JOONOH LEE

MECHANICAL ENGINEERING AT NORTH CAROLINA STATE UNIVERSITY

✉ joonohlee4@gmail.com
in linkedin.com/in/joonoh-lee/
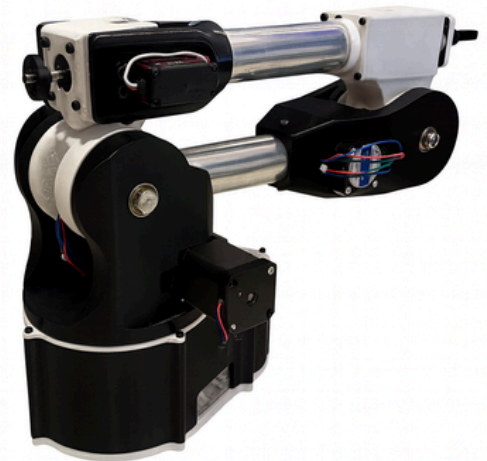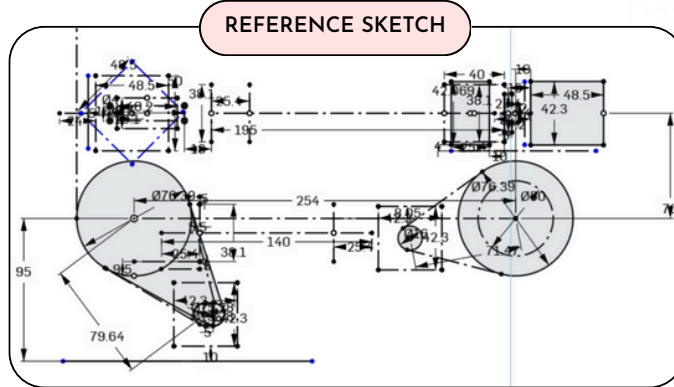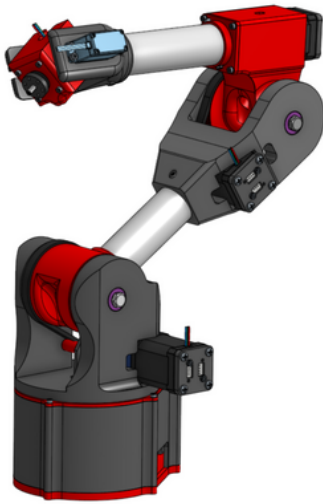📞 (252) 916 - 2382

6 DEGREE OF FREEDOM ROBOT ARM

REFERENCE SKETCH

What?

- Developed a 6 degree-of-freedom robotic arm designed to replicate human-like motions for precise repeatable tasks
- Created a cost-effective, modular prototype to serve as a foundation for future control development and research
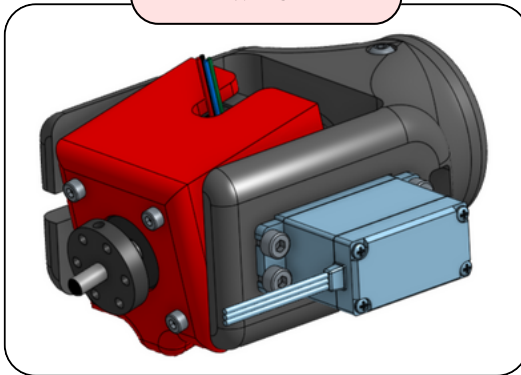
How?

- Created a full 3D CAD model using Onshape for the entire arm assembly
- Integrated stepper motors and Arduino hardware for preliminary motion testing and validation of each axis
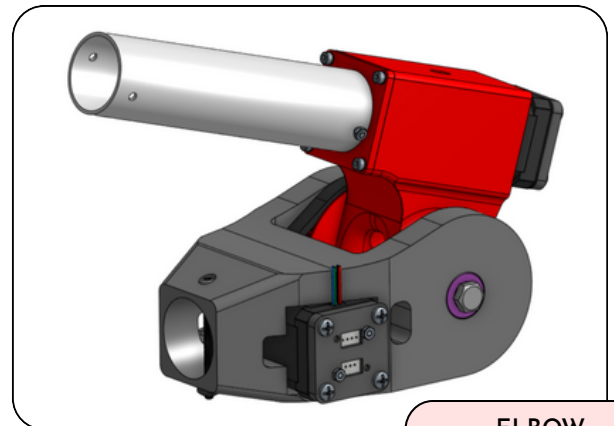
Results

- Achieved a functional mechanical prototype with smooth motion across all six joints
- Verified the structural durability and range of motion
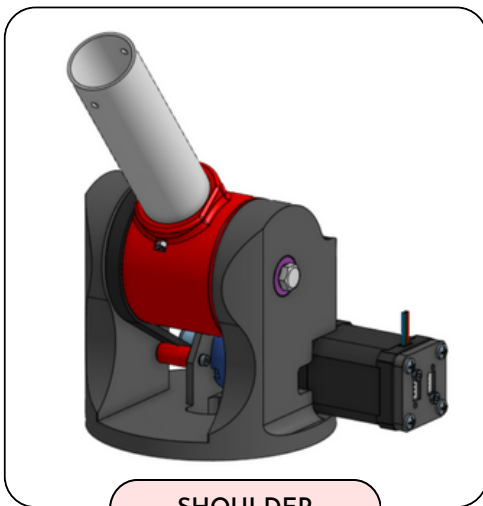- Established a robust platform for future integrations for control algorithms and end-effectors
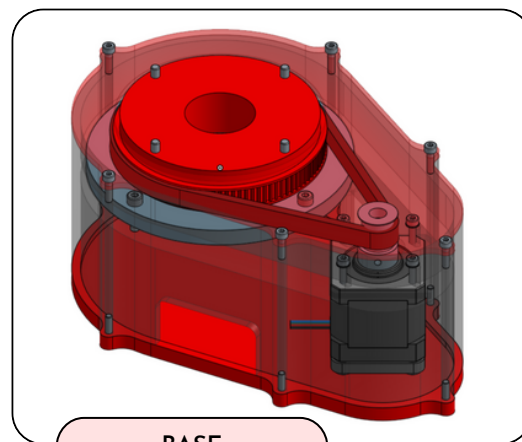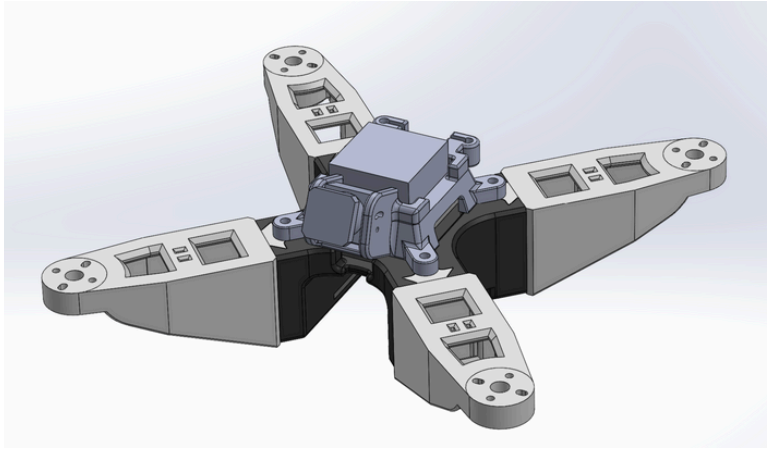

WRIST

ELBOW

SHOULDER

BASE

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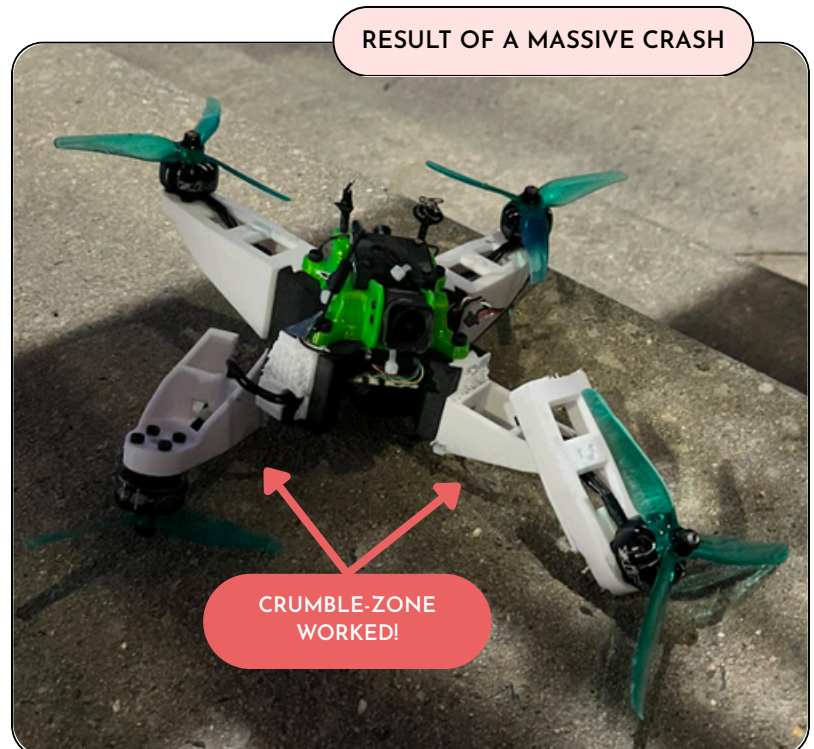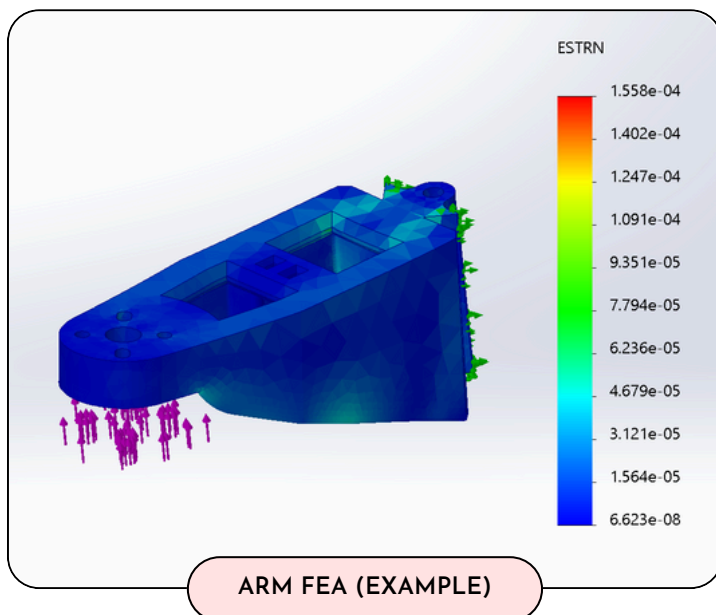
HIGH-SPEED 3D PRINTED DRONE

What?

- Design and fabricate a fast, fully 3D printed first-person view (FPV) drone
- Created a stiff, modular airframe that's easy to build and strong enough to handle the stress of high-speed flight
- Adjusted PID values to optimize battery efficiency, reduce prop wash, and stabilize at high-speed
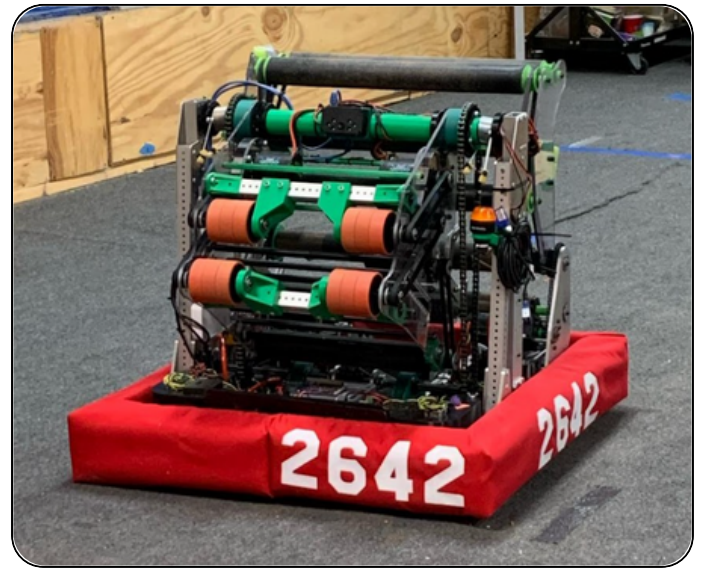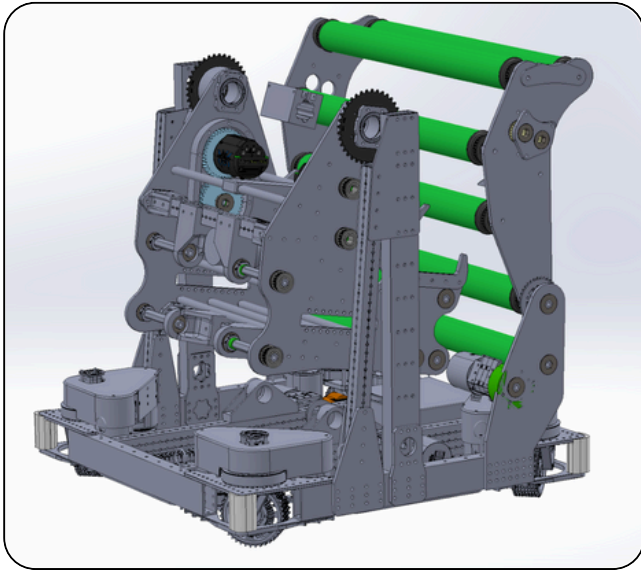
How?

- Designed the full airframe in SolidWorks
- Conducted finite element analysis to reinforce the arms and incorporate a "crumple-zone" for improved impact resistance
- Fabricated the airframe utilizing a variety of FMD 3D-printing methods with a variety of engineering-grade filaments

Results

- Achieved flight speeds over 90 MPH with stable control and smooth maneuverability
- Improved airframe reliability and structural stiffness
- Extended flight time by 20% through minimizing unnecessary motor commands

ESTRN

	1.558e-04
	1.402e-04
	1.247e-04
	1.091e-04
	9.351e-05
	7.794e-05
	6.236e-05
	4.679e-05
	3.121e-05
	1.564e-05
	6.623e-08

ARM FEA (EXAMPLE)

RESULT OF A MASSIVE CRASH

CRUMBLE-ZONE WORKED!

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FIRST ROBOTICS COMPETITIONS (TEAM 2642)

What?

- Led the engineering division guiding design, manufacturing, and prototyping efforts to create a reliable robot for four official competitions (per year)
- Focused on building a robot that was both functionally versatile and cost-efficient, balancing performance with budget constraints

How?

- Guided the team through rapid prototyping to test potential subsystems before committing to full builds
- Oversaw the creation of a 3D CAD model in SolidWorks and Onshape
- Managed sourcing and budgeting, negotiating material choices and redesigns to keep the robot affordable without sacrificing reliability

Results

- Reduced build costs by ~15%, freeing resources for spare parts and future upgrades
- Accelerated fabrication process by minimizing design errors, enabling faster subsystem iteration and freeing time to allocate where it was most needed
- Produced a high-functioning robot that consistently delivered in competition settings