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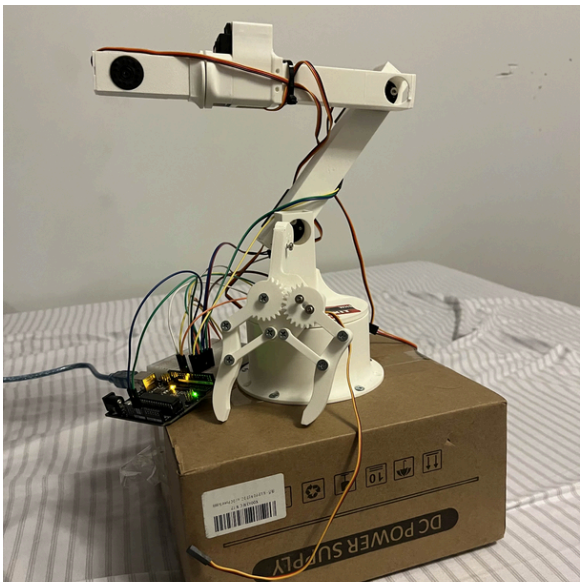
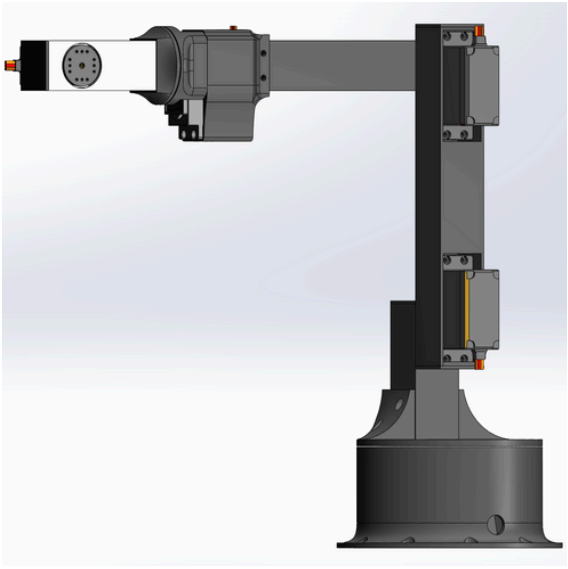
5-Axis Controllable Robot Arm



Developed a **5-axis robot arm** with the ability to support multiple interchangeable tools, including a **claw grip**, a **solenoid magnet**, and a **suction cup**.

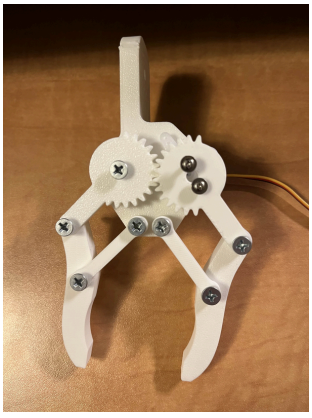
To ensure optimal movement involving the multiple motors a **PID control system** was implemented.

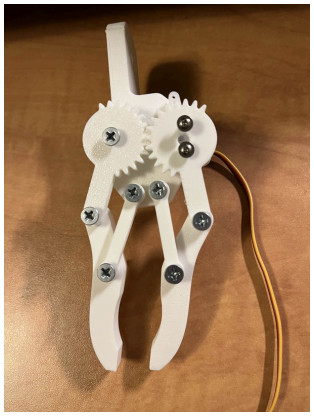


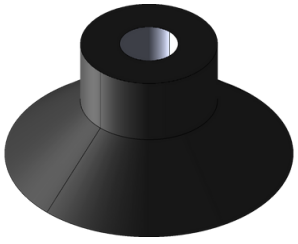
Components were designed in **SolidWorks** and **3D printed**.

An **Arduino** was used with **C++** to program the motors.

Clip Prototypes:







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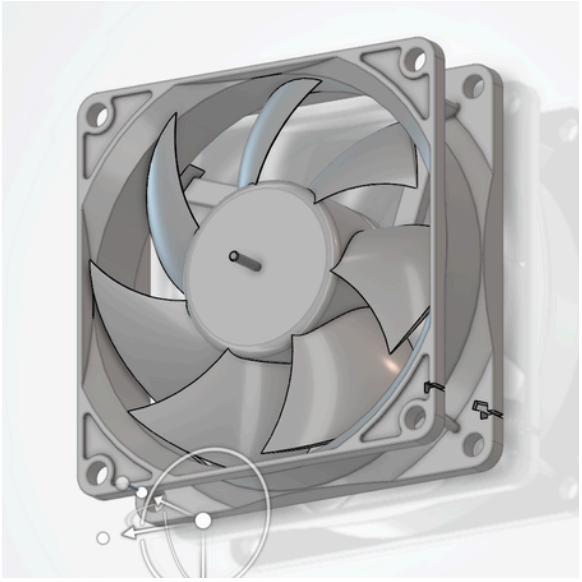
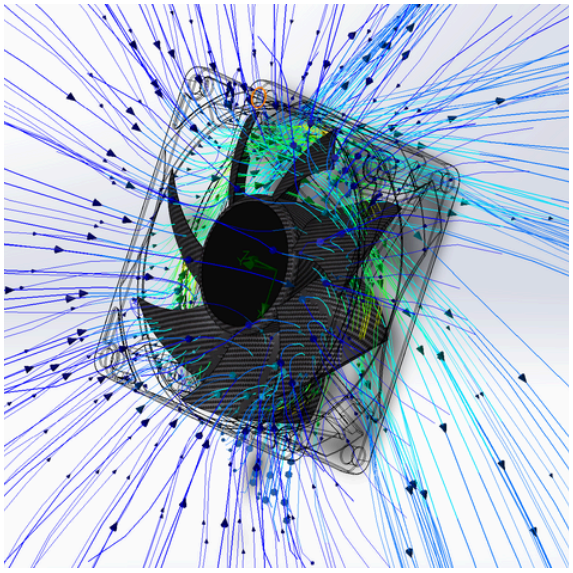
Computer Fan



Modeled a computer fan to be **3D printed** and assembled with brushless motors. The speed of these motors is controlled by **PWM**.

The frame was designed in **SolidWorks** with **Catia 3DX** used to design the blades for added precision.



To optimize the shape and size of the blades **CFD** was used through a **SolidWorks Flow Simulation**.

The inclusion of this fan in my computer **reduced temperatures by 9%** while maintaining consistent frame rates.

Final Print:

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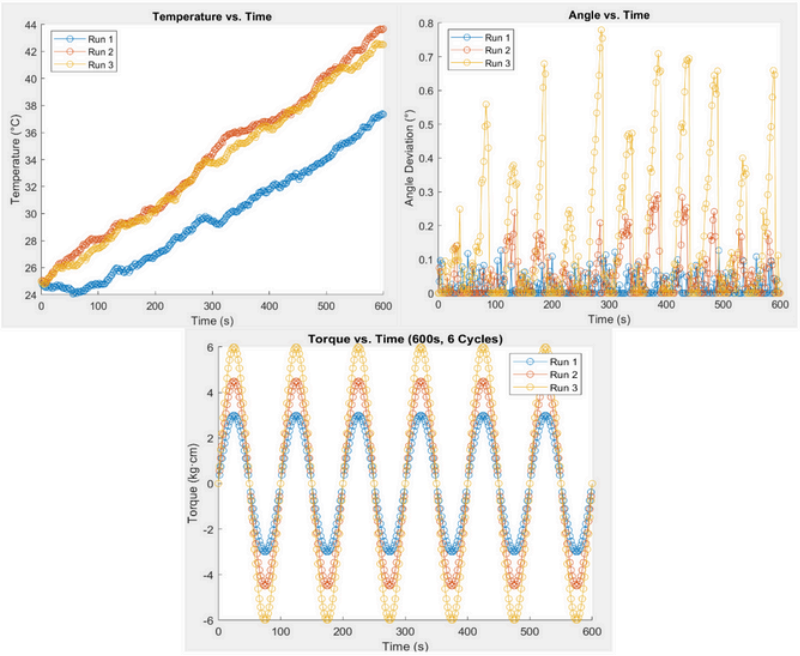
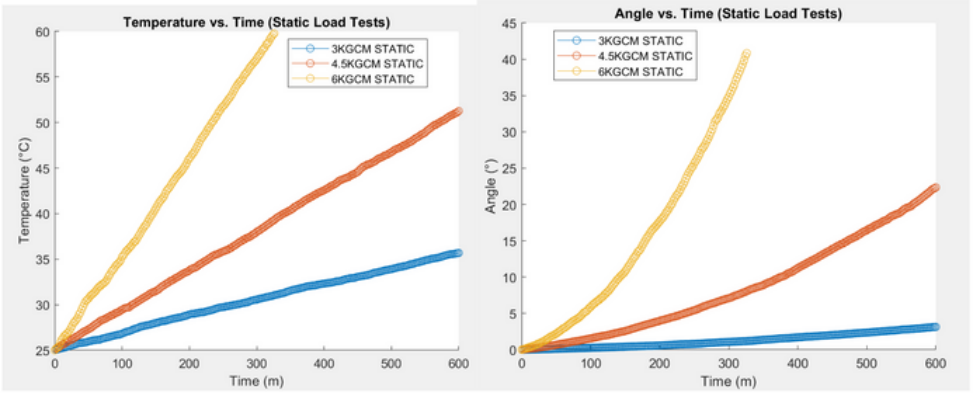
Servo/Motor Data Visualizer for Actuator Design



Using MATLAB I designed multiple programs that analyze and graph the torque, temperature, current and angular deviation with respect to time under load to see what modifications had to be made to our design and which servo/motor would be the best fit for our actuators.

The data was collected through a series of tests such as the rotating cantilever test, tensile test, and a simple static load test.



These tests determined the amount of gearing required, depending on the function of the actuator. Due to the torque limitations, the Mitoot 2206 100T was deemed optimal for most tasks the robot would perform, thanks to its gearing capabilities, high output, and relatively small profile.

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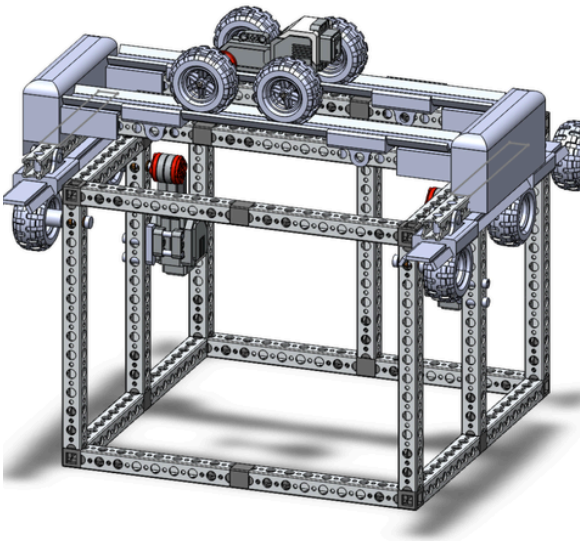
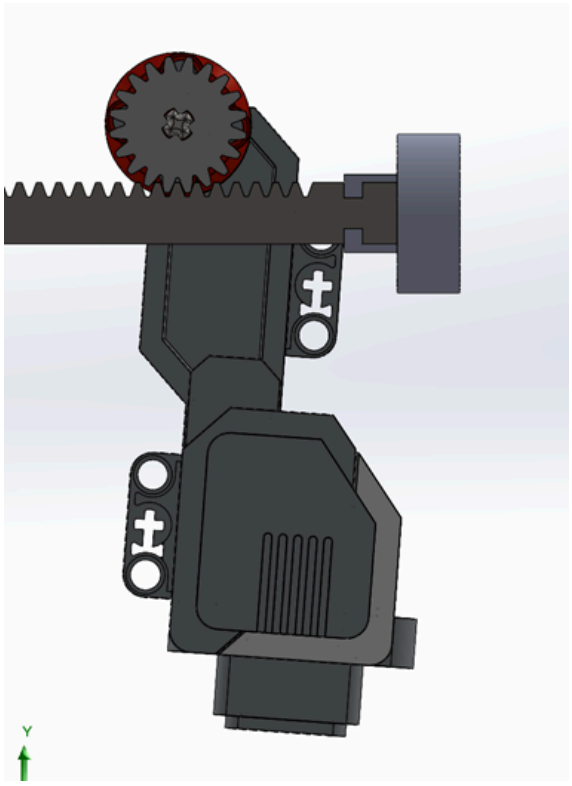
Pancake Printer

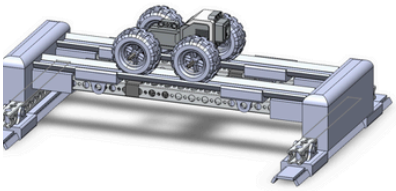


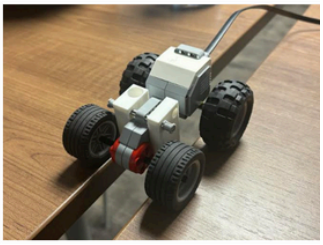
Developed a 2-axis pancake printer inspired by FDM 3D printers.

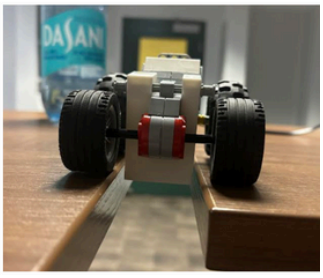
The movement of the nozzle is controlled by a gantry inspired system with a cart placed on top.



The batter is extruded by a rack and pinion pushing a syringe. This allows for the immediate start and stop of extrusion for more complex designs.







The cart system which controls the nozzle position is pictured on the left.

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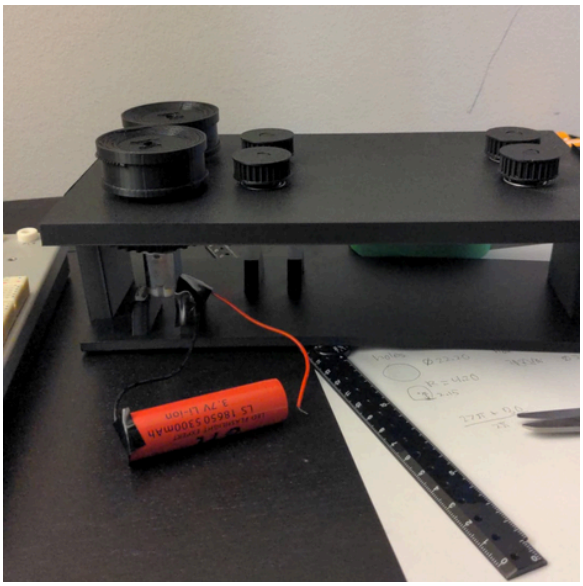
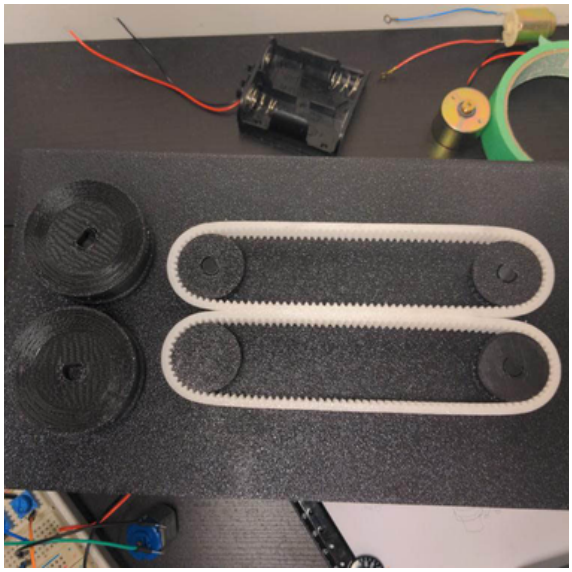
Paper Airplane Launcher



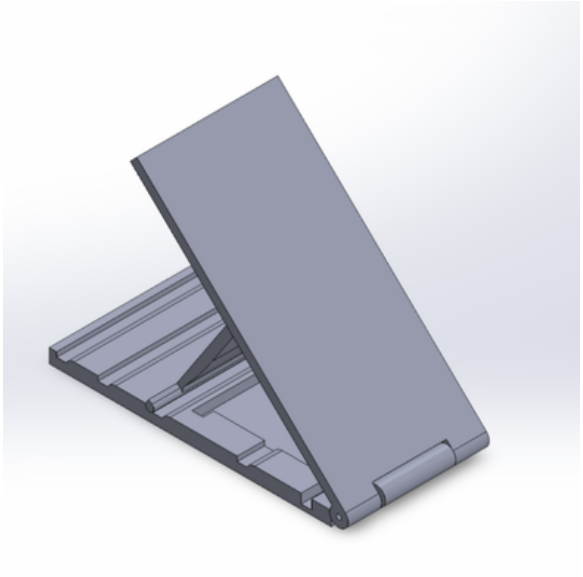
Working in a team of 5 we developed a **fly-wheel** based paper airplane launcher capable of launching planes **60+ feet**.

Prototyped with **3D prints** however for the final version fly-wheels would be machined out of stainless steel using a **lathe**.



To remove risk of injury a **conveyor belt** system was implemented to feed planes into the fly-wheels.

Multiple materials were experimented with until TPU was decided on due to its flexibility.



A stand was also designed allowing for multiple different launch angles.

The stand utilizes a series of grooves to allow for locking.

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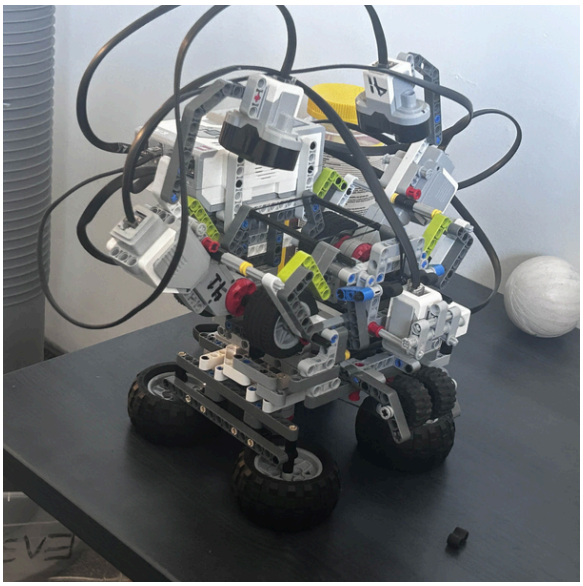
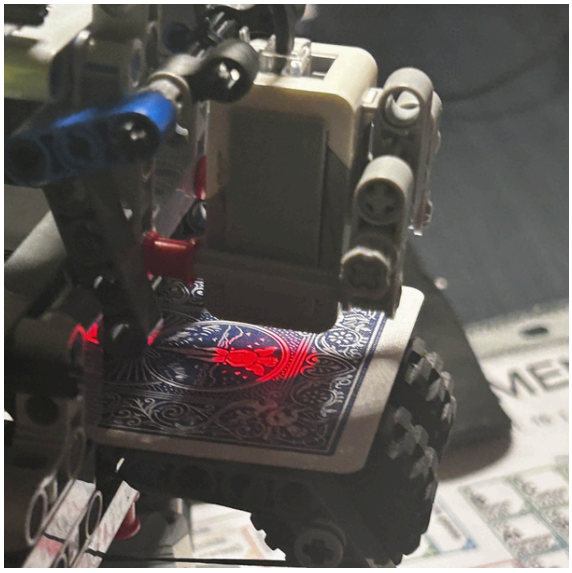
Robot Card Shuffler and Dealer



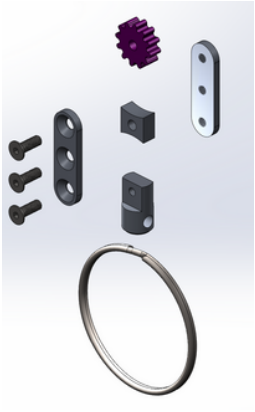
Using Lego Mindstorm and Technic kits I designed and assembled a robot capable of shuffling cards and dealing them to any specified number of people through an **automated process.**

This robot utilizes **high friction tires** to move each card and **light sensors** to count the number of cards dispensed.

The robot is portable for easy use and can rotate to deal to each individual player.



Mechanical Keychain



Using blueprints designed a mechanical keychain in **SolidWorks**.

Machined and assembled the individual parts using a **manual lathe**, **mill**, and a **drill press**.