Professional Experience

Apple (Cupertino, CA)
Manufacturing Design Engineer Intern
June 2020 - December 2020

Google (Mountain View, CA)
Product Design Engineer Intern
June 2019 - August 2019

Pratt & Whitney (Lansing, MI)
Mechanical Engineer Intern
June 2019 - August 2019

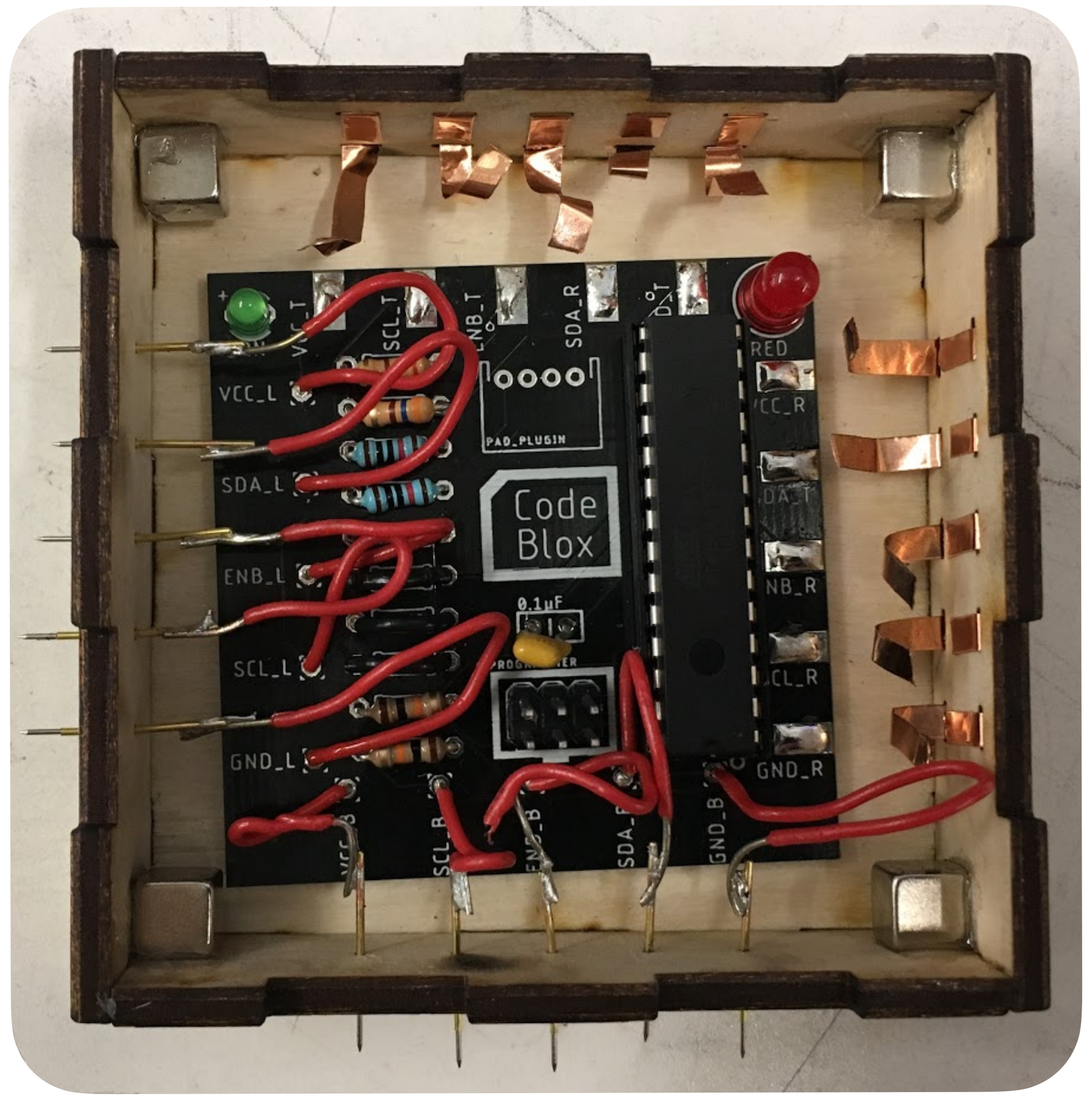
StairCat

For my senior capstone design project, I worked in a team of 5 to build StairCat, a safe and ergonomic moving assistant. StairCat looks to solve the problem of moving heavy and/or bulky objects up stairs, which can be difficult and dangerous. There are many existing solutions on the market, but products such as hand trucks provide minimal benefit on stairs, while more robust solutions that incorporate motorized lifting systems cost several thousand dollars and are too expensive for the average consumer.

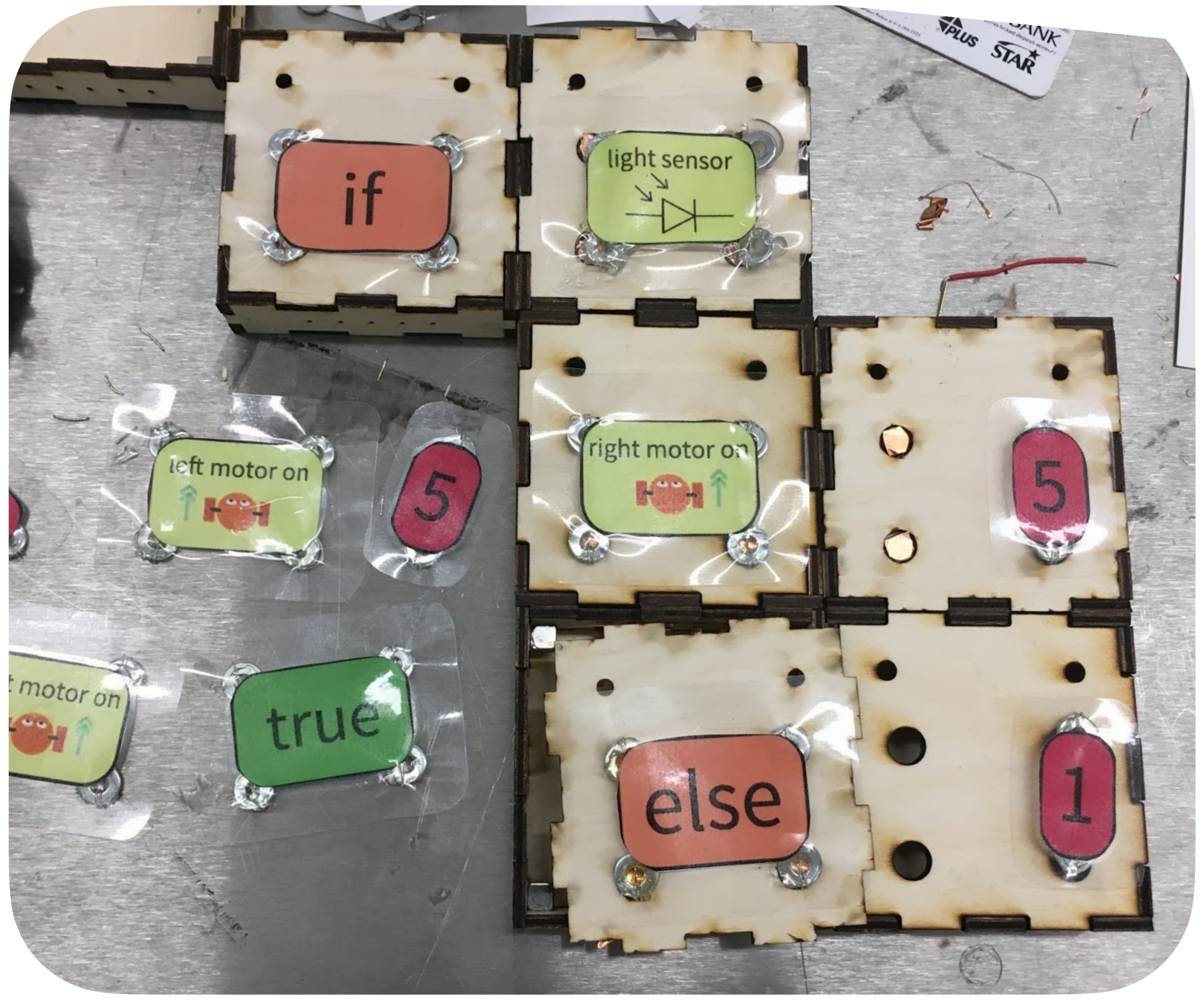
StairCat differs from a conventional hand truck in its ratcheted tread system, which allows users to seamlessly transition from moving on flat ground to traversing up stairs. The unidirectional motion of the ratchet acts as a safety mechanism, allowing the user to stop at any point on the steps without slipping. Over the course of the semester, we performed market research, built and demoed several prototypes, and conducted user studies to improve the ergonomics of our product. My main responsibilities on this project were the design and manufacture of the ratchet subsystem.

Codeblox

For a week-long buildathon, I worked with a team of 5 to build programmable blocks to teach children basic coding skills. The tiles can be linked together to create a program that controls a robot. Traditional methods of learning to code are computer based, limiting accessibility to text based learners. By creating tangible building blocks, we can better engage kinesthetic and visual earners and introduce programming concepts to kids at a younger age. Additionally, physically building a program encourages collaboration between peers. Our project won the Overall Sponsor Award, Rockwell Automation sponsored prize, and Intel sponsored prize.



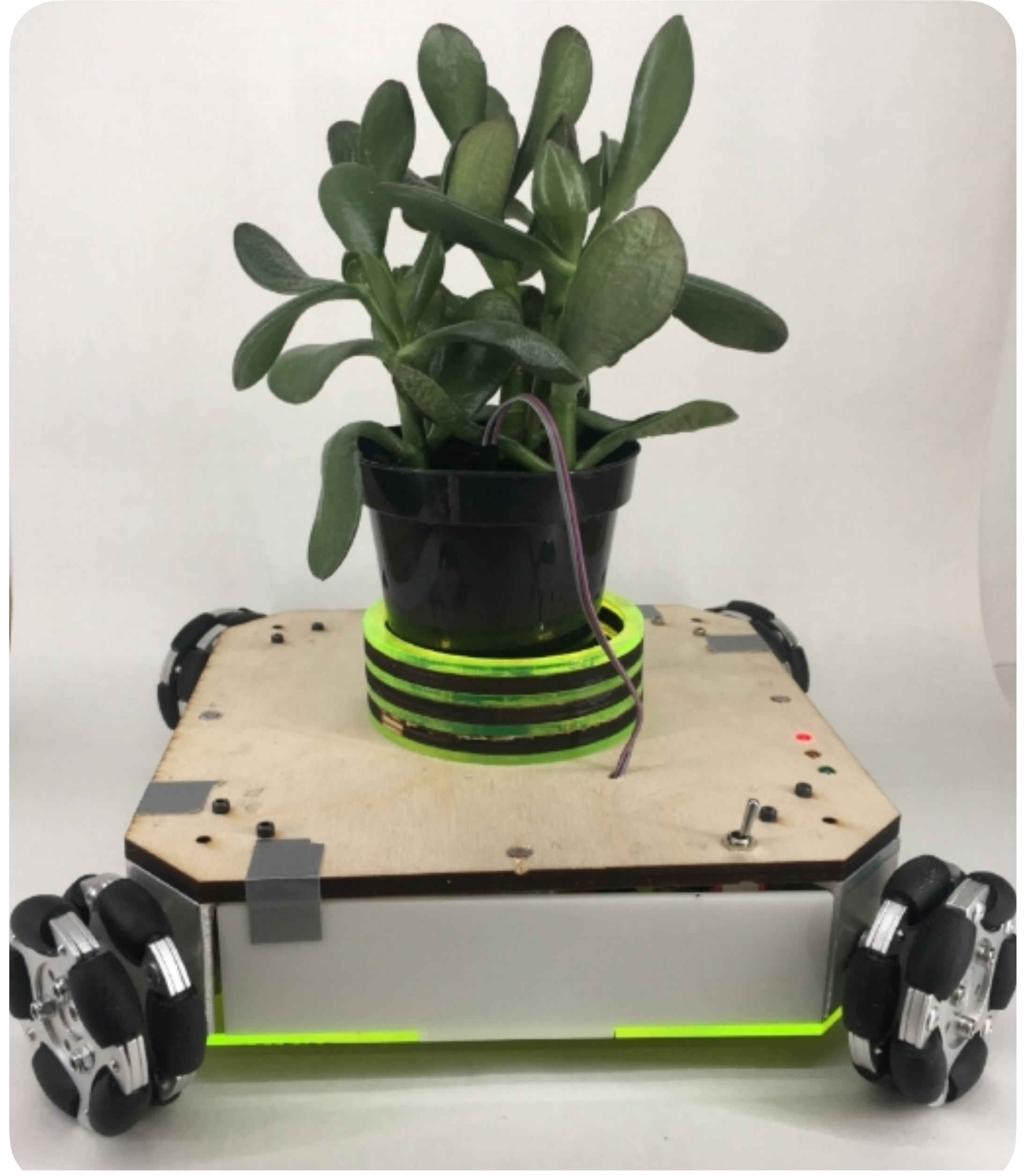
Each block contains a custom PCB board and spring loaded pins to transmit data. Blocks are connected via embedded magnets to write code that can control a bluetooth enabled robot. The blocks are generic, and do not take a value until a laminated pad is placed on top. This reduces the number of tiles that need to be fabricated. Pads are connected to the top of the tile with magnets wrapped in copper tape that connect to the PCB chip inside. Each pad is assigned a unique resistance value that encodes its value.

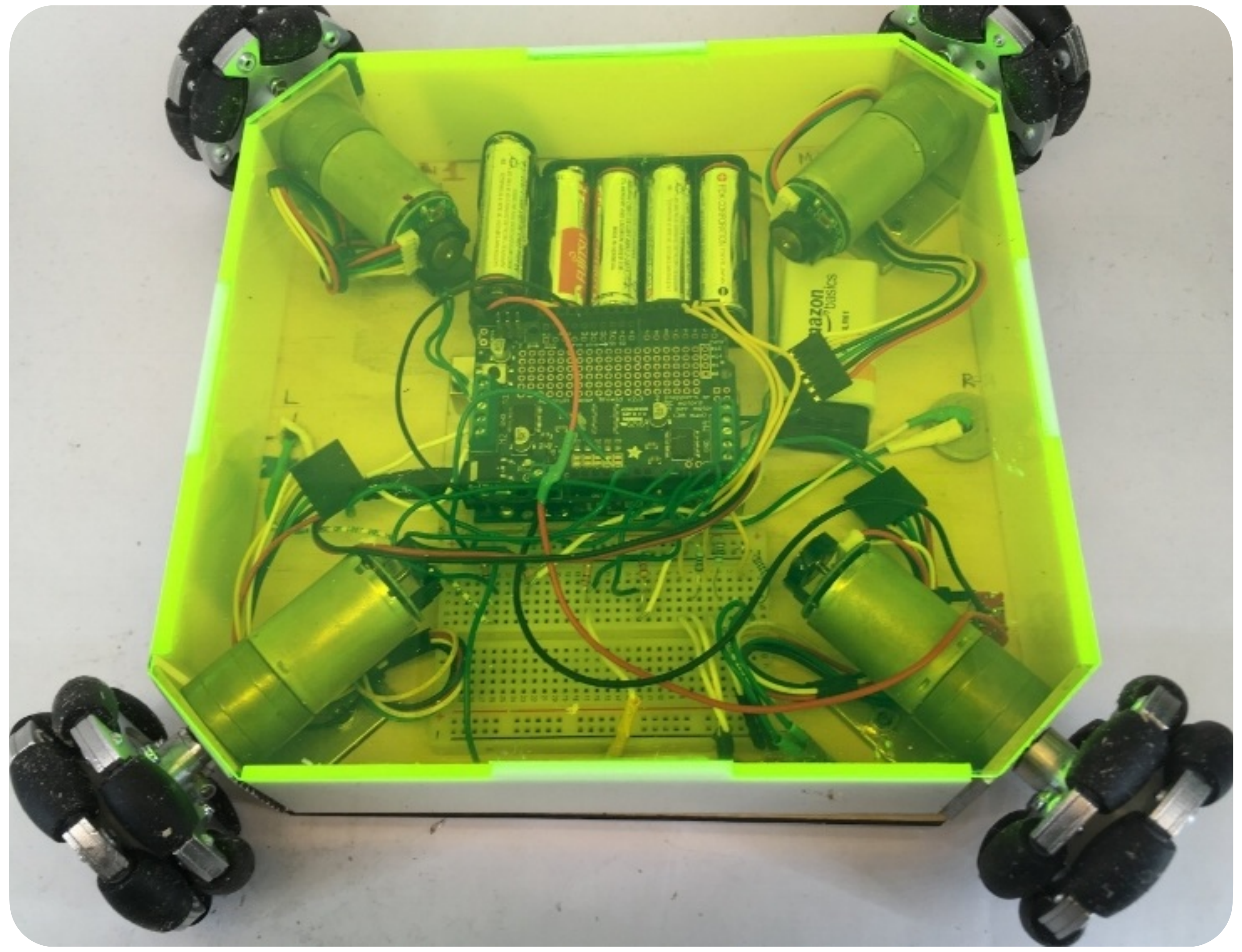


Light Sensing Plant Holder

For my gadgetry final project, I worked in a team of 3 to create a fully autonomous robotic plant maintenance system. This device moves towards optimal lighting conditions and monitors soil moisture levels to maximize photosynthesis of a potted house plant. Our team iterated through several designs before reaching the final product, focusing on adding functionality with each prototype.

The design features 4 omni-wheels mounted to a wooden base with aluminum brackets and press fit shaft collars. The robot receives data from photo resistors positioned around the edge of the body and will move the plant in the direction of highest light intensity (1 of 8 possible directions). The photoresistors are secured by 3D printed housings press fit into body. An Arduino Uno connected to a motor shield reads data from photo resistors and actuates motors accordingly. A moisture sensor in the soil detects when the plant should be watered and actuates an LED indicator. A laser cut acrylic housing unit holds all electronic components securely on the underside of the body.

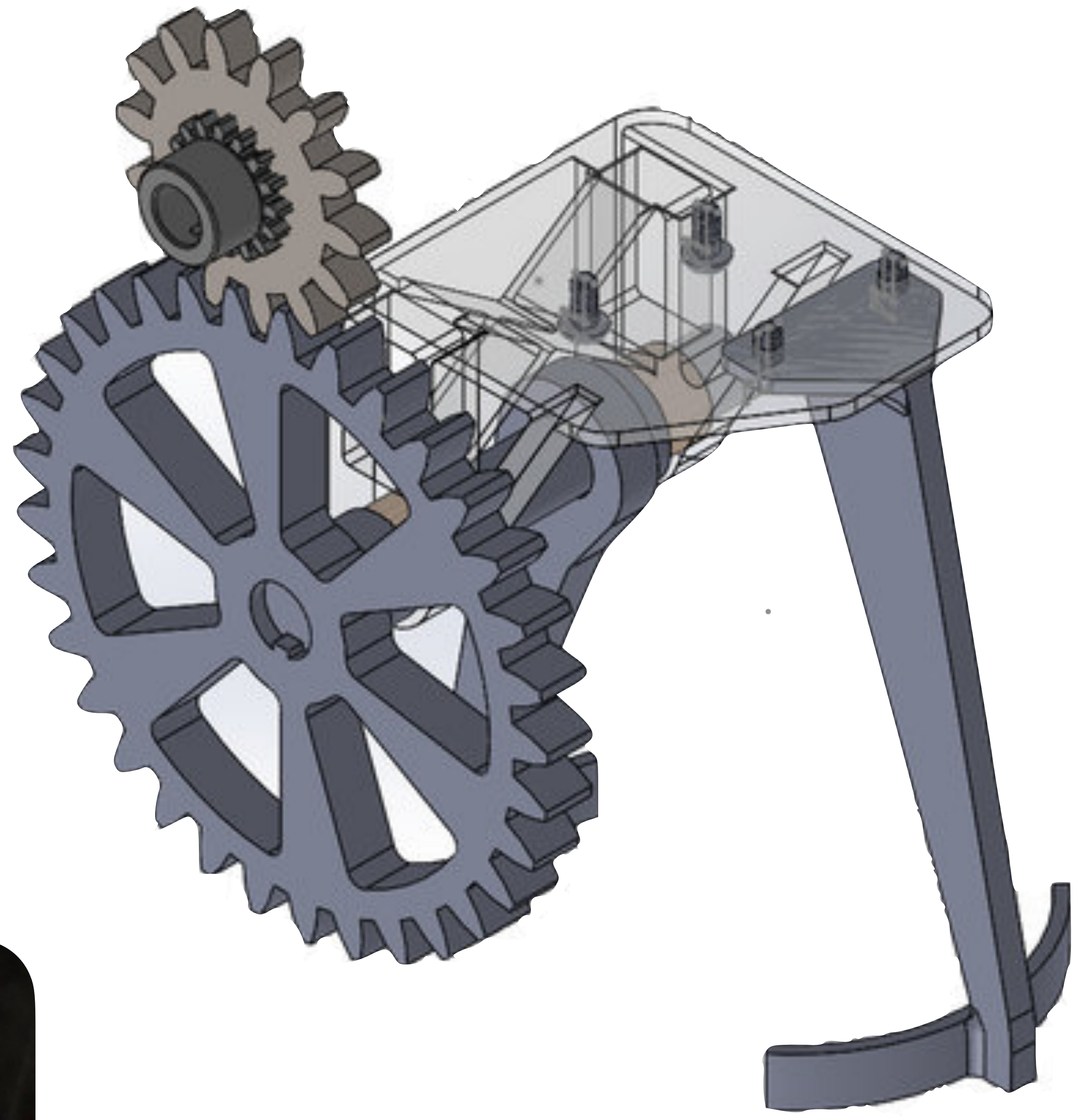




Swinging Gripper

I worked with a team of 5 in an Engineering Design class to design, fabricate, and test a robotic gripper in order to reliably grasp, hold, and release a custom object. The gripper must be able to hold on to the object without displacement in any direction while the robotic arm swings rapidly through a circular arc. Performance testing was based on success of dynamic testing, as well as total gripper mass.

Our design grips the object with two 3D printed arms, one static and one moving. A double gear set transfers torque from the motor shaft to the moving arm. The large gear is spoked in order to reduce the total mass of the gripper. Both the gear and moving arm is press fit onto a keyed shaft. Our group iterated through several prototypes of each component before reaching the final design. The gripper successfully passed dynamic testing, and weighed 152.4 grams.



Mechanical Crane

The objective of this project was to build a mechanical crane powered by a servo motor. The crane was to be mounted to a playing field, where it had to pass through one of two vertically-oriented holes to lift a 2 pound weight at least 2 inches in the vertical direction. In addition, no part of the mechanism was allowed to touch the playing field or obstacle.

Our design featured a rectangular base with a triangular crane arm. The servo motor was housed near the end of the arm, where it was attached to a delrin strip that served as the lever arm. Our team successfully completed the task of lifting the weight 2 inches while remaining under the 20 ounce weight limit.