Team Number: Group 32

Project Title: Multiple Drones Coordination System

Report Date: 03/17/2025

Part one:

All team members have detailed tasks listed on Team's Planner: YES or NO; if NO, explain.

Yes.

Please answer the following questions:

1.   Have you met as a team this past week? If yes, give date/time, and the members attended the meeting. If no, explain.

   No, everyone was focused on completing their tasks individually and there was not much we could do together.

2.   Have you met with the sponsor as a team? If yes, give date/time, and the member attended the meeting. If no, explain.

   No, we did not meet with the sponsor this week. We have not received a request for it from our sponsors; and we did not contact our sponsor as we were focused on the last stages of our project.

 3.   Describe verbally the tasks completed the past week and the challenges faced.

Tutku Gizem Guder (Target Detection Subsystem)

- Tested the target detection system with one drone in different environments using airsim and the game engine.
- Tested the communication between multiple drones in different environments.
- Optimization of target detection implementation
- Optimization of the communication between drones and the environment.

Matthew P.(User Interface)
- **Integration**: Debugging UI and integration of live metrics with arisim.
- **Testing and Feedback**: Conducted user testing and gathered feedback for improvements.

Brenden Martins (3D Simulated Environment Subsystem)

- Continued working on the new environment for the final integration process.

4.   Describe the tasks to be completed the coming week.

Tutku Gizem G. (Target Detection Subsystem)

- Testing after the integration.

Brenden Martins (3D Simulated Environment Subsystem)

- Working together with the other subsystems to have the integration fully done.

Matthew Wyatt (Data Management and Communications Subsystems)

- Continue to sync data with AirSim and our MySQL database as well as work to bring communications between other subsystems.
- Integrate the other subsystems with each other, primarily focusing on integration between subsystems that use AirSim first (Control, Target Detection, Simulation Environment).

Student Name	# Tasks completed past week	# Tasks not completed	# Tasks for next week
Brenden Martins	1	0	1
Matthew Paternoster	1	1	1
Matthew Wyatt	1	0	2
Tarek Kayali	2	1	N/A
Tutku Gizem	2	1	1

Name of the Member: Tutku Gizem Guder

Report Date: 3/17/2025

Testing and Implementation

- The stand-alone drone target detection system was simulated under various environments, including urban, rural, and industrial landscapes, in AirSim and a game engine.

  - The above-described environments were applied to simulate real-world applications for which the drones might be deployed to detect targets.
  - AirSim and the game engine allowed the simulations to occur in a real-world-like scenario to test the performance of the drone to identify and classify targets under various scenarios.

- The communication among the various drones was also rigorously tested to evaluate the coordination of the drones and the exchange of information.

  - Various communication protocols were simulated to evaluate their effectiveness and reliability in multi-drone systems.

- Tests were performed to simulate the swarm operations, in which the drones sweep in a large area together and share data for improved target detection.
- Both high-traffic environments with a lot of drones and low-traffic environments were used to check how well the drones communicated and synchronized.

- These tests were directed towards improving the robustness of the target detection system, optimizing communication protocols for the drones, and ensuring that the drones operate effectively in a range of environments and conditions.
  - System performance metrics such as detection accuracy, communication delay, and mission success rate overall were used to quantify system effectiveness and identify areas to improve.

- Both individual drone capability and multi-drone communications systems were tested across different weather conditions such as rain, fog, and high winds to check their flexibility and ruggedness.

  - The artificial weather conditions in the game engine provided a means for challenges that might occur in real applications, such as signal loss and line-of-sight communication blockers, to be determined.

Coming Up Tasks

- Completing the integration related optimizations, and record the video.

Name of the Member: Matthew Wyatt

Report Date: 3/17/2025

List the following:

1.   All tasks completed the week before the past week (completion date in parenthesis). This is copied from the last report, and if this report is the first one, skip.

a. (3/15/2025) ==Subsystem Data Integration (Communications)==

Description: Enhanced the communication subsystem by streamlining data exchange processes between MySQL and AirSim. Focused on improving system responsiveness and reliability by addressing latency issues and optimizing data synchronization pipelines.

Outcome: Achieved a robust and efficient communication framework capable of handling high-throughput data exchange securely and without interruptions.

2. All tasks completed the past week (completion date in parenthesis)

a. (3/22/2025) ==AirSim Integration Setup==

Description: Set up the AirSim simulation environment and prepare it for integration with the project subsystems. This includes installing dependencies, configuring the environment, and ensuring compatibility with project requirements.

Outcome: A fully configured AirSim simulation environment that is ready for integration with the Drone Control, Target Detection, and Simulation Management subsystems.

3. All tasks you are currently working on or planned for this coming week (completion date in parenthesis)

a. (3/30/2025) ==AirSim Integration (Drone Control, Target Detection, Simulation Environment)==

Description: Integrate the AirSim simulation environment with the Drone Control and Target Detection subsystems. Set up the integration within the simulation environment to replicate real-world scenarios for testing and development.

Desired outcome: Enable the Drone Control and Target Detection subsystems to interact with the AirSim simulation environment effectively and validate their functionality in a simulated environment.

b. (3/30/2025) Integration Testing

Description: Perform integration testing for the AirSim environment, Drone Control, and Target Detection subsystems. Ensure all components work seamlessly together and meet project requirements.

Desired outcome: Verify that the integrated system functions as expected and identify any issues for resolution.

Name of the Member: Matthew Paternoster

Report Date: 03/17/2025

Implementation (2/26):

- **Testing and Feedback**: Continue to debug and refine the UI and live metrics integrated with airsim.
- **Testing Integrated System**: Perform more testing to search for bugs and improve any existing functionalities.

Next Steps:

Continue to test the communication between the UI and AirSim.

Name of the Member: Brenden Martins

Report Date: 3/17/2025

List the following:

1.   All tasks completed the past week (in this example template, tasks between 1/20 and 1/26) (completion date in parenthesis) <mark>Highlight these tasks headers in green.</mark>

<mark>**Simulation Environment Maintenance and Upkeep (03/17/25)**</mark>

- **Description:** Conducted routine maintenance on the 3D simulation environment to ensure stability and consistency across testing sessions. This included verifying asset integrity, cleaning up unused files, and updating level configurations to match subsystem integration needs.

- **Outcome:** Maintained a stable, optimized environment to support ongoing testing and development for the Drone Control and Target Detection subsystems.

2.   Tasks you attempted but did not get to complete due to time constraints or other factors in the week (in this example template, tasks between 1/20 and 1/26).

<mark>**None (03/17/25)**</mark>

Name of the Member: Tarek Kayali

Report Date: 3/23/2025

Tasks Completed the Past Week (completion date in parenthesis)

(03/17/2025) Initial Integration of Drone Control Subsystem

Description: Integrated the Drone Control Subsystem with MySQL for data retrieval and logging. Established foundational communication between the control module and AirSim to initiate autonomous flight paths using predefined coordinates.

Outcome: Enabled basic autonomous flight execution and ensured real-time synchronization of drone telemetry with the central database.

(03/17/2025) Flight Logic and Pathing Test Runs

Description: Developed and tested basic flight control algorithms within AirSim, including waypoint navigation and response to environmental boundaries.

Outcome: Drones successfully navigated through simulated environments using scripted paths; this validated the early logic for pathing and command response.