

Progress Evaluation: Milestone 5

SRCIS

Search and Rescue Coordinated Intelligence Systems

Team Members

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Faculty Advisor & Client

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Milestone 5 task matrix:

Task	Completion	Yav	Young	Pop	To-Do
<i>Target Sharing</i>	100%	50%	25%	25%	N/A
<i>Multi-agent Coordination</i>	75%	60%	25%	15%	Setup Unitree GO2 + operation
<i>Integrating custom ROS Driver w/ Drone (Parrot)</i>	75%	40%	60%	0%	The drone is fully controllable through ROS, need to finalize the SLAM algorithm.
<i>Integrating custom ROS Driver w/Unitree Go2</i>	80%	40%	0%	60%	Errors with the Navigation2 driver prevent us from marking it as complete.
<i>Concurrent Map Sharing</i>	50%	60%	20%	20%	Test map merging in active demo, code has been tested to compile on the hardware.
<i>Mission Command Structure</i>	10%	33%	33%	33%	Draft a scheme of maneuver to explain the priorities pre-, during, and post-execution
<i>Target engagement algorithm</i>	50%	33%	33%	33%	Refine the engagement algorithm; the robot can follow a moving target relatively well and has basic logic for reacquiring a lost target.
<i>Showcase Poster Drafted</i>	10%	33%	33%	33%	Work on revisions given by advisor
<i>Full-dress Demo</i>	0%	33%	33%	33%	Work out remaining blockers with the drones and unitrees

Discussion of accomplished tasks (and obstacles):

- Target Sharing: In milestone four's implementation of target sharing, the robots would occasionally fail to navigate to the target, these issues have been solved in milestone five.
- Multi-agent Coordination: With the addition of the exploration algorithm, the agents are much closer to being able to perform divide and conquer tasks and collapse onto a target.
- Integrating custom ROS Driver w/ Drone (Parrot):
- Concurrent Map Sharing: The code for map-sharing has been compiled successfully, all that's left is to bridge the map data between Hazelcast and ROS2.
- Target engagement algorithm: When robots receive the target's position, they use its displacement to naively predict where the target is heading. We will continue to improve the prediction as it can be unpredictable at times due to motion blur.
- Showcase Poster Drafted: We drafted the poster for our advisor's review including the recommended components from the syllabus website. We focused on finding a format that would give the viewer the most valuable information with the lowest interaction cost.
- Mission Command Structure: We have drafted how we want the mission command structure to work and can articulate the breakdown of how each robot is supposed to function in each corresponding state. This is just a prompt that will be communicated to the agents in order for them to have a shared understanding.
- Integrating custom ROS Driver w/Unitree Go2: We successfully got the drivers for the Unitree GO2 running and tested out the custom ROS driver in the robots. The last kinks we have to work out are related to navigation. We can display the local cost map, but the global cost map in the navigation driver is not displaying, so we are troubleshooting and figuring out if it is a problem with a ROS topic not being published or an issue with a configuration.

Discussion of contributions:

- **Yav**: For the fifth milestone, I was responsible for integrating the new exploration algorithm. The algorithm ensures that the full operation space is totally explored in an efficient manner. Along with the new exploration, the package brings map sharing abilities which will allow for all of our robots to divide and conquer. As we continue to get ready for our full demo, I have been working to improve our ability to actively pursue a moving target and in this milestone I have done so. The robot can now consistently track a moving target and will attempt a naive recovery when the target is lost.
- **Pop**: This milestone I completed majority of what we had left for integrating the custom ROS driver with the unitree GO2. I tested the base driver on the unitree and copied the configurations for the navigation visualizer to ensure we had the same configs for all of the agents. I also drafted the poster and put a few things in there to show our advisor and instructor what direction we wanted to go before finalizing anything. I wrote up a draft of the mission command structure to prompt the agents with.
- **Young**:
 - Continued ORB-SLAM integration for drone localization and mapping

- Set up Docker to resolve dependency issues, including NumPy and OpenCV version conflicts for Orbslam
- Worked on environment configuration and package compatibility
- Tested the setup for smoother development and deployment

Milestone 6 Task Matrix

Task	Yav	Young	Pop	To-Do
<i>Target Sharing</i>	50%	25%	25%	N/A
<i>Multi-agent Coordination</i>	60%	25%	15%	Setup Unitree GO2 + operation
<i>Integrating custom ROS Driver w/ Drone (Parrot)</i>	40%	60%	0%	The drone is fully controllable through ROS, need to finalize the SLAM algorithm.
<i>Integrating custom ROS Driver w/Unitree Go2</i>	40%	0%	60%	Errors with the Navigation2 driver prevent us from marking it as complete.
<i>Concurrent Map Sharing</i>	60%	20%	20%	Test map merging in active demo, code has been tested to compile on the hardware.
<i>Mission Command Structure</i>	33%	33%	33%	Finalize a scheme of maneuver to explain the priorities pre-, during, and post-execution
<i>Target engagement algorithm</i>	33%	33%	33%	Refine the engagement algorithm; the robot can follow a moving target relatively well and has basic logic for reacquiring a lost target.
<i>Showcase Setup</i>	33%	33%	33%	Poster and Booth Plan
<i>Full-dress Demo</i>	33%	33%	33%	Work out remaining blockers with the drones and unitrees
<i>Performance Statistics</i>	33%	33%	33%	Find our weaknesses and strengths and be able to explain during the showcase

Plan for the next Milestone:

Target Sharing

- Expand the target sharing to the drone and the unitree. These agents will have the ability to locate the target once one of the agents has spotted it.

Multi-agent Coordination

- Connect the Unitree Go2 and Parrot drone to the base driver that other agents use for operation, so they can work together and successfully encircle the prey. Heavily reliant on the completion of neighboring tasks. We have to fix the navigation issues to get the mapping fixed.

Integrating custom ROS Driver w/ Drone (Parrot)

- Upgrade the drone's code to check world regions and send the target location to other agents.

Integrating custom ROS Driver w/Unitree Go2

- Creating/Adding the publishers for Unitree in the base driver for the agents.
- Once this is complete, the robots will all be visible in the multi-agent view and will inherit the map/target-sharing details.

Concurrent Map Sharing

- One map with all of the necessary information for the mission operator to view:
 - Robots (LIMO, Unitree, Parrot)
 - Target(s) (once found)
 - Obstacles/map of the space.
- Each of the agents will

Implementing Mission Command Structure

- Integrate the mission command structure and monitor the execution to validate that the agents are developing in their roles.
- All ground robots function as finite-state machines, with most optimistic actions having programmatic transitions, but some transitions are only accessible via the agents & mission command structure. For example, exploration → targetting is an autonomous action that does not need agentic help. However, planning → exploration requires the agent to indicate the change in state.

Full Demo

- Agents successfully initialized and delegated roles and responsibilities upon commencement of the mission.
- Create a mock environment to represent an urban environment (Obstacles: Buildings)
- Agents cooperating to pursue and capture the target in the mock environment

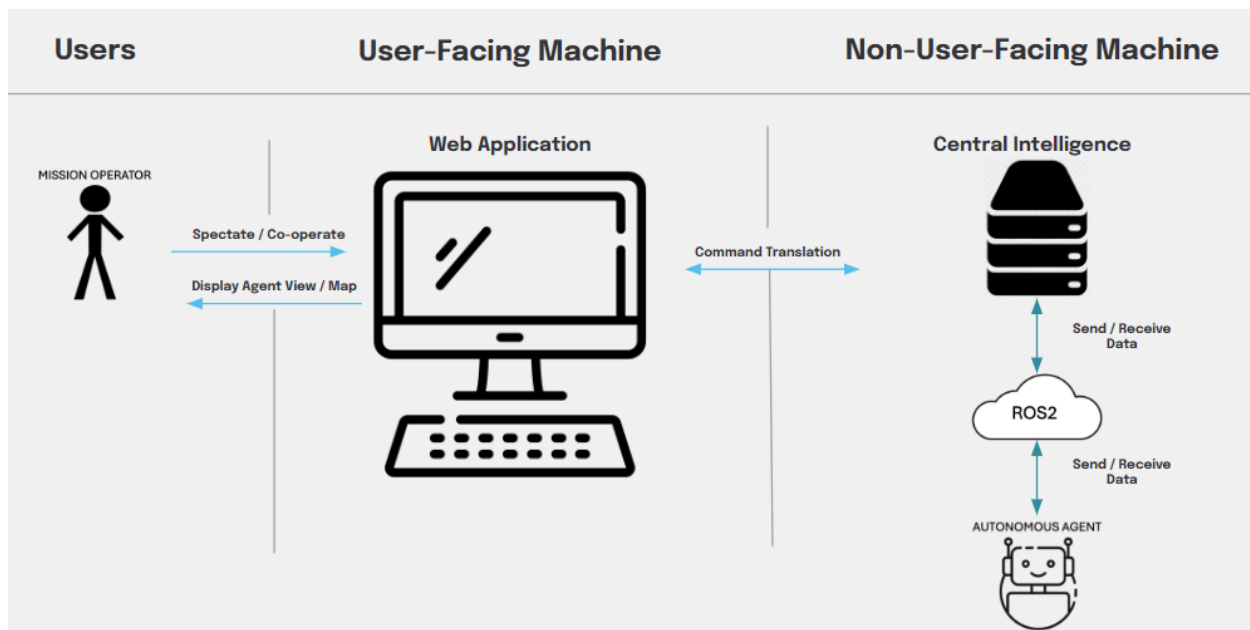
Showcase Setup

- *Poster Finalized*
 - a. All sections of the poster have been reviewed and approved by our advisor and instructor
- *Stickers*
 - a. Just a simple item for guests and judges to take with them
- *Monitor*
 - a. Display lab demo's
 - b. This is our alternative if we are not permitted to pilot the drone in the building
- *Scheme of Execution*
 - a. Coordinating shifts and ensuring availability on presentation day
 - b. Setup/Teardown matrix
 - i. Who is responsible for what, and how we would like to set up the table
 - c. Pitch
 - i. Finalize our script for how we want to present our project to the judges

Performance Statistics

- Have a log and general analysis of how efficient our system runs. Knowing the network boundaries for thinking of ways to scale our project up is important, along with knowing how to work around the issues we may run into, so we can improve our system for the customer.

Diagram



Advisor Section

Date(s) of meeting(s) with Client during the current milestone:

- See faculty advisor dates below

Client feedback on the current milestone

- See faculty advisor feedback below

Date(s) of meeting(s) with Faculty Advisor during the current milestone:

- 3/16/26

Faculty Advisor feedback on each task for the current Milestone

- Now is the time to start thinking about prioritizing the tasks that will let you construct a reasonable demo, then adding additional features on after you can effectively trap the prey. So you may consider leaving the dog and parrot development until after you have a reasonable target engagement algorithm. With only a few weeks left, you should think of what features are needed to create a minimal demonstration, and focus on those first.

Faculty Advisor Signature: __Thomas C Eskridge_____ Date: __3/30/2026_____