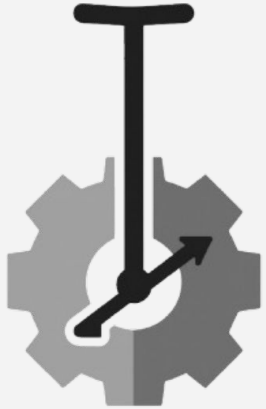
Search & Rescue Coordinated Intelligence Systems

The autonomous teamwork of ground and air assets in a mission-oriented environment



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OVERVIEW

- Progress Matrix
  - Accomplished Tasks
    - Interface Demo
      - Milestone 4 Plan
        - Demos

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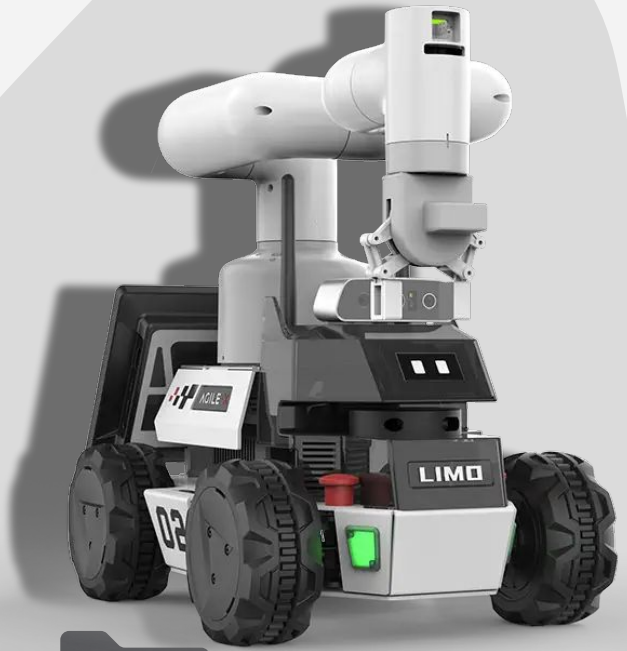

M3

Progress Matrix

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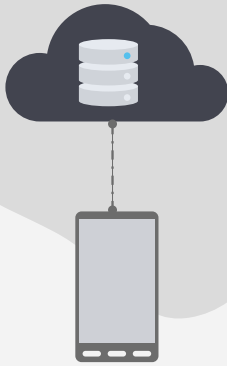
M3 Progress Matrix

Completed Tasks

Task	Completion	Yav	Young	Pop
Heartbeat Safety	100%	30%	0%	70%
Static Target Detection	100%	25%	50%	25%
Multi-agent View	100%	50%	25%	25%
Location Info (SLAM)	100%	40%	60%	0%
Moving Target Detection	100%	60%	40%	0%
Complete repair of LIMOs	100%	33%	33%	33%
Drone integration (Parrot)	10%	0%	10%	0%
Multi-agent Coordination	0%	0%	0%	0%

M3 Progress Matrix

Completed Tasks



Heartbeat Safety

Note:
-The **frontend publishes** a **heartbeat**, that the LIMO listens to.
-When active, the agent moves, when the **connection** is **lost**, the **agent stops until** the connection is **reestablished**.

Static Target Detection

Note:
-We opted for a, more stable, **ArUco marker**; the previous method for static target detection via colors was too broad and left too much room for error.

SLAM Implementation

Note:
-To compliment the SLAM algorithm, we use **ArUco markers** as a point of reference / "**world origin**" for the training environment.

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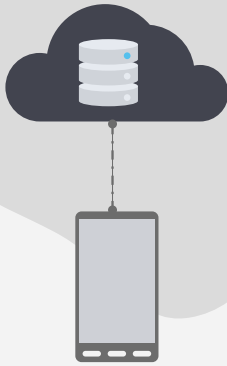
M3 Progress Matrix

Completed Tasks



Repair LIMOs

Note:
-We **labeled** and **installed** all **wheels** to ensure consistency for repairs and identification if issues occur.
-We have **four operable LIMO** robots.

Moving Target Detection

Note:
-This functionality utilizes the **ArUco detection** and **SLAM** algorithm to **identify** the **target** and its **disposition** in the environment.

Multi-agent View

Note:
-On the user **interface**, the user can now **switch** between different **camera views** for each robot.
-User can **individually access each robot** on the network.

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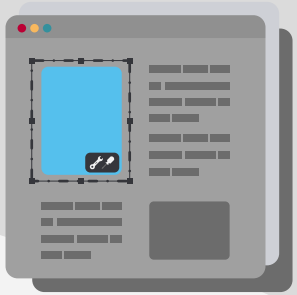

M4

Task Matrix and Rollovers

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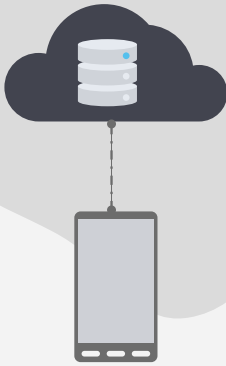

Drone Integration

Note:
-Made ROS2 code for drones, but could not run the code due to **lack of** connection **support for macOS.**

Multi-agent Coordination

Note:
-Repairing the Limos posed as a **blocker** for this task.

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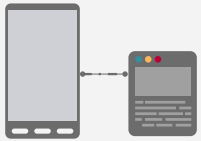
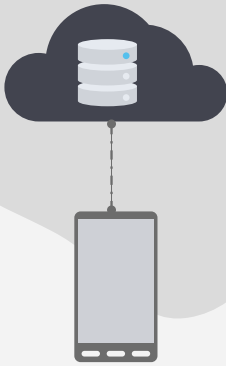
Task	Yav	Young	Pop
Drone integration (Parrot)	33%	33%	33%
Multi-agent Coordination	33%	33%	33%
Unitree Go2 Setup	33%	33%	33%
Concurrent Map Sharing	33%	33%	33%
Target Sharing	33%	33%	33%
Target engagement algorithm	33%	33%	33%
Robot Operator	33%	33%	33%





Concurrent Map Sharing

Note:
-Build a map that contains relevant information
-Robots in network, Target(s), and Local objects

Target Sharing

Note:
-When a target is found, the robot will inform the Robot Operator and notify the other agents.

Target Engagement Algorithm

Note:
-Create an efficient algorithm for the robots to collaborate and surround the target.

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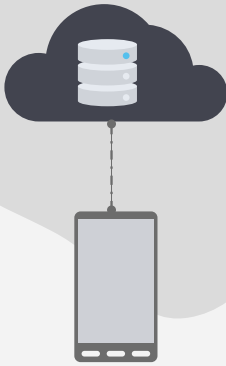

Unitree Go2 Setup

Note:
-**All three** Unitree **Go2's have been** powered on and **tested** to ensure all functions work as intended.
-Need to reverse engineering the code to integrate with our Hazelcast setup.

Robot Operator

Note:
When the robot sends the target ArUco, the operator will decide the confidence level.

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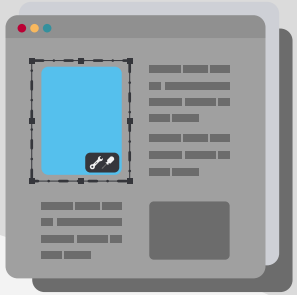

Demos

- Multi-agent view
- Multi-agent operation
- Unitree Go2 Testing

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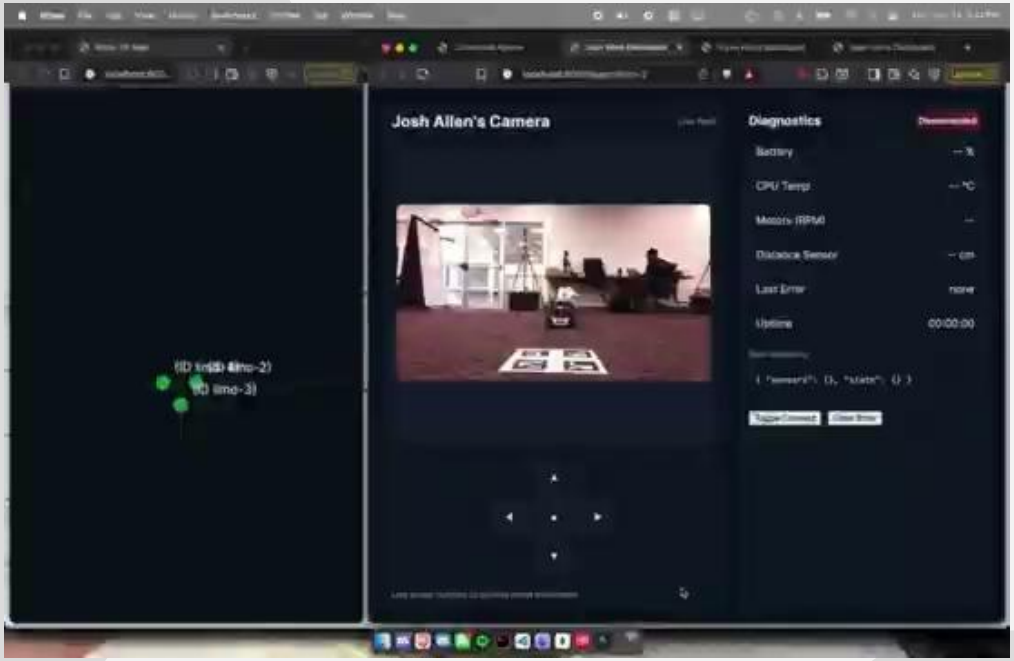
Multi-agent Operation

Unitree Go2 Testing



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Multi-agent Operation

Unitree Go2 Testing

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QUESTIONS?