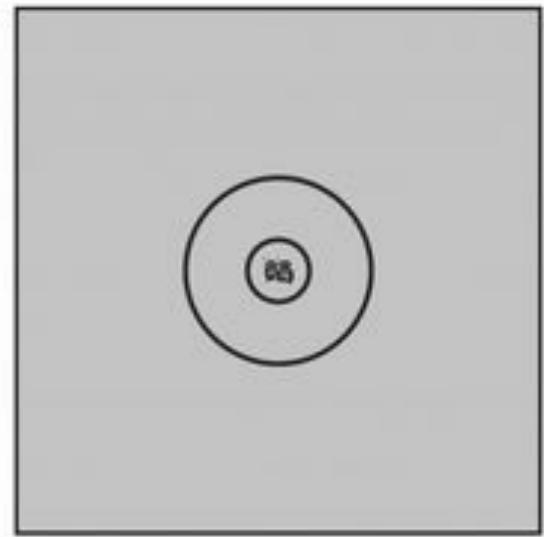
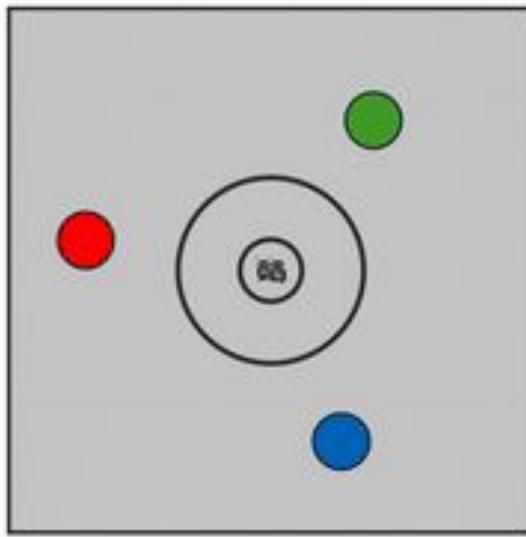
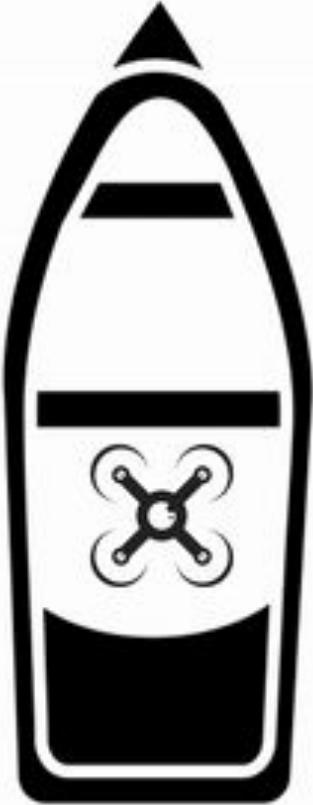


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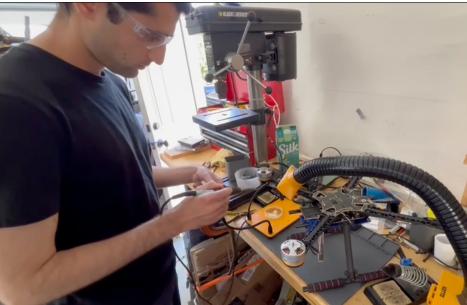
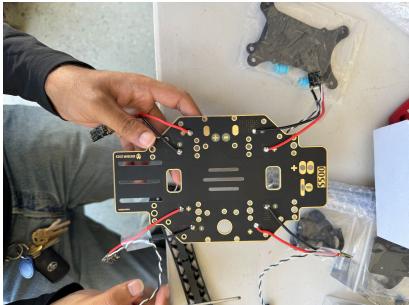
UAV Replenishment Task



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Phase 1 - Drone Build



4/20

Initial drone hardware mount

4/27

Wire management,
soldering (OBSCENE
amounts)

5/18

Debugging hardware,
calibration testing



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Phase 2 - Flight Tests



- 5/11 ━━━━━━━━ **First Drone Flight**
- 5/16 ━━━━ Minor Crash at Aerodrome
- 5/18 ━━━━ Dataset collection:
makeshift landing pad
- 5/25 ━━━━ Dataset collection: official
landing pad
- 5/29 ━━━━ Model testing and
diversifying dataset



Phase 2 - Flight Tests



- 5/11 — First Drone Flight
- 5/16** — **Minor Crash at Aerodrome**
- 5/18 — Dataset collection:
makeshift landing pad
- 5/25 — Dataset collection: official
landing pad
- 5/29 — Model testing and
diversifying dataset



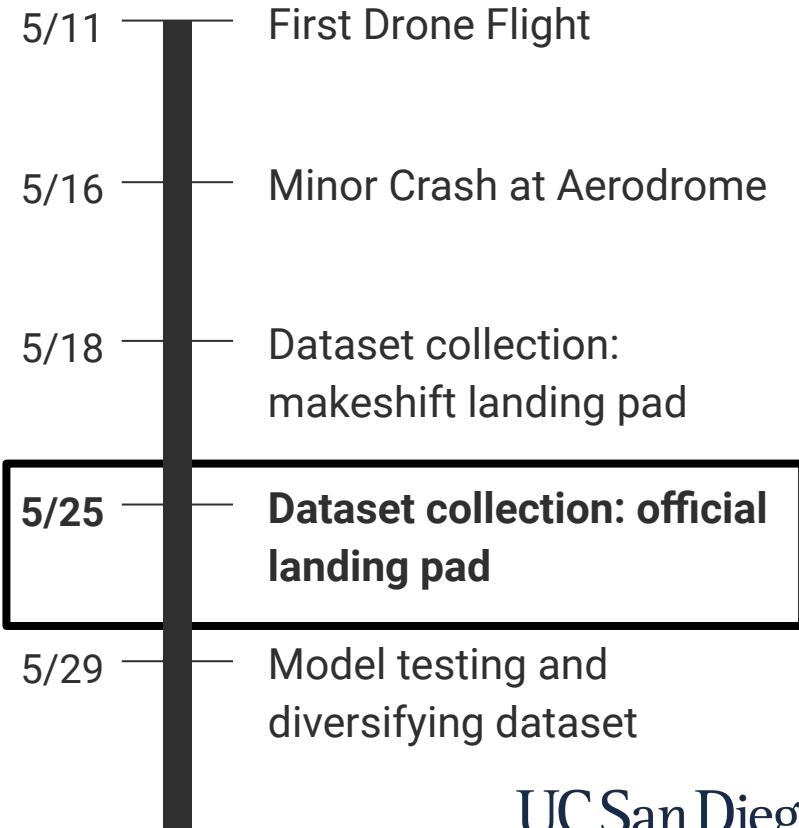
Phase 2 - Flight Tests



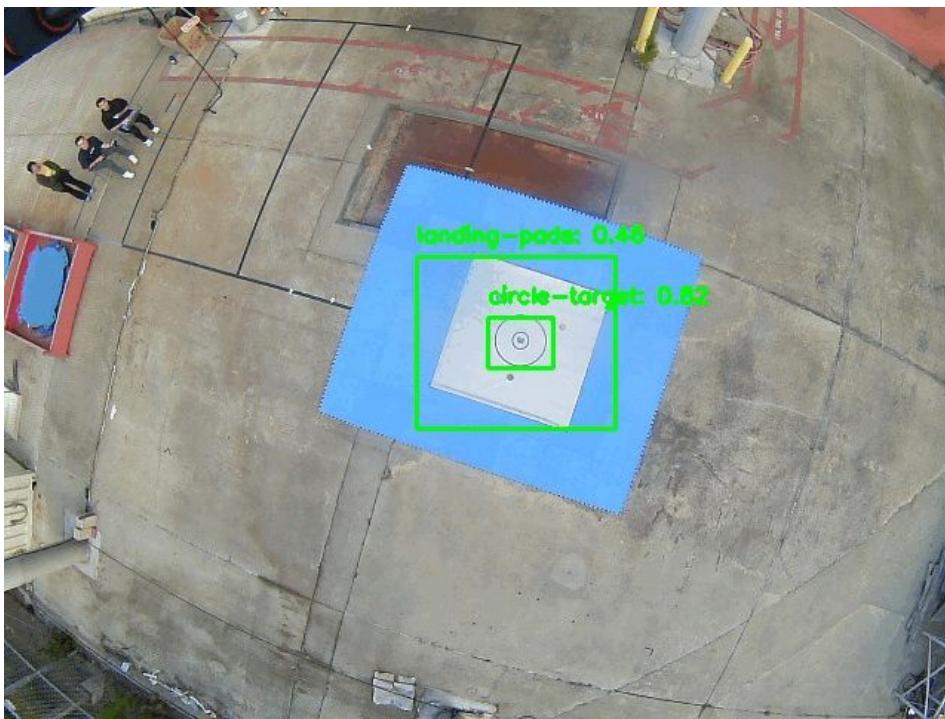
- 5/11 First Drone Flight
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Phase 2 - Flight Tests



Phase 2 - Flight Tests



- 5/11 ━━━ First Drone Flight
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diversifying dataset**



Dataset and Landing Pad Evolution

No helipad + iPhone images	Temporary helipad + drone images	Official helipad + drone images



Dataset and Landing Pad Evolution

No helipad + iPhone images	Temporary helipad + drone images	Official helipad + drone images
		

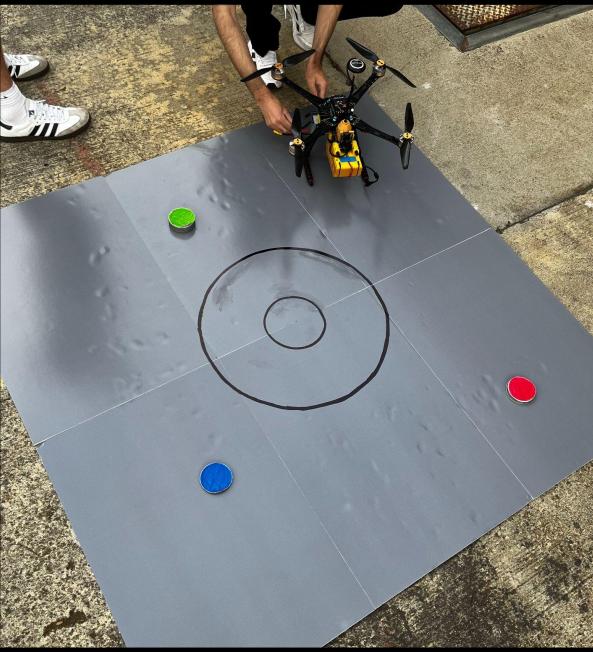


Dataset and Landing Pad Evolution

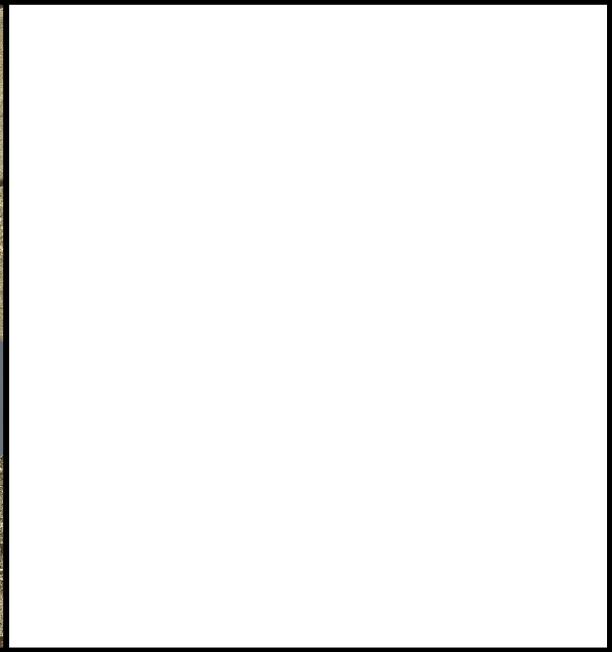
No helipad + iPhone images



Temporary helipad + drone images



Official helipad + drone images



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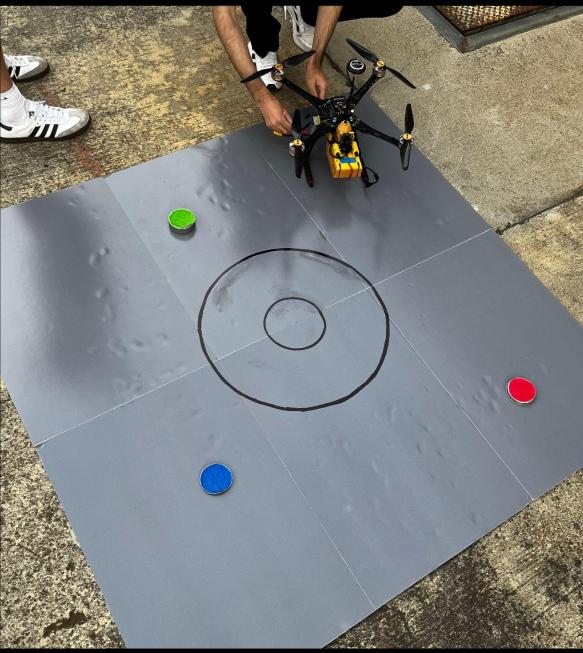
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Dataset and Landing Pad Evolution

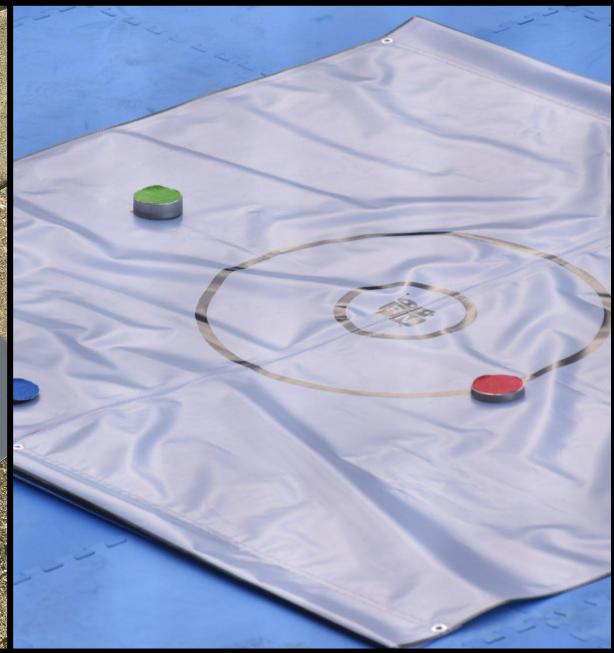
No helipad + iPhone images



Temporary helipad + drone images



Official helipad + drone images



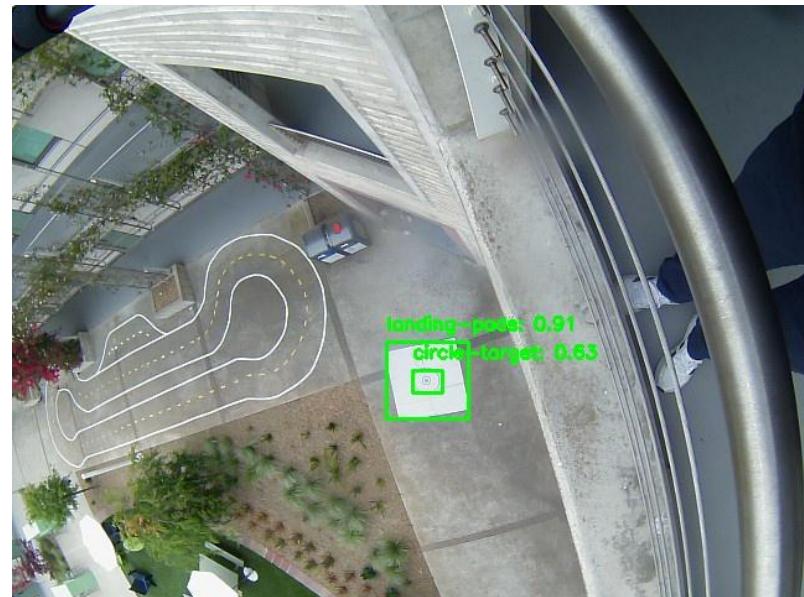
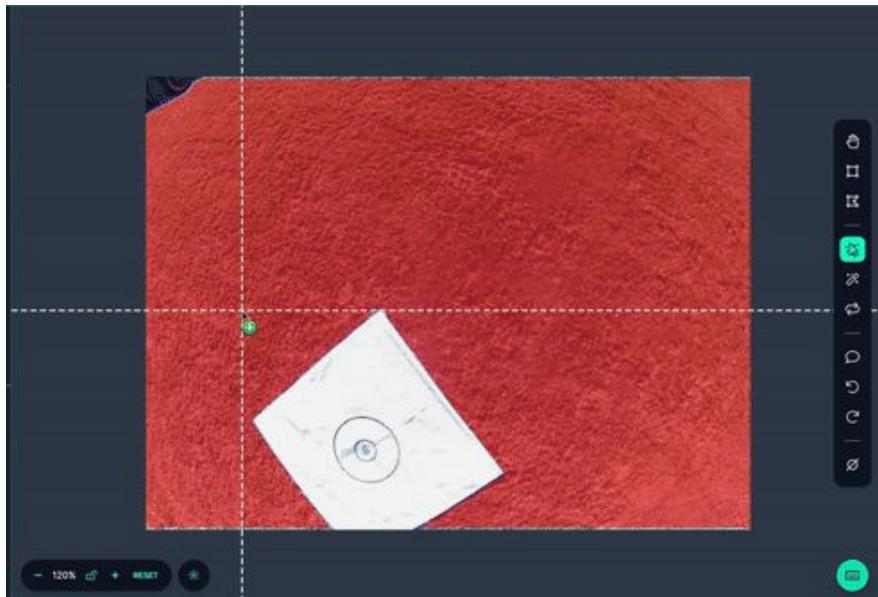
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Object Detection

Annotations: Roboflow

Model: yolov5



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Jetson Nano

Arducam

- Collecting images
- Detecting objects

Docker Containers

- ROS2 Humble environment

Pixhawk Integration

- Communication between Jetson and Pixhawk



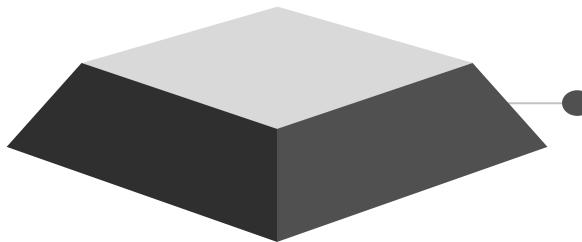
Accomplishments & Demo



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Accomplishments & Demo

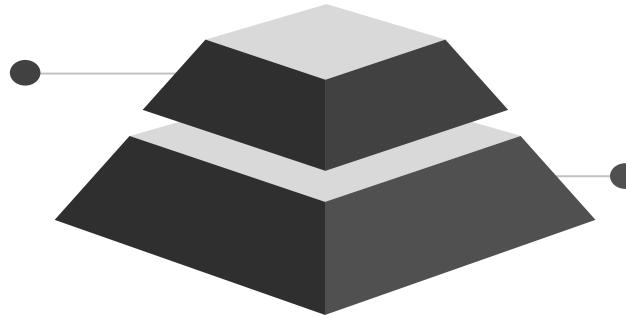


Drone Build and Flight



Accomplishments & Demo

Static Object Detection



Drone Build and Flight

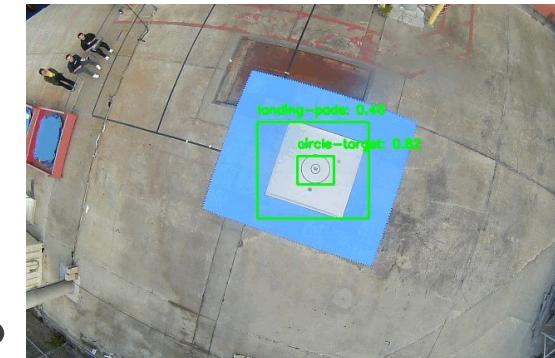
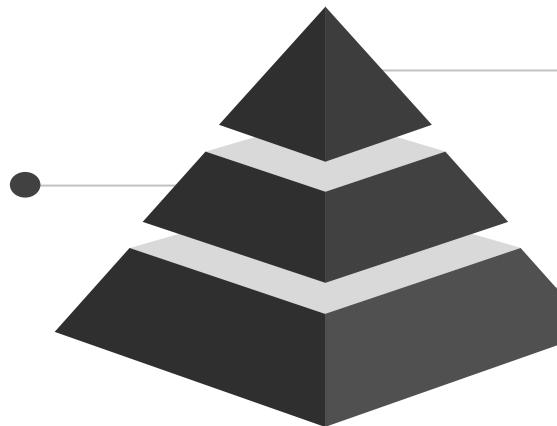


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Accomplishments & Demo

Static Object Detection



Live Inference and Localization

Drone Build and Flight



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Challenges

Hardware:

- Building the drone
- Controlling the drone
 - Rebuilding the drone

CV Software:

- Model integration on Jetson Nano
- Training on a good background



Simulator/ROS:

- Component Virtualization
- Running on WSL
- Running ROS on Jetson Nano



What did we not do?

Test control software.

Plan:

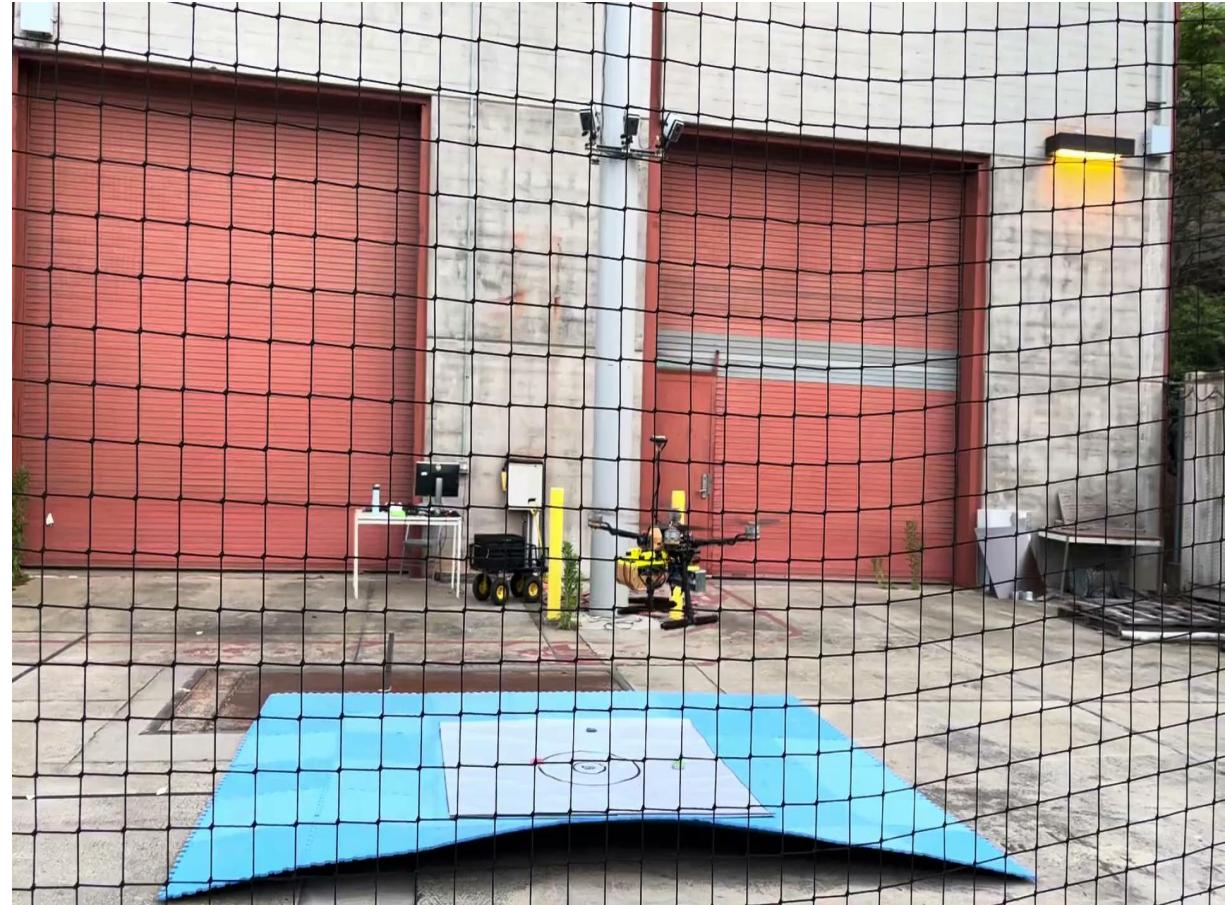
- Align drone with helipad
- Hover over landing pad
- Land

What did we not do?

Test control software.

Plan:

- Align drone with helipad
- Hover over landing pad
- Land



Autonomous Flight

	Time	Image	Helipad Center X	Helipad Center Y	Directions
77	20240529-17122	frame_20240529	317	319	Move Right
78	20240529-17122	frame_20240529	231	355	Move Backwards Move Right
79	20240529-17123	frame_20240529	163	288	Move Backwards
80	20240529-17123	frame_20240529	142	285	Move Backwards
81	20240529-17123	frame_20240529	366	166	Move Left
82	20240529-17123	frame_20240529	189	300	Move Backwards
83	20240529-17123	frame_20240529	189	299	Move Backwards
84	20240529-17123	frame_20240529	259	322	Move Right
85	20240529-17124	frame_20240529	261	274	Centered

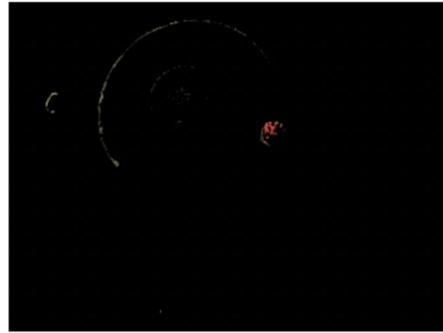


Tin can detection

Blue



Red



Green

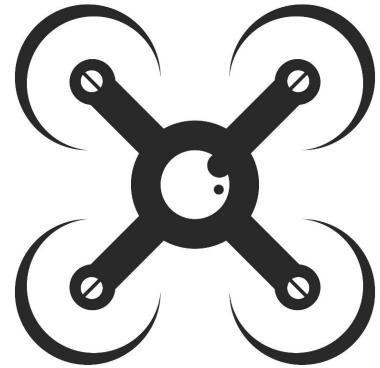


Image with Circles



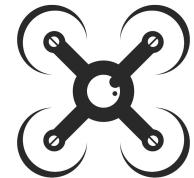
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Thank You!

Questions?



Summary

- Maritime RobotX Challenge 2024
- UAV Replenishment
- Drone hardware assembly
- Object detection model for landing pad
- Flight control software

ADCS Dynamics

Alec Digirolamo

Daniel Sanei

Carson Rae

Soumi Chakraborty