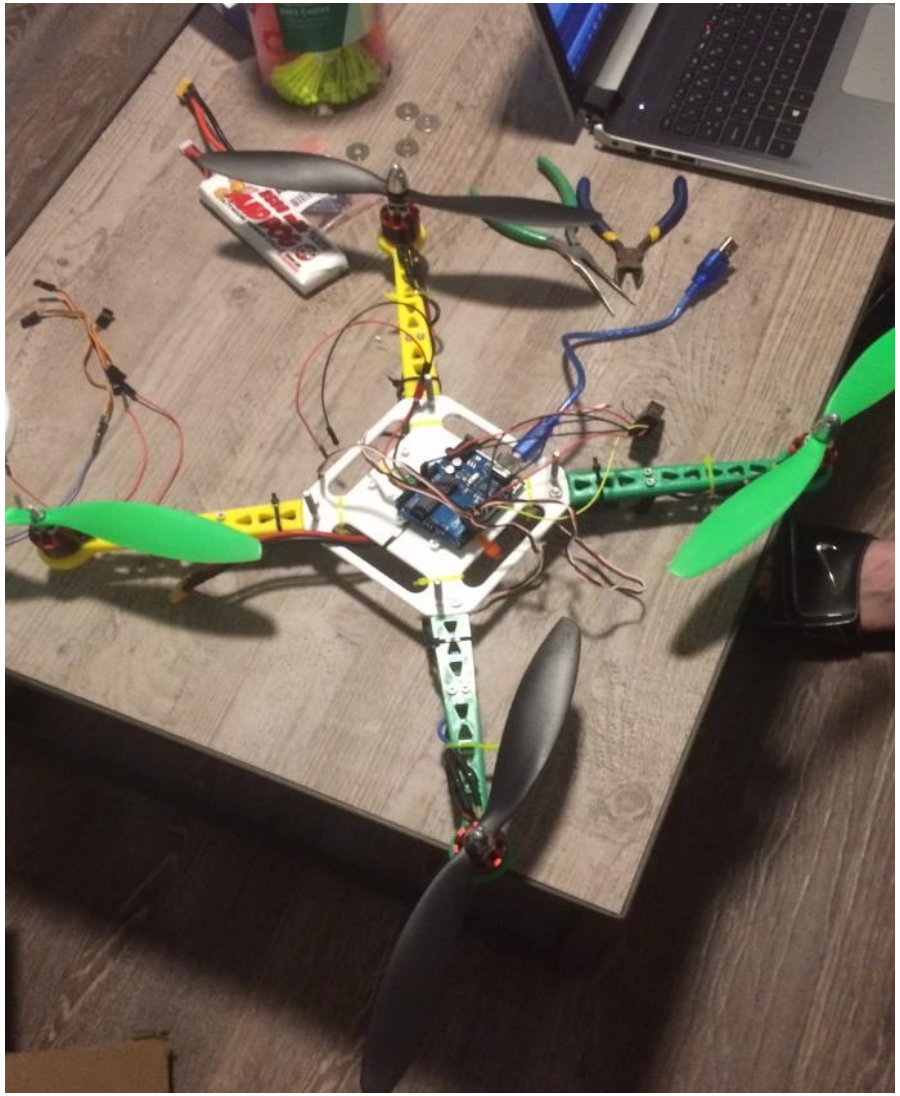
Pin joint uses a detent feature to create a tight interference fit with outer link, easing assembly while maintaining a low-friction bearing surface.

Quadcopter

- Objective
  - Build a quadcopter to apply mechanical design, control system design, and rapid prototyping.
- Links
  - Github Repository



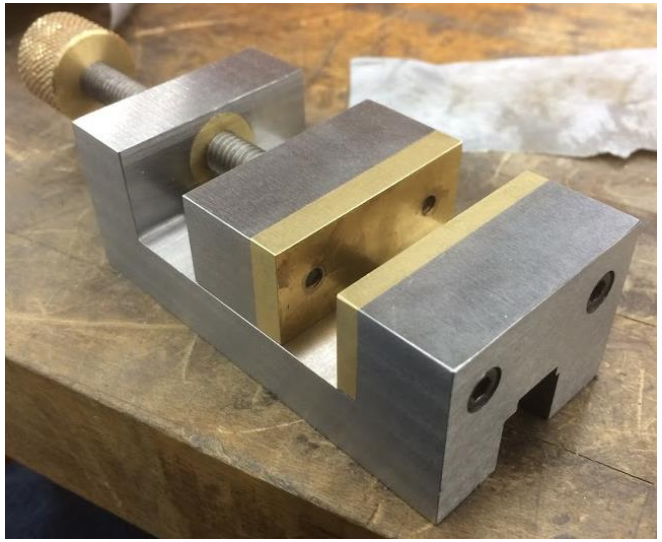
Test stand for PID and motor trim tuning.



3D-printed quadcopter assembly with an Arduino microcontroller and an IMU sensor for feedback control.

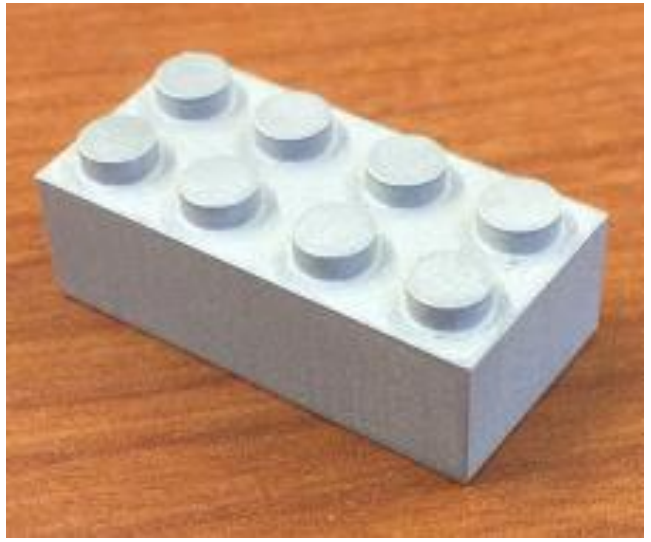
Machine Shop Projects

- Objective
  - Become familiar with shop equipment and common manufacturing methods.



Manufactured 9 steel and brass parts of a mechanical vise with a manual mill, manual lathe, and a CNC mill and finished with a surface grinder.

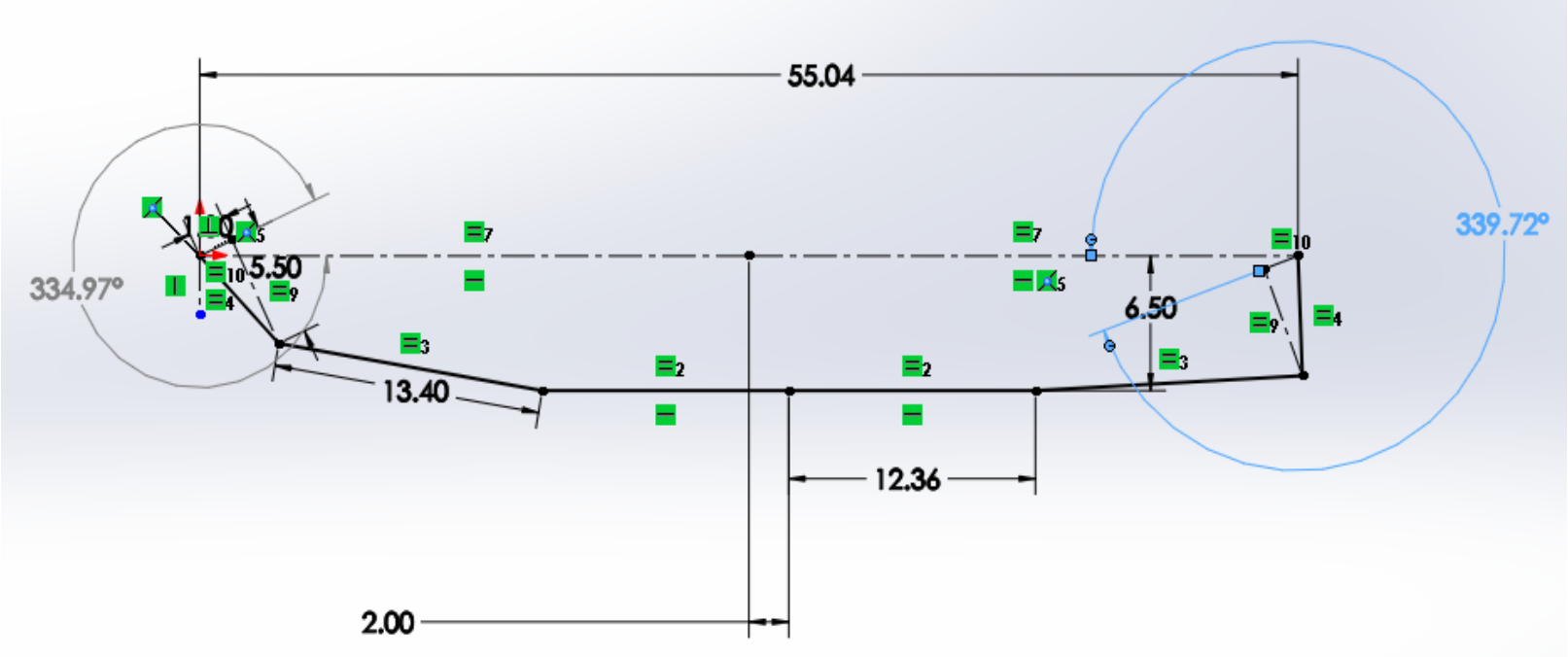
Lost-foam cast a mountain in aluminum.



Generated toolpaths in Mastercam, CNC-milled, and beadblasted an aluminum Lego brick to scale.

Solar Vehicle Steering Design Tool

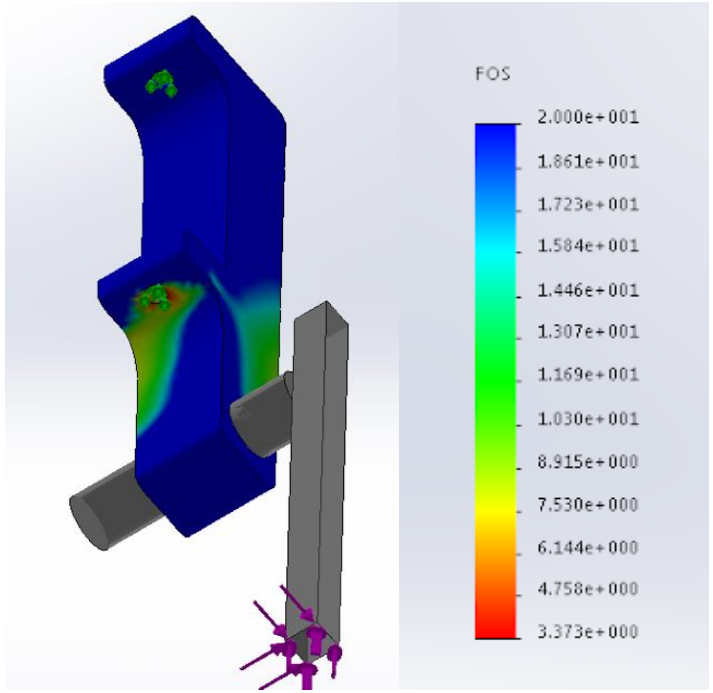
- Objective
  - Design a tool to model the steering system for the Solar Vehicles Team.



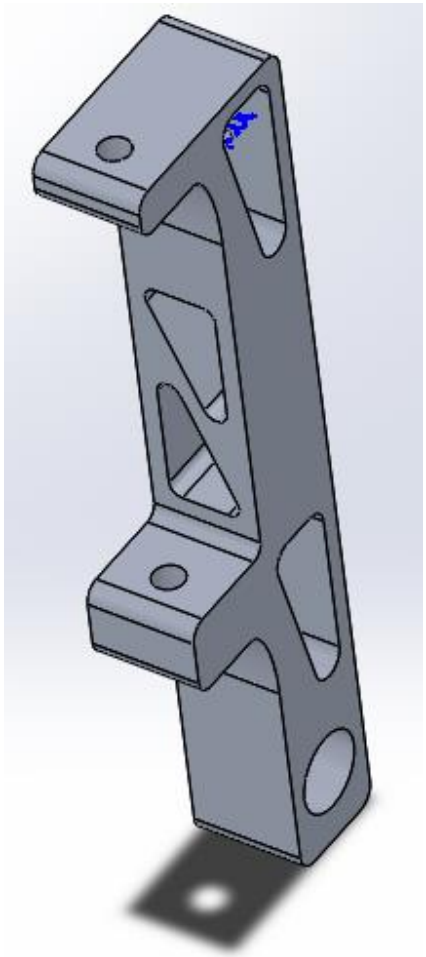
A Solidworks sketch depicts the linkage for the Ackermann steering system in order to properly specify required link lengths and pinion travel to achieve desired vehicle turn radius.

Solar Vehicle Upright Design

- Objective
  - Design new uprights for the Solar Vehicles Team to be lighter than previous versions while satisfying structural requirements.



Used Solidworks static simulation to iterate through designs, optimizing for safety factor and weight.

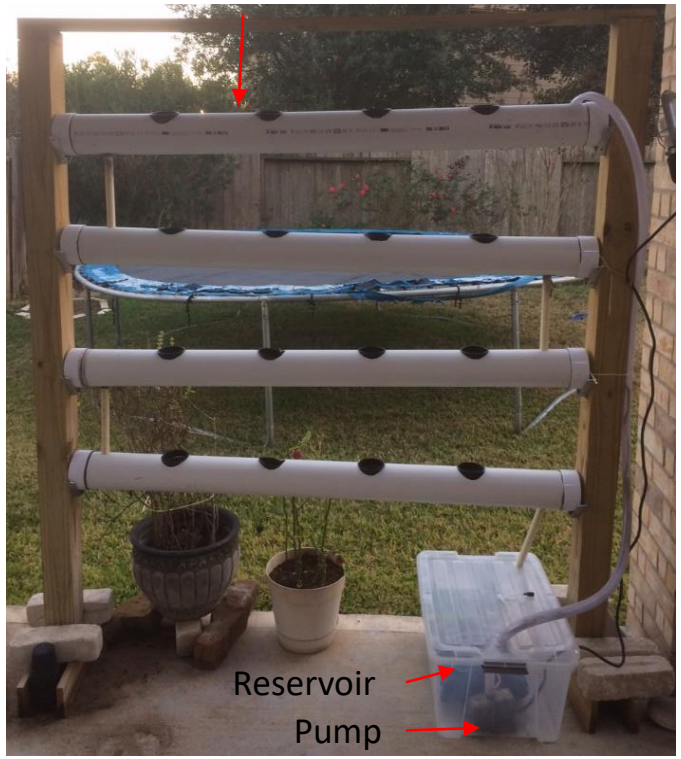


Final upright design in Solidworks with a 3.13 lb weight and a 3.1 minimum safety factor to yield.

Hydroponic Garden

- Objective
  - Design and build a continuous flow hydroponic garden to enable low-maintenance gardening.

4 planters per channel



First, calculated pump size and max allowable channel angle to achieve desired flow rate. Then, spec'd parts and built functional system.