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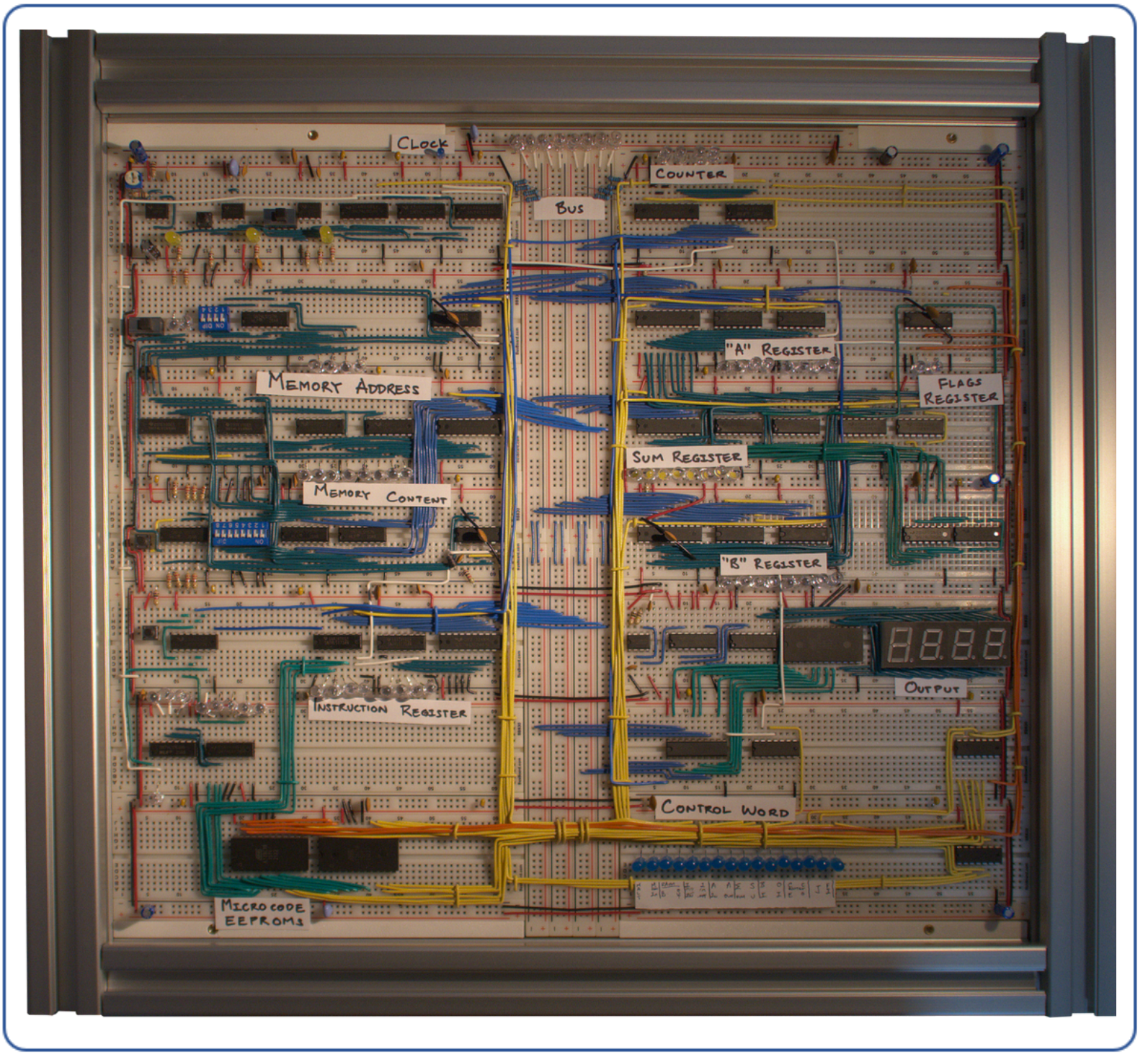
8-BIT BREADBOARD COMPUTER



What?

- Created a Turing-complete 8-bit breadboard computer as a personal project

How?

- Learned from Ben Eater's implementation of the classic SAP-1 CPU Architecture design, and implemented some design changes (decoupling capacitors, modified debouncing for system timer, clock-line noise isolation, etc.) to make the computer more stable.

Results

- 8-Bit computer is able to run arithmetic logic and simple instruction sequences - for example, it is able to run the fibonacci sequence!

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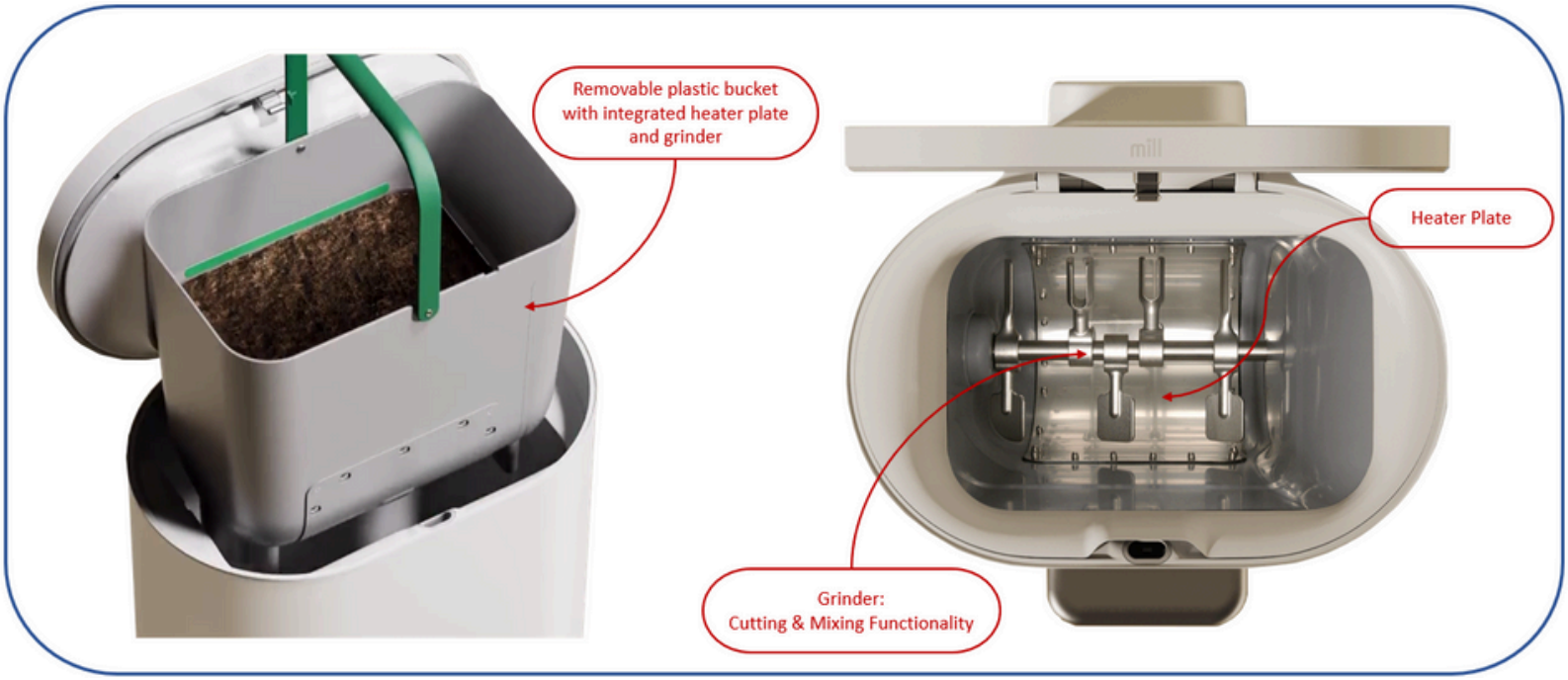
GRINDING SYSTEM ARCHITECTURE AND DESIGN - MILL INDUSTRIES



*Designs shown here are of the first generation Mill Kitchen Bin. My work was focused on the second generation bin, which has not been released yet. The photos here are all taken from the company website and are for illustration purposes only!

What?

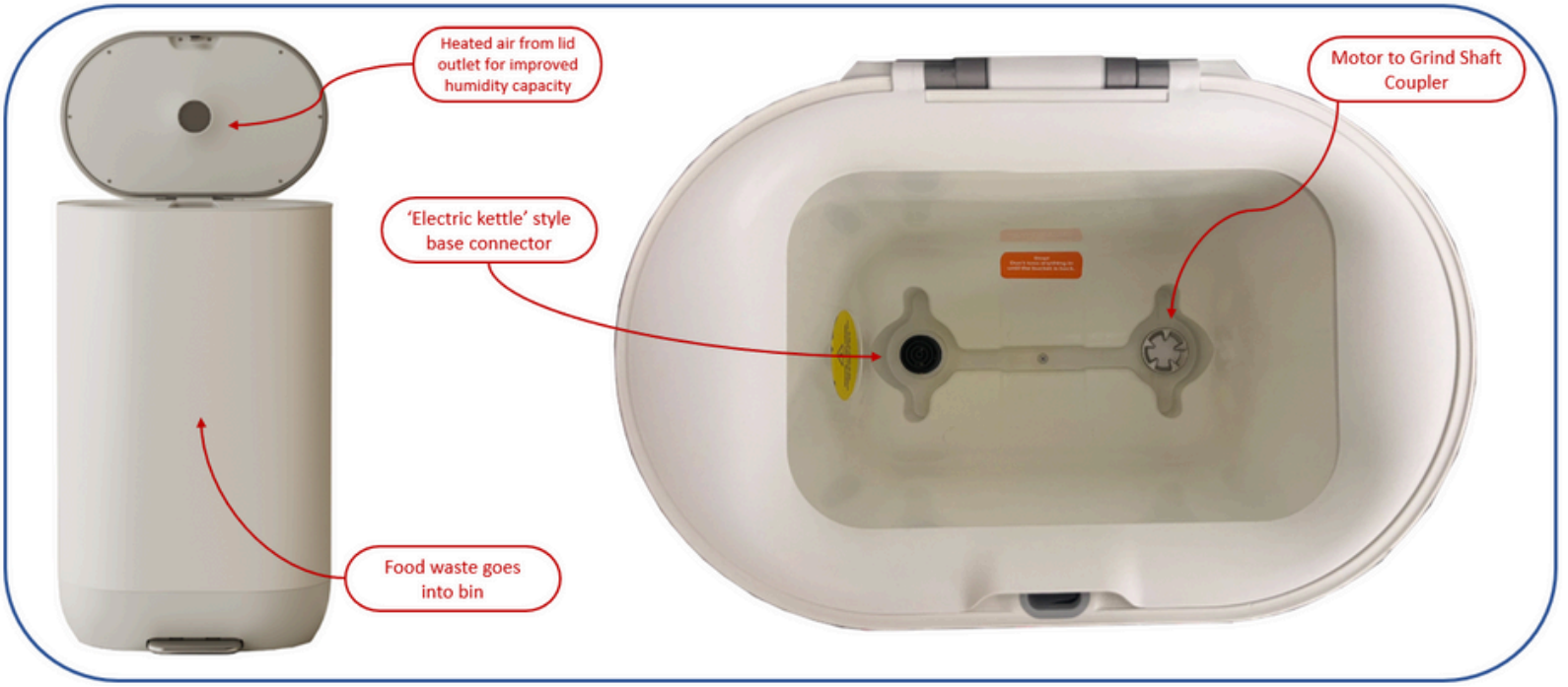
- Led design and down-selection for Grinding architecture, which breaks down and dries food waste
- Validated reliability of grinding architecture through test engineering
- Designed for strong cost reduction and simplification

How?

- Collaborated with multiple teams on **PD, systems architecture and test reliability from concept to production** (Proto through DVT & PVT)
- Used Siemens NX for design of **novel grinding shaft design and geartrain design** (2 patents pending)

Results

- **Improved grinder system** with effective cutting, mixing and drying
- **Significant Cost reduction** through DFM and part simplification
- Designs implemented into final production unit!



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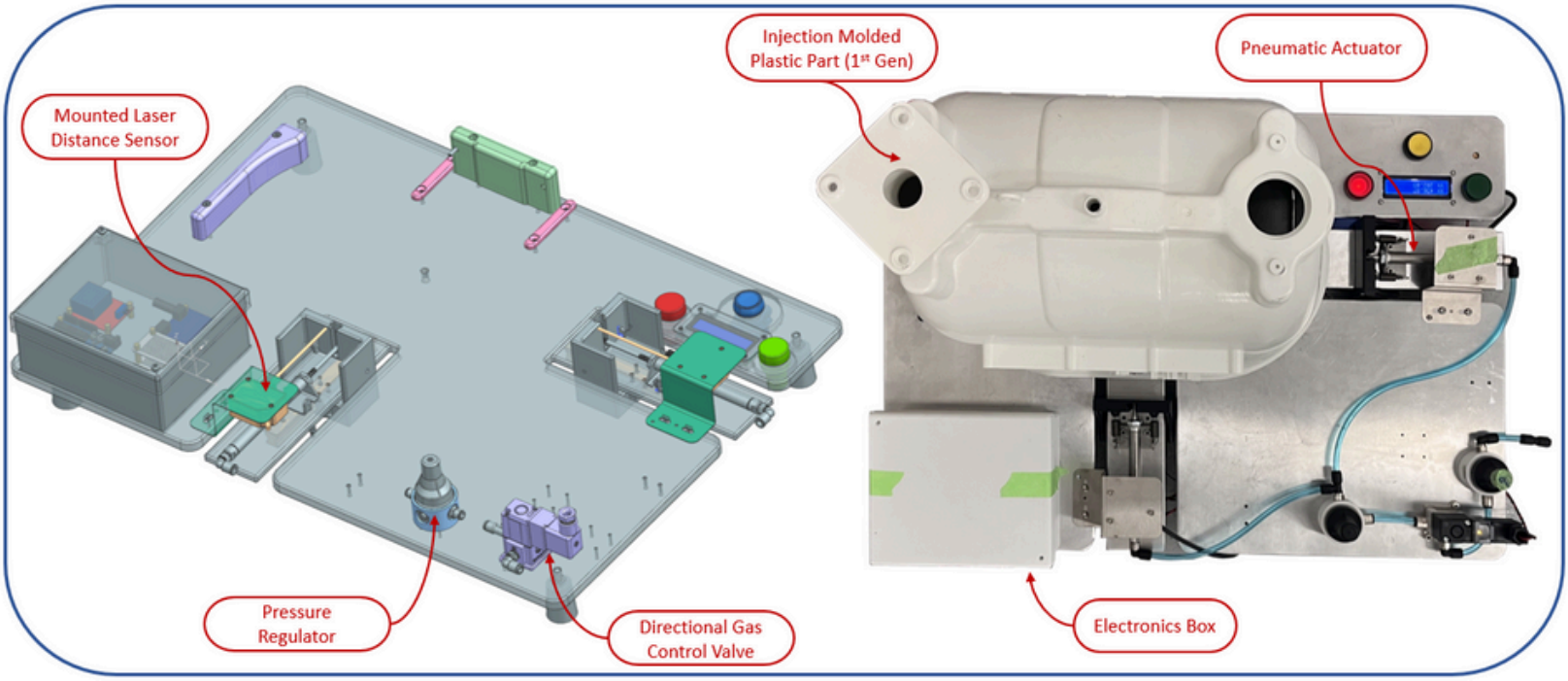
PNEUMATICALLY-ACTUATED PLASTIC PART INSPECTION FIXTURE - MILL



What?

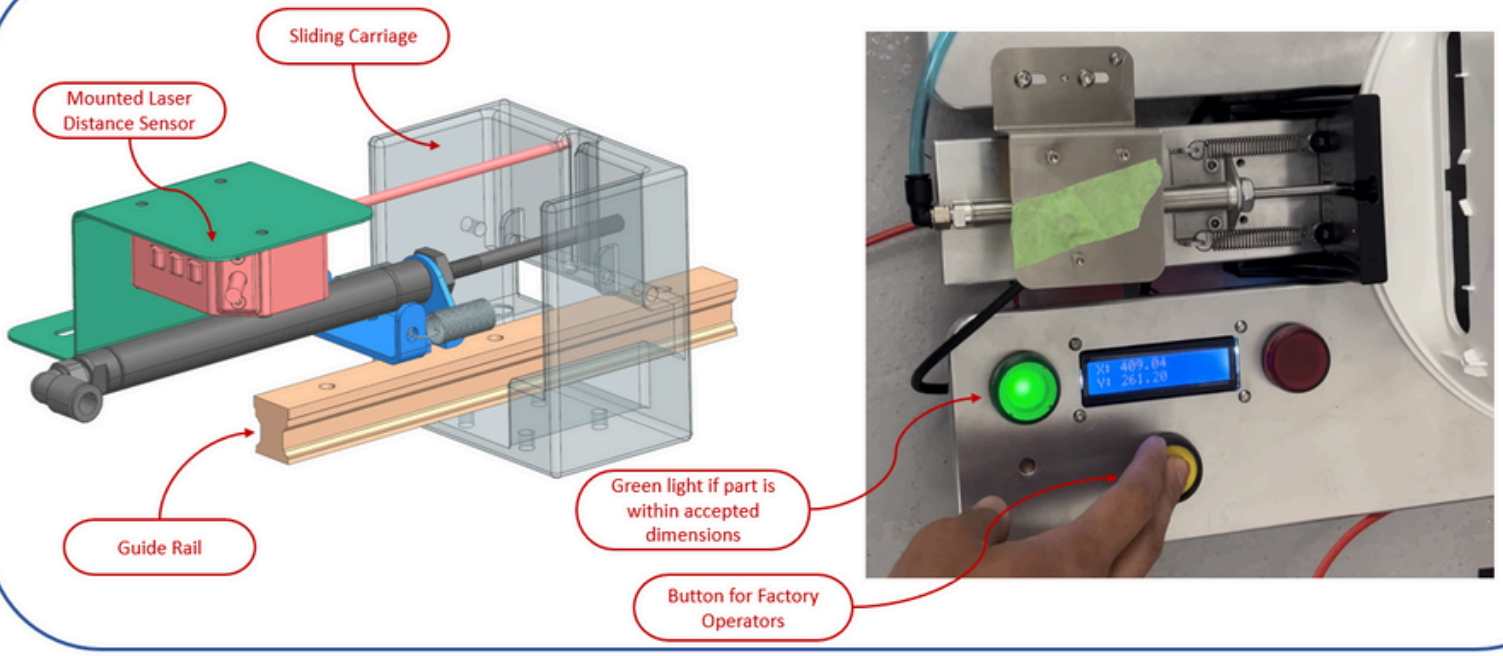
- **Design** and **fabricate** the inspection fixture for injection-molded factory parts
- **Design** the pneumatic actuation system through use of control valves and pressure regulators

How?

- Used **Siemens NX** to design all parts
- Applied **DFA principles** for the component location and pressure regulator mounts
- **Calibration of input air pressure** to minimize deflection in plastic part

Results

- The design fulfilled its purpose well with **accurate and consistent measurements,** with mitigation for deviation in part placement and tolerances
- **User-friendly design** for factory operators
- Deployed for long term use in factory!



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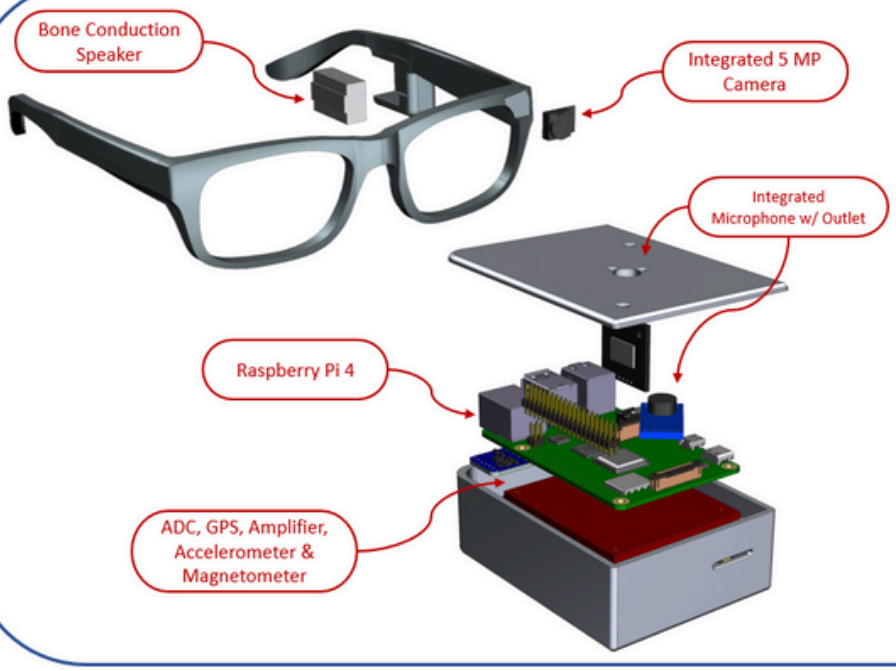
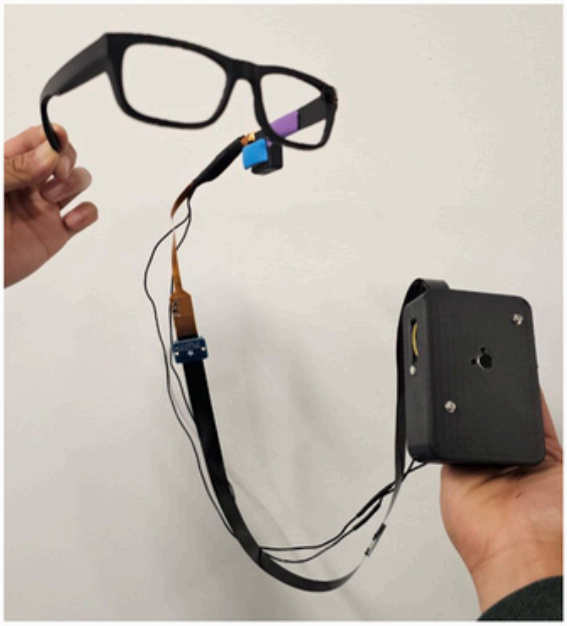
VIDI: TRAVEL COMPANION GLASSES FOR THE VISUALLY IMPAIRED - UC BERKELEY AI HACKATHON





What?

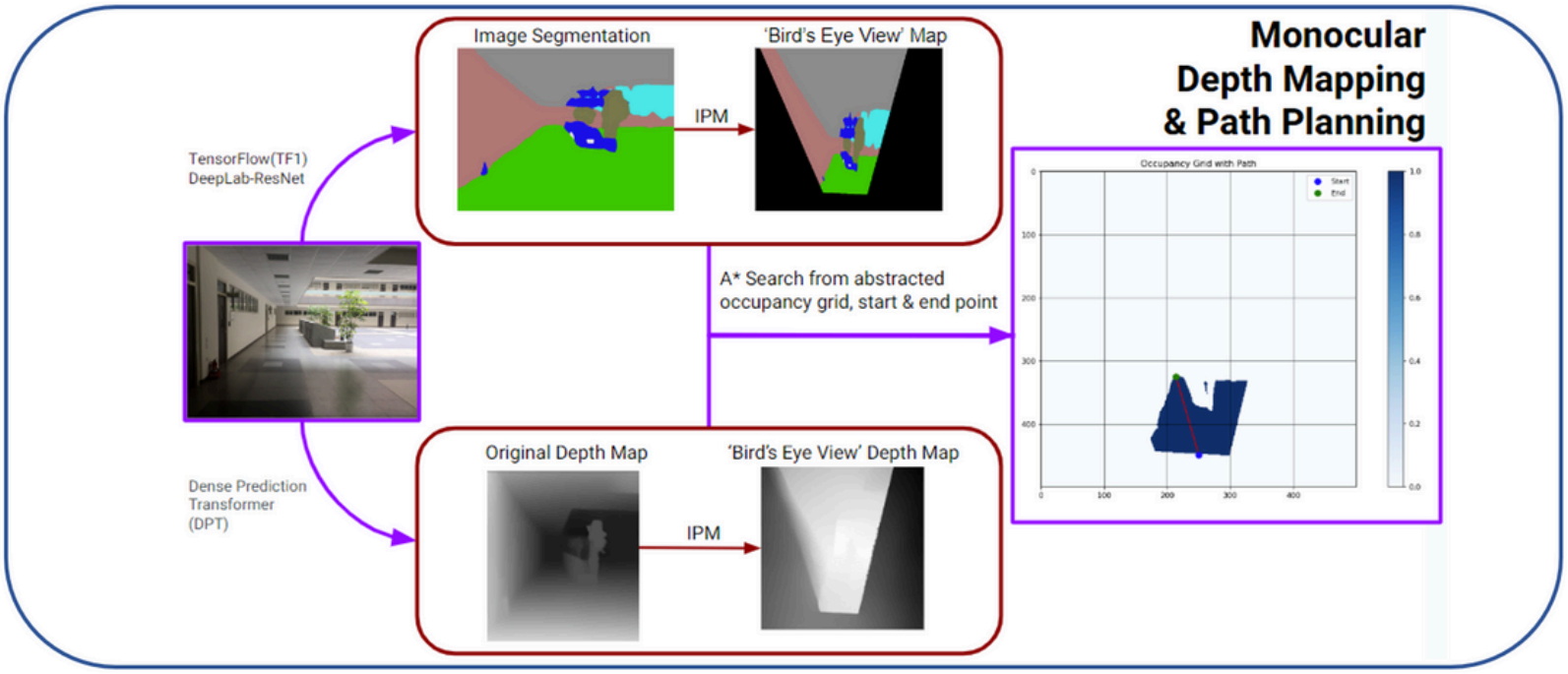
- Vidi is a pair of smart glasses that utilizes the power of **LLMs and sensor technologies** to help guide and support the visually impaired
- It can do **path planning**, along with **object detection & identification** for the user.

How?

- Designed 3D CAD models for glasses and electronics case, with **integrated sensors and connectors**
- Designed **customized path planning method involving monocular camera**, via Inverse Projection Mapping and TF1 Image Segmentation model
- Used YoloV8 for object identification

Results

- **Successful product demo** at hackathon with object detection and voice recognition!
- Comfortable, compact and user-oriented design



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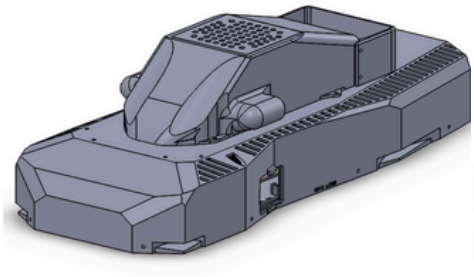
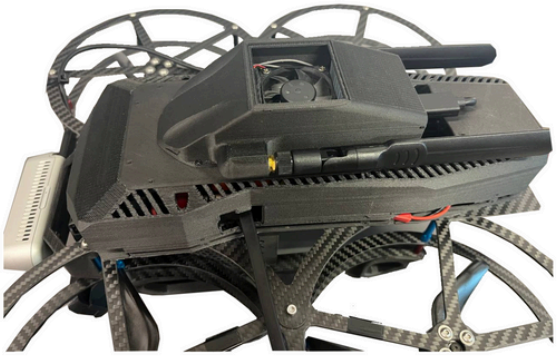
RAVEN DRONE BODY PROJECT - PERFORMANCE ROTORS (PR)





What?

- **Design** and **fabricate** the housing & mounts for new electrical components for a testing drone
- **Design** antenna receiver mounts to **minimize intrusiveness**

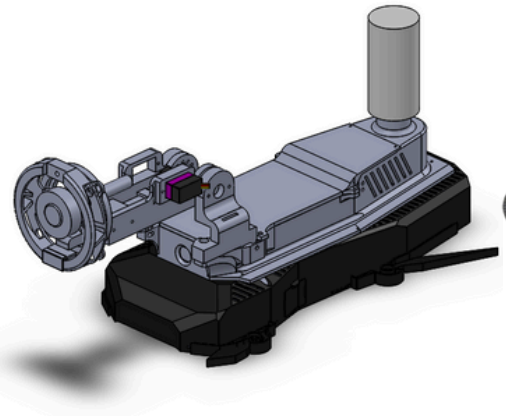
How?

- Used **SolidWorks** to design my parts
- Applied **DFM principles** for the housing design
- **3D Printed** all components

Results

- The design fulfilled its purpose well with a **minimal part count**
- Provided **compact** and **aesthetic** housing while allowing abundant **airflow for fan & heatsink**

NDT RAVEN DRONE BODY PROJECT - PR



What?

- **Design** and **fabricate** a compact housing for NDT components
- Ensure housing accomodates **easy removal and refilling** of couplant fluid bottle

How?

- Used **Solidworks** to design my parts
- Applied **DFM principles** for housing design
- **3D Printed** all components

Results

- New design **reduced manufacturing & assembly time by 45%** with its **minimal part count**

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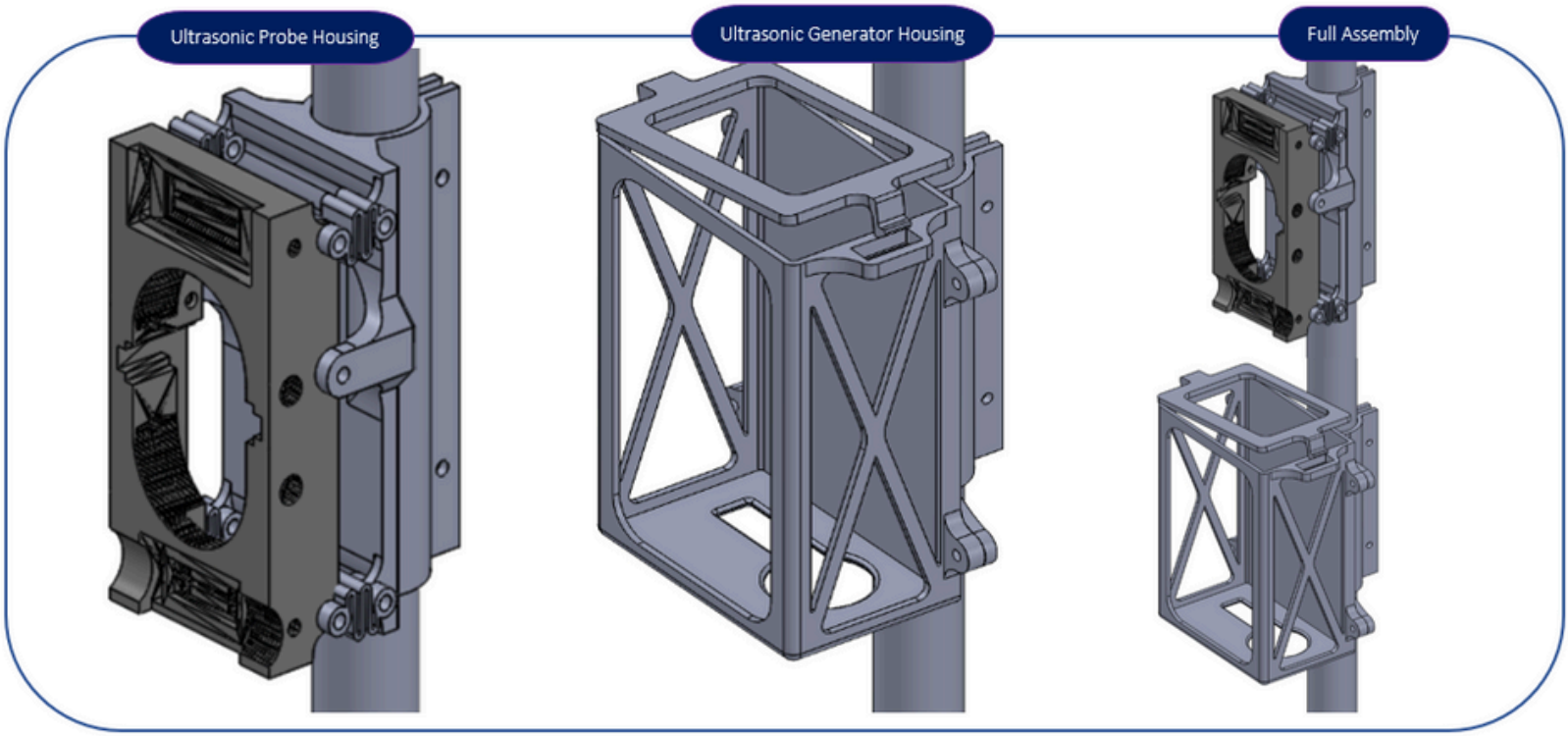
ULTRASONIC TESTING PROBE MOUNTS - PR



What?

- **Design** and **fabricate** the housing and mounting clamps for Ultrasonic Testing (UT) equipment
- Design a **compliant spring mechanism** to allow for limited rotation of UT Probe head

How?

- Used **SolidWorks** to design fixture
- **Prototyping** of various spring designs to achieve target flexure
- Prototyping & **extensive testing** of **snap fit lock** and **friction clamps**

Results

- The UT set has been **successfully deployed** for On-Site NDT **operations**, with **good reviews** from the operations team

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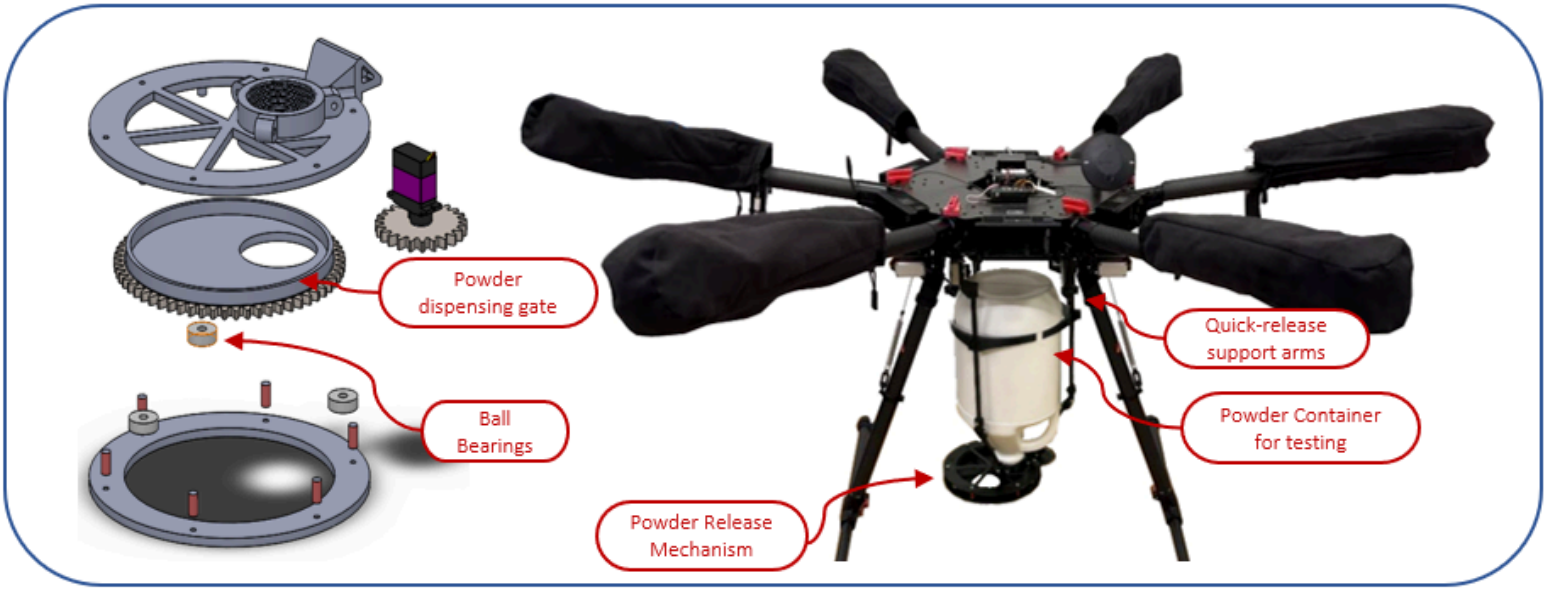
DRONE POWDER RELEASE MECHANISM & MOUNT - PR



What?

- **Design, Fabricate & Test** a **powder dispensing mechanism** which mounts onto a powder payload
- **Minimize** number of **electrical components** required
- Ensure payload and dispensing mechanism can be **quick-released**

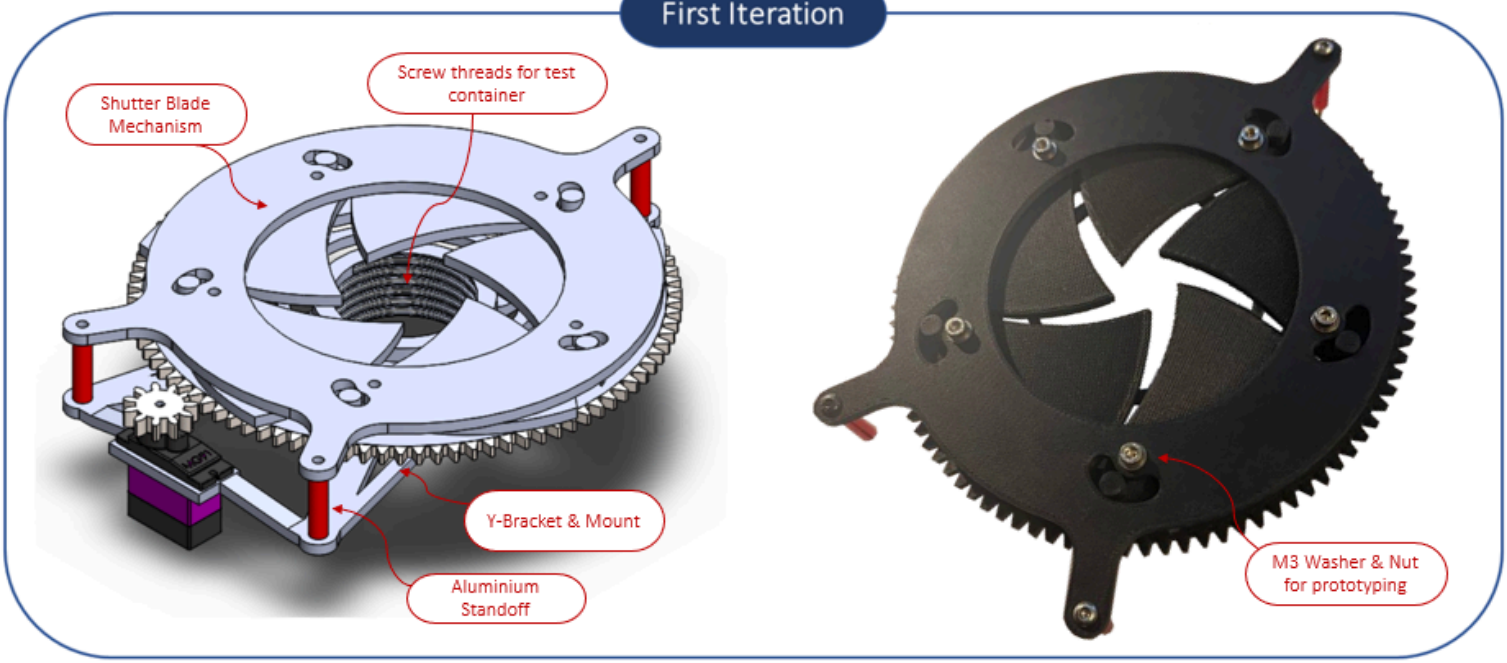
How?

- Produced **3D CAD** models with **Solidworks**
- Used **Solidworks Gear Toolkit** to design gear system
- **3D Printed** all components

Results

- The design fulfilled its task well while **minimizing weight** and **part count**
- Design will be further iterated and **presented to the private client for sale**

First Iteration



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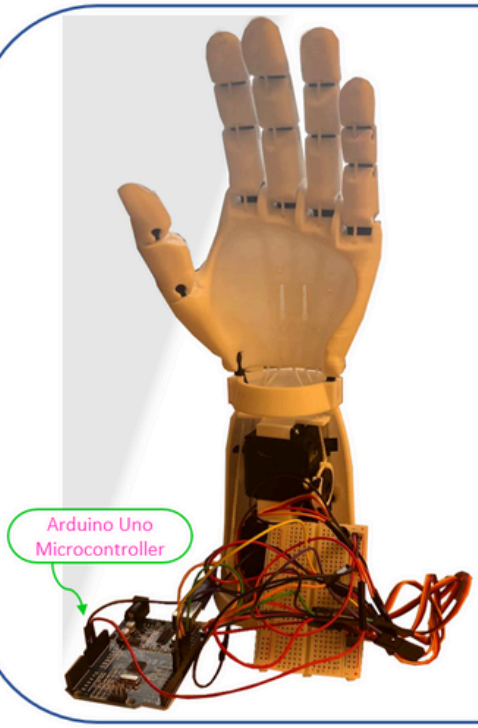
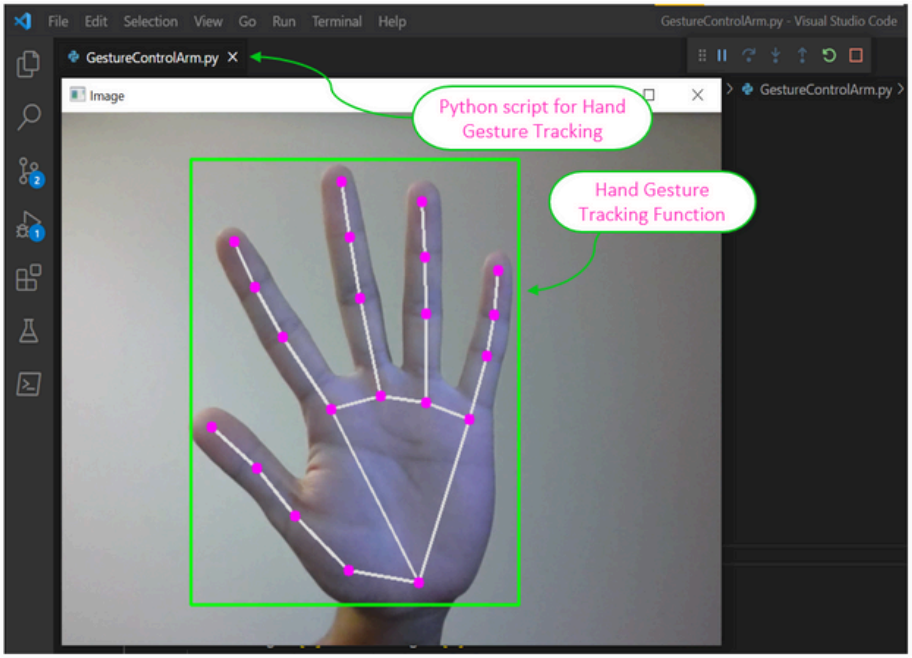
3D-PRINTED GESTURE TRACKING ROBOT HAND





What?

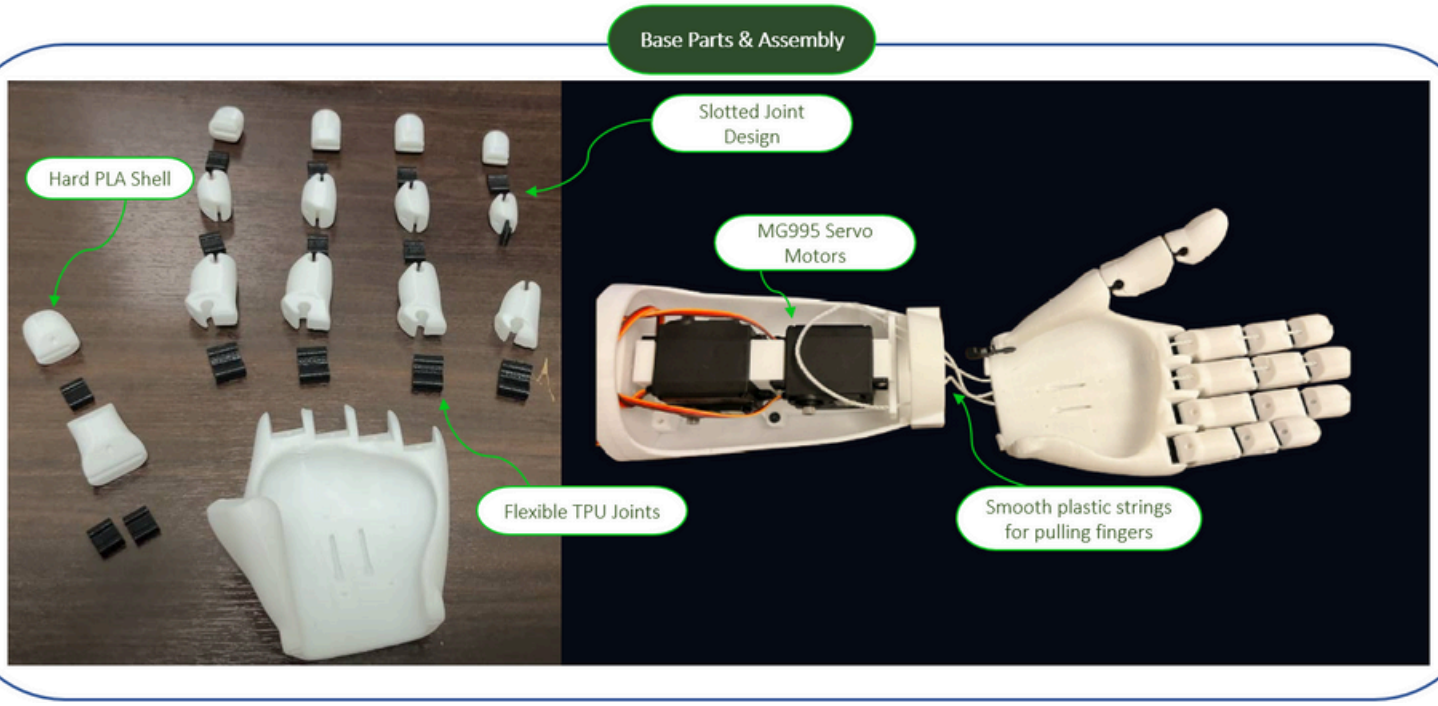
- **Design, Fabricate & Assemble** a 3D-Printed Robot Hand
- Implement **hand gesture tracking** ability via **computer vision**

How?

- **Improved** upon open source 3D Robot Hand design to **fix wrist joint design issues**
- Used **Arduino Uno** for robot finger controls
- Implemented **CV2 & CVZone python packages** for computer vision capability

Results

- Robot Hand can track and mimic user hand gesture **successfully and quickly (scale of 0.1 seconds)**



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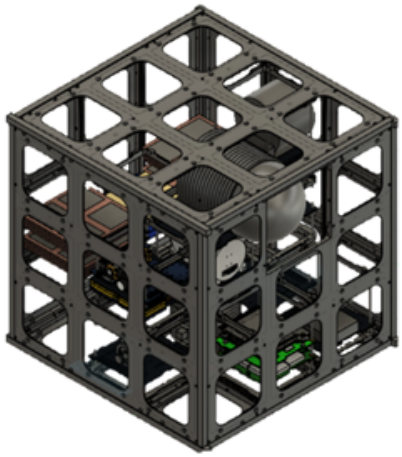
INTERNATIONAL SPACE CHALLENGE (ISC SSTL) 2022 - 2ND PLACE



What?

- **Design a satellite** that would traverse the Van Allen's Belt region.
- **Design** an **experimental payload** that the satellite would bring up

How?

- Used **Fusion360** to design my parts
- **Optimized dimensions and materials** using paper on solar wind particle energy harnessing mechanisms

Results

- The design achieved **full sensor and instrumentation integration** while fitting within **highly-constrained CubeSat dimensions**
- Successful **simulation** of subsystem capabilities

NUS N-NOVATE CIRCULAR ECONOMY CHALLENGE - 1ST PLACE

What?

- **Design** and **fabricate** a mount to fix used face-masks into vacuum cleaners as filters
- **Architect** the **manufacturing process** and **regulatory compliance** of product

How?

- Used **Solidworks** to design my parts
- Applied **DFMA principles** for mount design
- **3D Printed** all components

Results

- Successfully produced a **functional prototype** with measurably effective results!
- **Pitched** in circular-economy themed entrepreneurship competition and Won 1st Place

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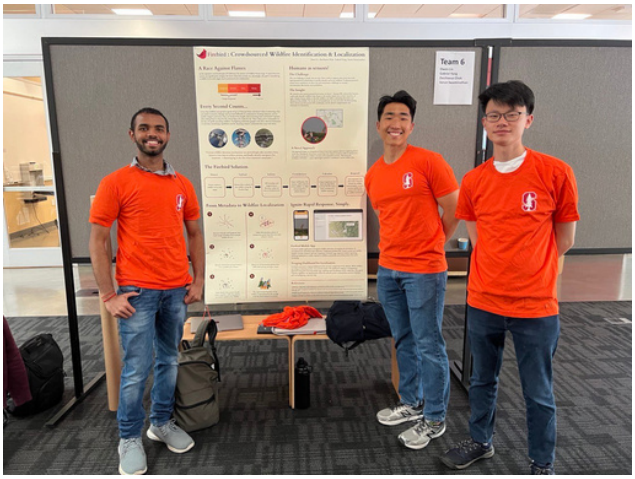
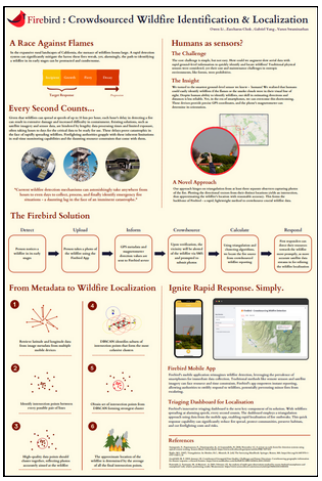
STANFORD WILDFIRE HACKATHON (BIG EARTH HACKS)





What?

- **Design** a solution that makes Wildfire detection and localization faster, so firefighting authorities can prevent smaller fires from becoming too big.

How?

- Wildfire **localization algorithm design** using DBSCAN
- Develop **mobile phone application** to harness GPS + Magnetometer metadata and Camera data

Results

- Developed a **fully functional prototype** with **successful demo** to panel of judges
- Wildfire localization algorithm proved to be **resistant to noise** while **preserving accuracy**!