



SpAceD juNkies

TEAM MEMBERS

Nora Fischer
Autumn Edwards
Sukti Tiwari
Desvaun Drummond
Yaman Siwakoti

Sponser:
Corporation

Aerospace

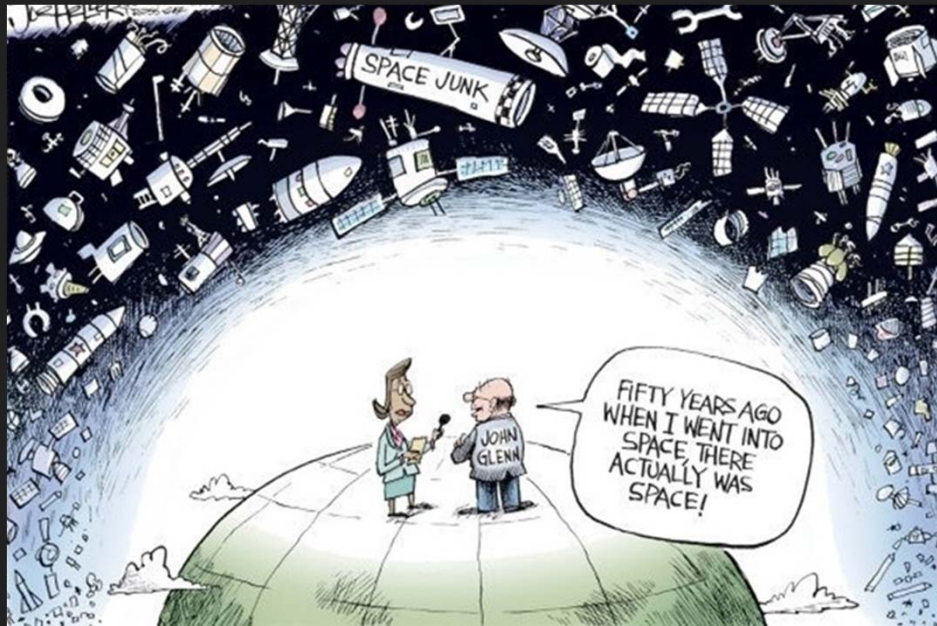
Advisors:

Casey Jones

Selasi Etchey



What is Space Junk?



National Aeronautics and Space Administration

How Much Junk Is Currently Up There?



Softball size or larger (≥ 10 cm): ~22,000
(tracked by the Space Surveillance Network)



Marble size or larger (≥ 1 cm): ~500,000



Dot or larger (≥ 1 mm): ~100,000,000
(a grain of salt)

- Total mass: ~6300 tons LEO-to-GEO (~2700 tons in LEO)
- Debris as small as 0.2 mm pose a realistic threat to Human Space Flight (EVA suit penetration, Shuttle window replacement)

Product Objective and Purpose

- Prevent the debris from having a large impact on space exploration, potentially causing damage to satellites and spacecrafts.
- Collect parts that scientists could reuse from the debris orbiting space through the camera based sensing
 - Debris could be analyzed to make improvement to next set of satellites/spacecraft
 - If debris can not be reused by scientists, it could be sold as souvenirs or used as an artifact in a museum



Problem Statement

The need of the Aerospace Corporation's complaint of reducing the amount of space junk and the expense of building new tools to be sent to space is to provide a means of collecting space junk to be reused in the future while being environmentally friendly.

Refined Problem Statement (for proof of concept)

Creation of an autonomous robot that will identify an object (tennis ball) .

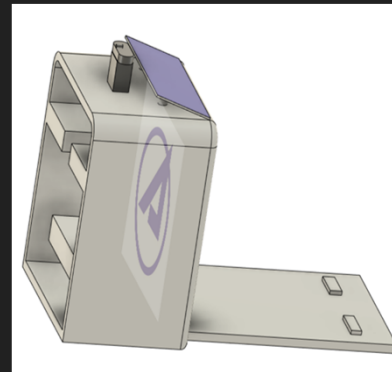
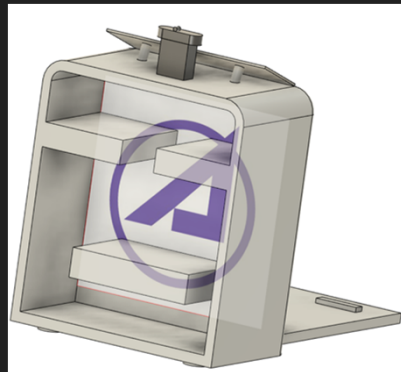


Constraints

- Renewable energy (solar power)
- Ensuring it satisfies the company rule and the state protocol
- Ensure it satisfies space regulations
- Battery size and solar access could create a problem where the system runs out of power.
Example: If there is no access to solar energy and the battery runs out.
- Unfamiliar with machine learning techniques
- Good quality camera could lead to slow processing and degradation of image processing
- Limited to one school year to construct POC.

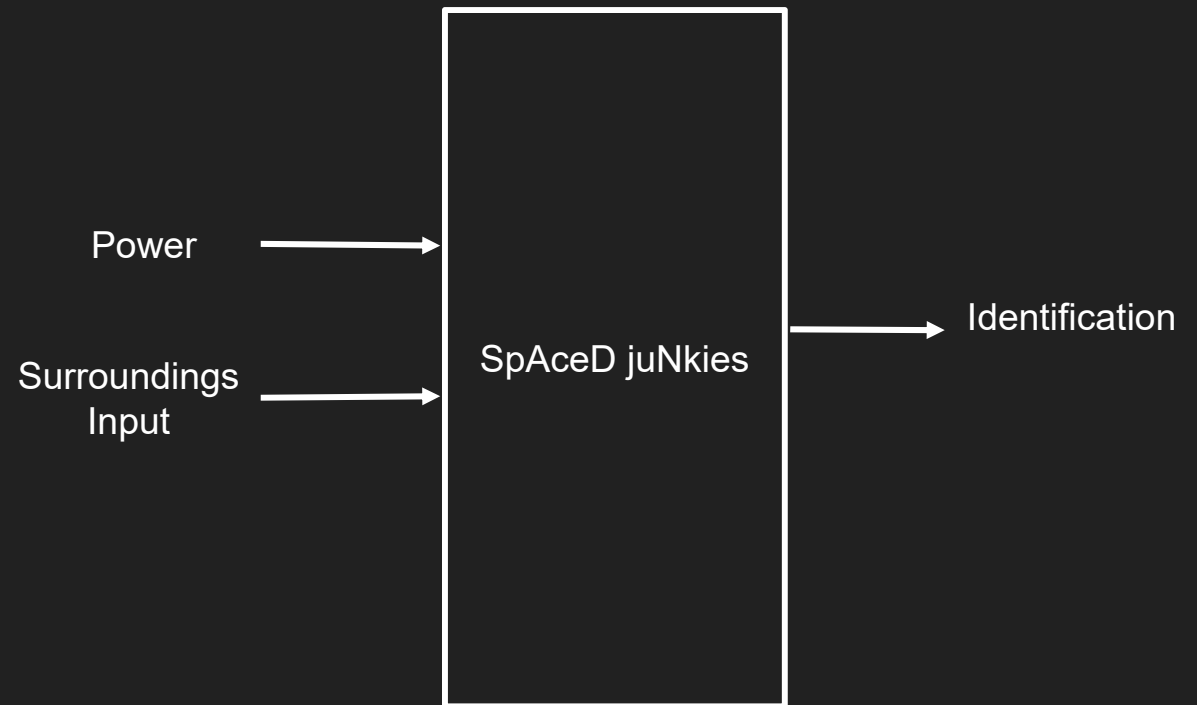
Proof of Concept Deliverables

- Demonstrate correct object identification using laser
 - Motor stops when object is detected
 - Laser turns on when object is detected
- Demonstrate working power systems through battery charging and power to all systems



Big Picture

- Inputs
 - Power Input
 - Surroundings Input
- Outputs
 - Identification
- Functionality
 - Identify object by moving motors.



Implementation Process : Sprint #1 Object Detection Code

Sprint #1

Finish Date: 21 Feb 2023

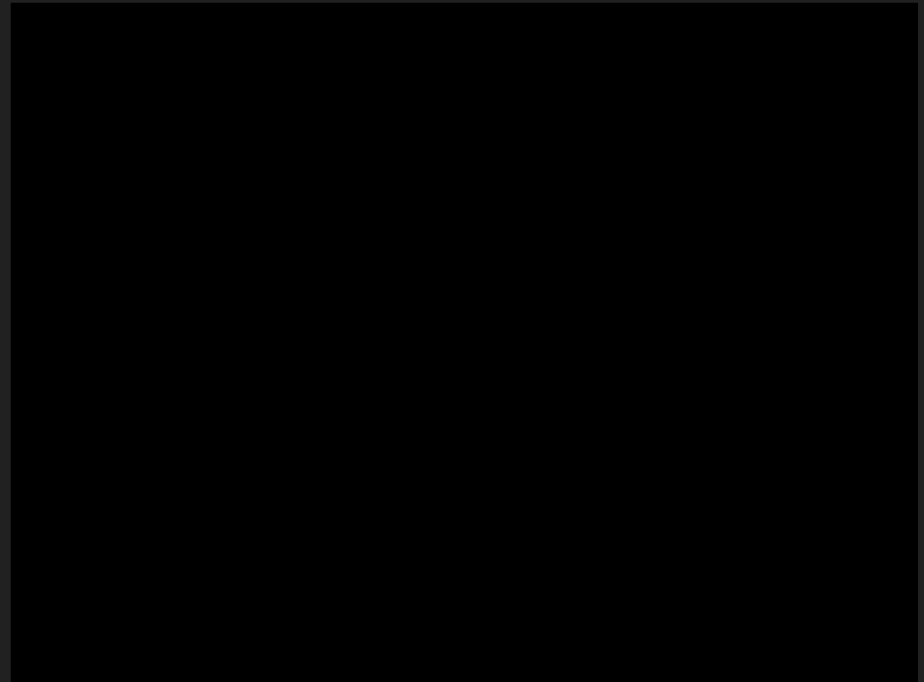
Goal: Object Detection Code

Week 1: Develop Code

Week 2: Microprocessor
Implementation



Implementation Process : Sprint #1 Object Detection Code



Implementation Process : Sprint #1 Object Detection Code



Implementation Process : Sprint #2 Power System

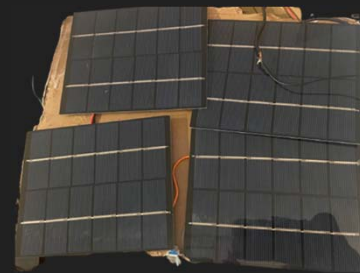
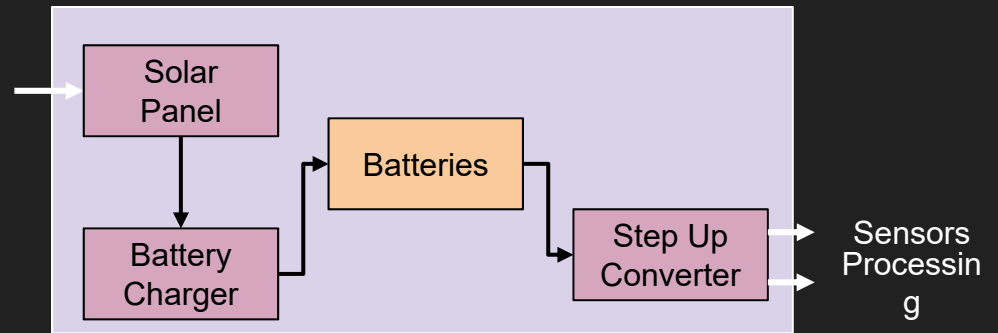
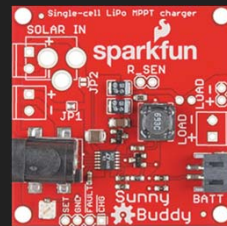
Sprint #2

Finish Date: 14th
March 2023

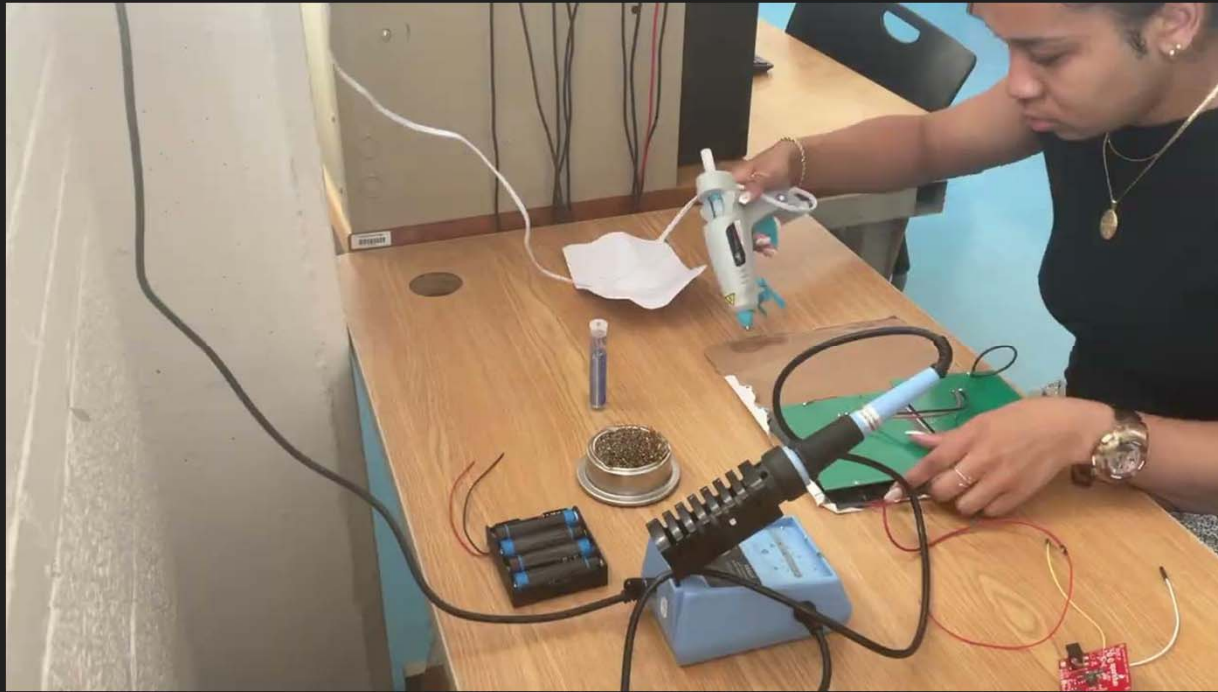
Goal: Power System

Week 1: Solar,
Battery, and Voltage
Conversion

Week 2: Connect to
Microprocessor



Implementation Process : Sprint #2 Power System



Implementation Process : Sprint #3 Sensors

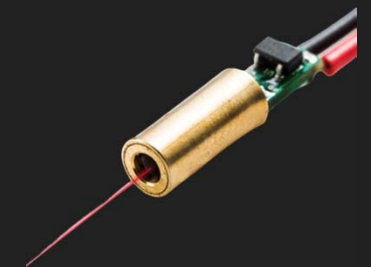
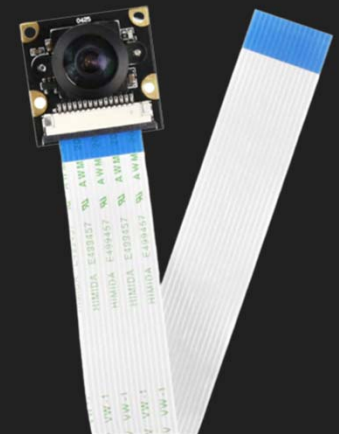
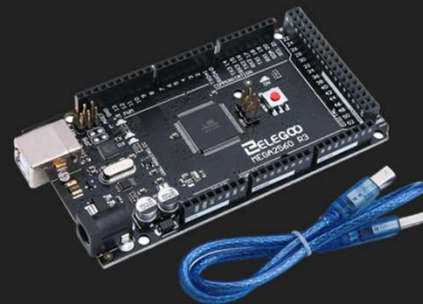
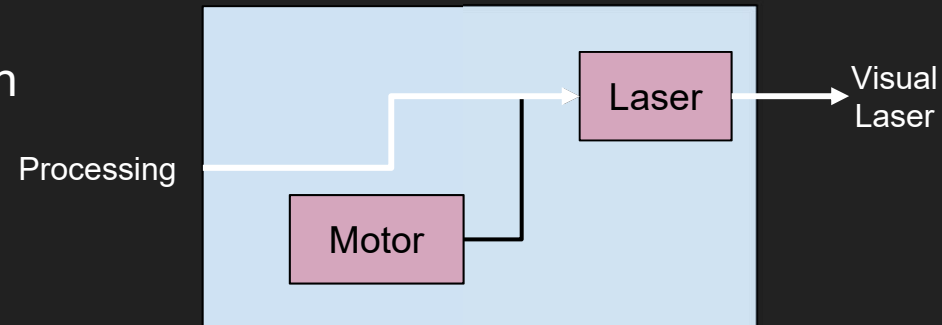
Sprint #3

Finish Date: 28th March
2023

Goal: Sensors

Week 1: Add Camera

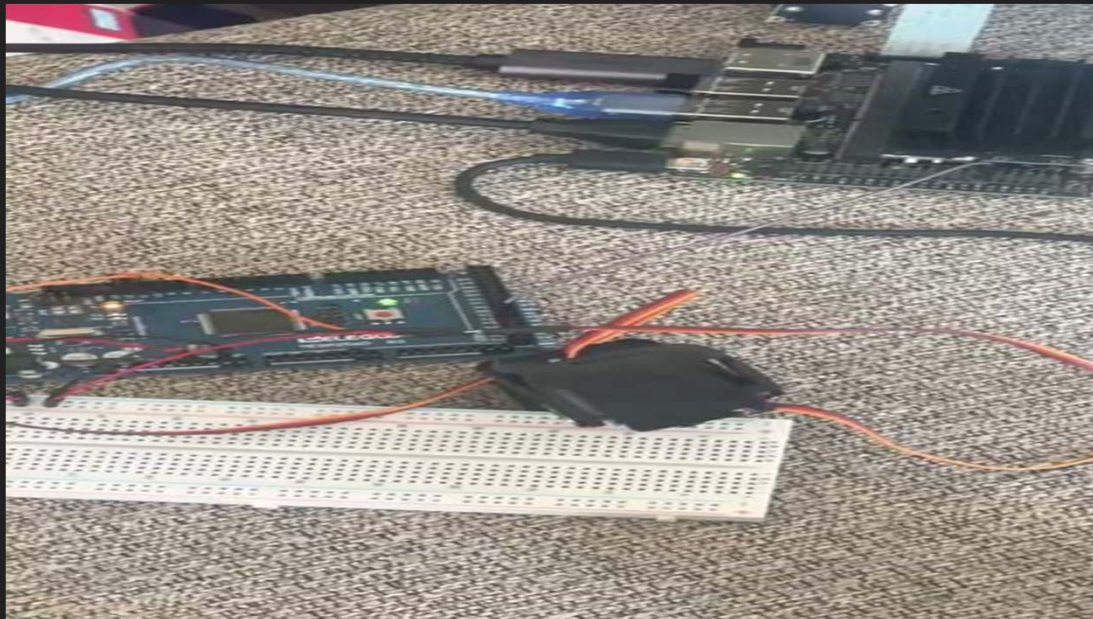
Week 2: Add Laser



Implementation Process : Sprint #3 Sensors



Implementation Process : Sprint #3 Sensors



Implementation Process : Sprint #4 Final Assembly

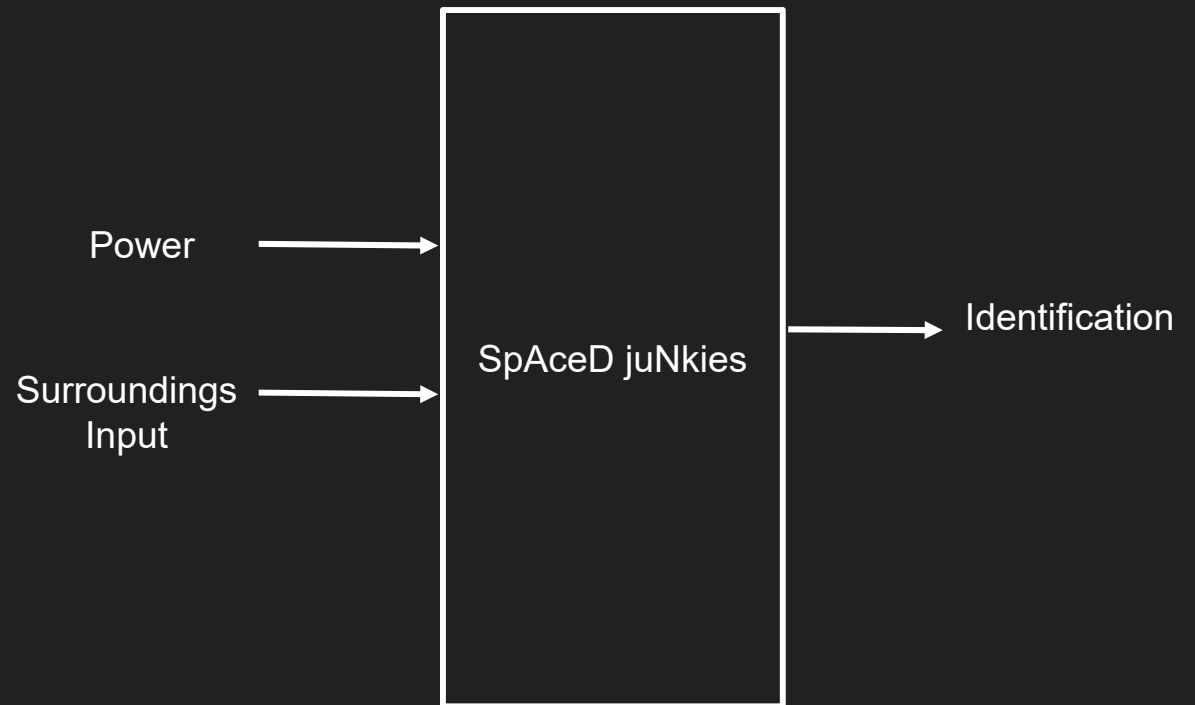
Sprint #4

Finish Date: 11th April
2023

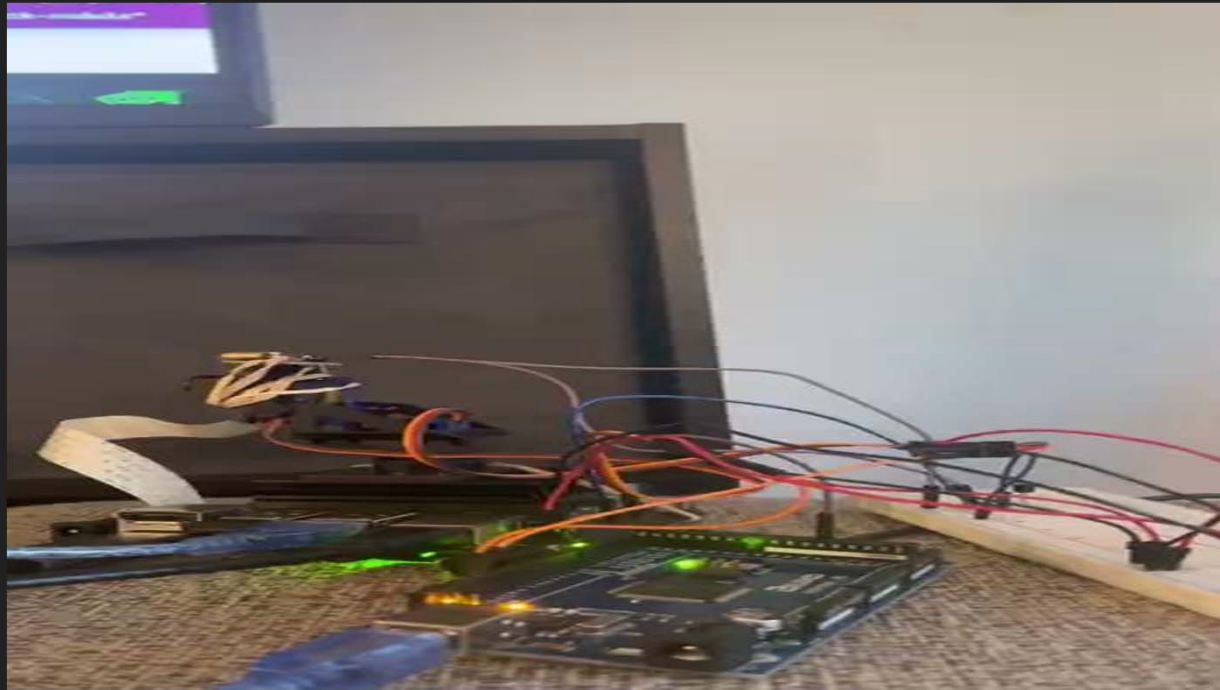
Goal: Final Assembly

Week 1: Connect All
Components

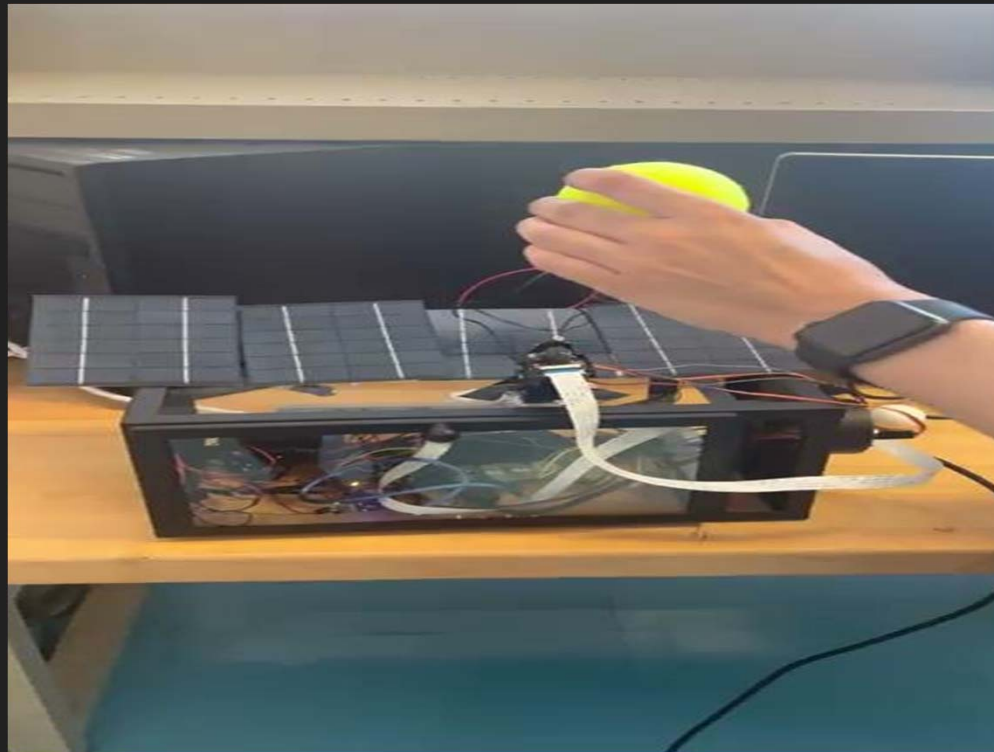
Week 2: Final Tests &
Debug



Implementation Process : Sprint #4 Final Assembly



Implementation Process : Sprint #4 Final Assembly



Conclusion

Successfully Completed the Proof of Concept Deliverables

- Demonstrate correct object identification using laser
- Demonstrate working power systems through battery charging and power to all systems

Next Steps



Thank You!

Questions?