Rayyan Hisham Abdul-Jabbar (Xe/Xer)

(A.S.T) Mechanical Engineeering, (A.S) Physics, (A.S) Mathematics, (B.S) Mechanical Engineering (in progress)

Projects

Latest Research

Acomplishments

Resume / Contact

Last Updated
12/4/2025

About Me

I am a Mechanical Engineering student pursuing a bachelor's degree at California Polytechnic University, Pomona. I am especially interested in stepping into the automotive and automation industries, where I can apply, and grow my skills in CAD modeling, 3D printing, mechanical analysis, control systems, and hands-on fabrication. I developed my skills by working on various advanced-level engineering related projects, and applying my academic knowledge in these scenarios. I am continuously driven to learn, improve, and contribute to innovative and impactful engineering solutions. All documentation to my past adn present projects can be viewed here.

My Projects

Project Hatchery: Autonomous Ice-Cream Scooping Robot

Authentic Design

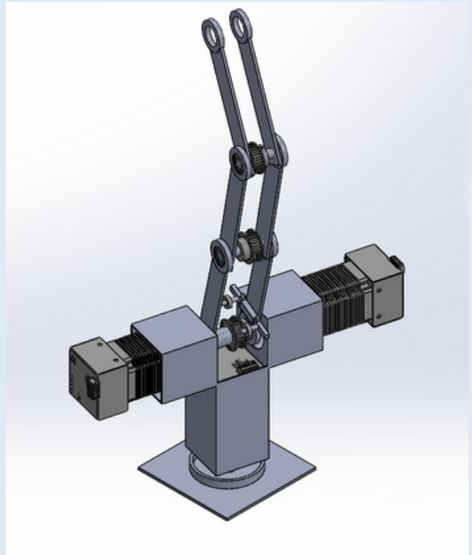
Tested to ensure optimal load-bearing capacity for scooping ice cream. Designed full mechanism in Solidworks with assmebly for simulation & testing purposes. Scooping mechanism attachment is our next step

Goal

hands-free ice cream scooping method that can be implemented in ice-cream stores

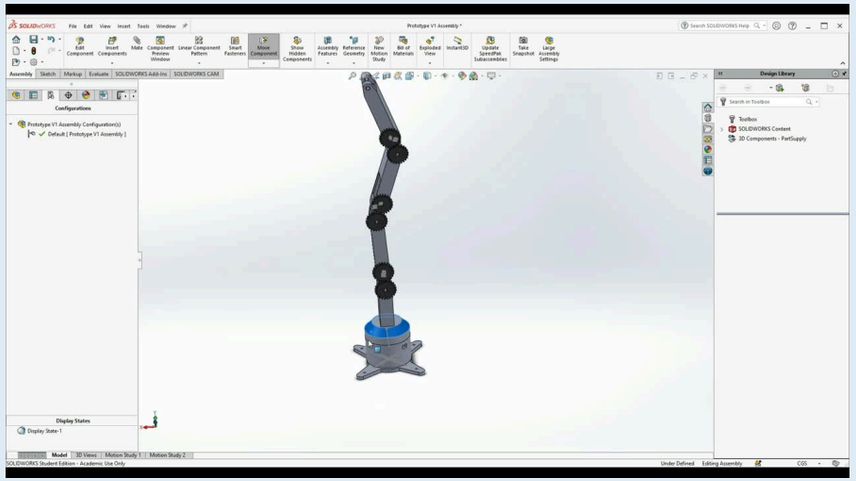
Vision

We hope to make an efficient/modular system that can scale up to complete more complex tasks autonomously



Real-Size Arm Design

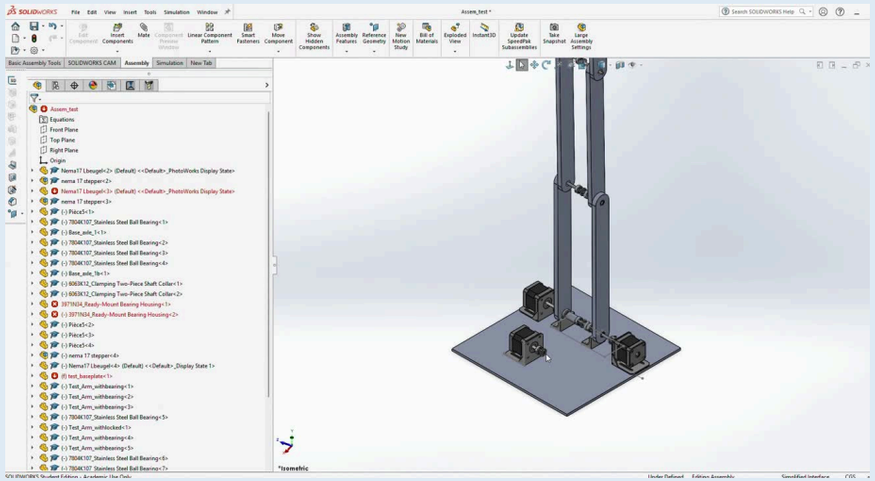
Prototype assembly: for purposes of testing code and mechanical design



Initial prototype Design

Advantages: simplistic design

Disadvantages: Difficult to manufacture, direct-driven motor design added weight away from the robot base



Optimized Version (prototype)

Advantages: Easy to manufacture, Sourceable parts, simplified mechanism, allows smaller motors to power arms

Disadvantages: Minor Loss of Power (belt friction)

- Functional Assembled prototype; currently in coding phase
- All mechanisms worked as Intended
- Goal is to utilize Ros2 for robot motion programming
- Currently updating belt tensioner design to better support slack
- Further improvements need to be made in tolerencing, shaft alignment, and ensuring accurate dimensions of parts ordered

production-version desgin set to be complete before 1/1/26, focusing on improvements takeaways from prototype

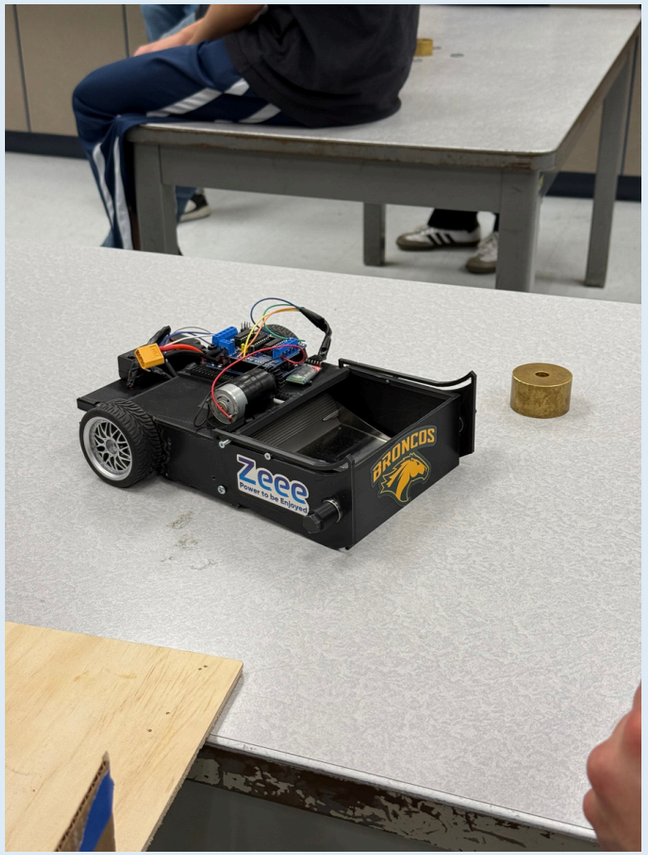
Remote Controlled Payload Retreiver & lift

Compatible Deisgn

I designed a functional and easy-to-manufacture lift (Left image) that can withstand the weight of the retriever robot (Right image)

Functionality

Weight was an important factor, as it needed to be light enough to be able to maintain the center of gravity at a precise location to allow the lift to balance on the edge of a table



The Final Product

Weight configurations

Lift ~ 7lbs
Retrevier Robot ~ 3lbs

Thust Vectored Rocket

Goals

The Goal of this project was to develop a reusable rocket with a vectoring thruster to complete multiple takeoff and landing cycles

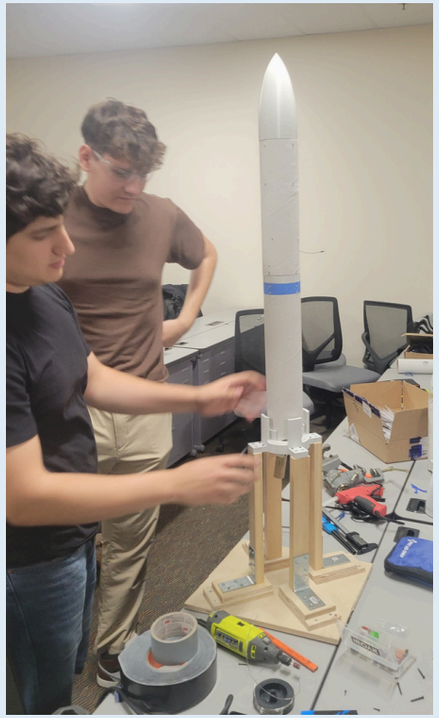
Acheivements

It was a successful first phase of experiments. the rocket was ready to take off, and the gimbal's mechanism were working, as well as the electronics

Room for improvement

For my Mechanical team, we have to update the design for the gimbal to house two motors, and possibly a two-stage gimbal mechanism for landing. Experiments also proved that due to the extreme forces caused by servos and thrusters, not all parts are ideal to be made of 3D printed PLA

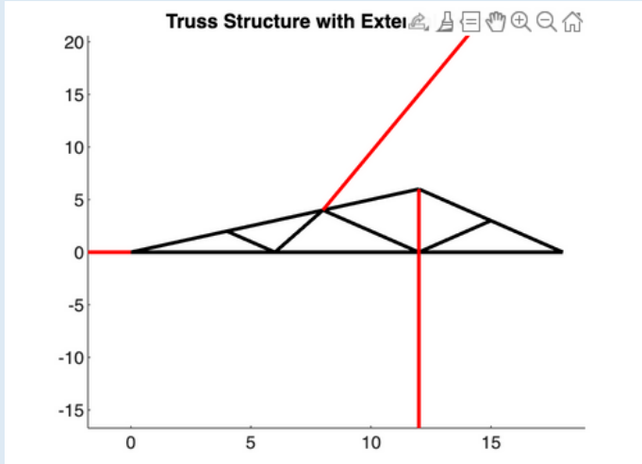
As a group, we have to change our Gimbal code to account for Gimbal Lock. We hope to achieve this using Quaternions, instead of conventional Euler Angles.
Additionally, we also need to build code to find the "golden-zone" for landing based off data from the accelerometer and gyroscope sensors



MATLAB 2D Truss Analysis Program

Purpose

This program can analyze any 2D truss system by allowing users to input joint locations, truss members, and external force data. The program uses these inputs to calculate internal forces within the truss structure.



Results

The program computes the load on each truss member using mathematical functions and generates a visual plot showing the truss configuration along with the applied external forces. This helps users validate structural designs efficiently.

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Calculated internal forces:

Internal Forces:
Member ab: 2.19 N (Compression)
Member ac: 45.14 N (Tension)
Member bd: 6.02 N (Compression)
Member bc: 8.53 N (Compression)
Member cd: 14.52 N (Tension)
Member ce: 25.80 N (Tension)
Member de: 26.78 N (Tension)
Member eg: 5.71 N (Compression)
Member eh: 41.96 N (Tension)
Member gh: 49.70 N (Compression)
Member fg: 69.73 N (Compression)
Member df: 60.24 N (Compression)
```

MATLAB Truss Anaylsis program (Click here)

My Research

Optimizing Convolutional neural networks (CNN)

What is a CNN?

They are complex, mathematical algorithms that are designed to use the data of an Image, compress it, and analyze sections of an image to complete image recognition by matching similar features to its training data images. The algorithm trains using images with various features, and using color images

Our Goals

Efficient Image recognition algorithms are computer-intensive, which, as a result, requires optimization for faster processing, with less heavy program tasks. By understanding a deep breakdown of its architecture, we can see where improvements can be made

☞ Research Paper Link here

Certifications / Accomplishments

- Bronco Motorsports Intern - Vehicle Dynamics Team
- Completion of Training (Automotive Service Pollution Prevention) – S/P2 (June 2020)
- Certified Technician Training (Wheel Handling) – Snap-on Corporation (May 2019)
- Certified Technician Training (Hand Tools Safety) – Snap-on Corporation (Nov 2018)
- Certified Technician Training (Digital Multimeter) – Snap-on Corporation (Nov 2018)

Lets Connect!

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☞ My Resume