



Tecnológico de Monterrey

Evidence 2. Progress and Presentation of the Challenge

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Modeling of Multi-Agent Systems with Computer Graphics

Professor Iván Axel Dounce Nava

August 20th, 2025

Team

Team Conformation & Lay of Commitments

The team is conformed by 5 members, all current students of the 5th semester of the degree in Computational Technologies, these members are César Moran Macías, Ana Paola Jiménez Sedano, Ariana Guadalupe Rosales Villalobos, Demmí Elizabeth Zepeda Rubio and Luisa Merlo García.

With the objective of delegating an efficient work plan according to abilities of each team member, the strengths and areas of opportunity of each have been identified.

Member	Strengths	Areas of Opportunity
César Morán	Good and proactive at teamwork, responsible, organized.	Time management, get distracted easily, sometimes learns slowly.
Ana Paola Jiménez	Always attentive of what is missing and making sure everything is covered. Good at organizing tasks and the team.	Perfectionist, sometimes overthinks details, which can increase hours working.
Ariana Villalobos	Proactive at teamwork, good at documentation and writing. Ultimately, I complete the work as required, looking ahead to the future tasks.	Often tries to get things right on the first try, causing delays in her tasks. Get nervous easily and find it difficult to express her ideas clearly.
Demmí Zepeda	Documentation and writing skills, good communication, research agility, attention to detail.	Time management, deep technical implementation in Unity.
Luisa Merlo	Strong communication, adaptability, proactiveness.	Improve management of schedule so times are more available, review and practicesome technical content such as unity.

With the objective of accomplishing a successful delivery in the completion of the challenge, each team member has stated their expectations for the block, the goals they hope to achieve and the commitments towards accomplishing them.

- **César:** For this block I expect to understand and learn how agents can talk and work together. I know this topic can be difficult at first, but I want to get a clear idea by practicing on my own and with my team. I also expect to improve my skills in modeling and unity coding, because I feel I am not that strong in both of them, so I hope this project helps me see how theory connects with real cases and at the end I want to feel I really learned something useful for the future.
- **Ana Paola:** From this course I expect to understand more how tasks in real life, specially the ones involving technology, are divided and assigned to different agents that communicate with each other to increase efficiency. I find it really interesting how there is a huge theory and research area for establishing this communication and autonomy. Moreover, I want to understand more about parallel programming, which is also based on this principle of efficiency growth due to subdivision of tasks. After understanding these concepts, I want to be fully capable of implementing it in 2 tools that have always been really complicated for me, Unity and 3d modeling.
- **Ariana:** My expectations for this course are focused to understand how intelligent agents are built, and have a solid foundation of the knowledge required to develop my own agents and exploit the techniques in which they can be used. I hope to master in unity and C#, because these are very useful tools that have many applications and I'm very excited to develop more projects on them. Also I wish

we have time to see in a deeper level more about parallel and concurrent programming in CUDA and how it can be implemented in our challenge.

- **Demmi:** For the class of MAS and Computer Graphics, I am excitedly expecting to strengthen my technical skills, especially in Unity, and have a wide sufficient knowledge on Blender. I wish to deepen my understanding of MAS and their applications, since I was not familiar with MAS before; I hope this also helps me reinforce my abilities in designing and analyzing algorithms.
- **Luisa:** My expectations for the block are firstly to get a clear understanding and robust knowledge of multiagent systems, from their theoretical composition to their practical application in modeling. I also expect to discover new ways to implement agents in real world problems, hoping to achieve solutions and improve processes. My commitments are to keep active listening and participation during class, engage in the activities and keep a proactive attitude of collaboration and communication with my team.

Subsequently, this is a list of what the team hopes to achieve and obtain as a working unit in the current block, along with the groupal commitments and goals to achieve it.

- Stay organized and finish the project on time, step by step.
- Meet together often so we can share the progress and also help each other.
- Learn and practice the concepts of how multiagent systems work in practice.
- Keep a clear communication between all of us through constant updates of each one's work.
- Upload each one's part on time so nobody gets behind.
- Respect each other's ideas and keep a positive attitude.

- Finish a working model for the drone mission.

Collaborative Work Tools

- Github Repository (for storing documentation and generated code).

Repository link: <https://github.com/callmedems/MASforMAV>

- Discord (for synchronous meetings and daily updates).

Formal Challenge Proposal

Challenge Description

The challenge consists of designing and implementing a multi-agent system that enables Micro Aerial Vehicle (MAV) so that it can:

- Autonomously receive and interpret a mission
- Navigate to a designated area
- Identify a target person based on a description
- Land autonomously near the identified person within a 2 meter radius, without making content

The resultant agent is expected to successfully complete the mission as follows:

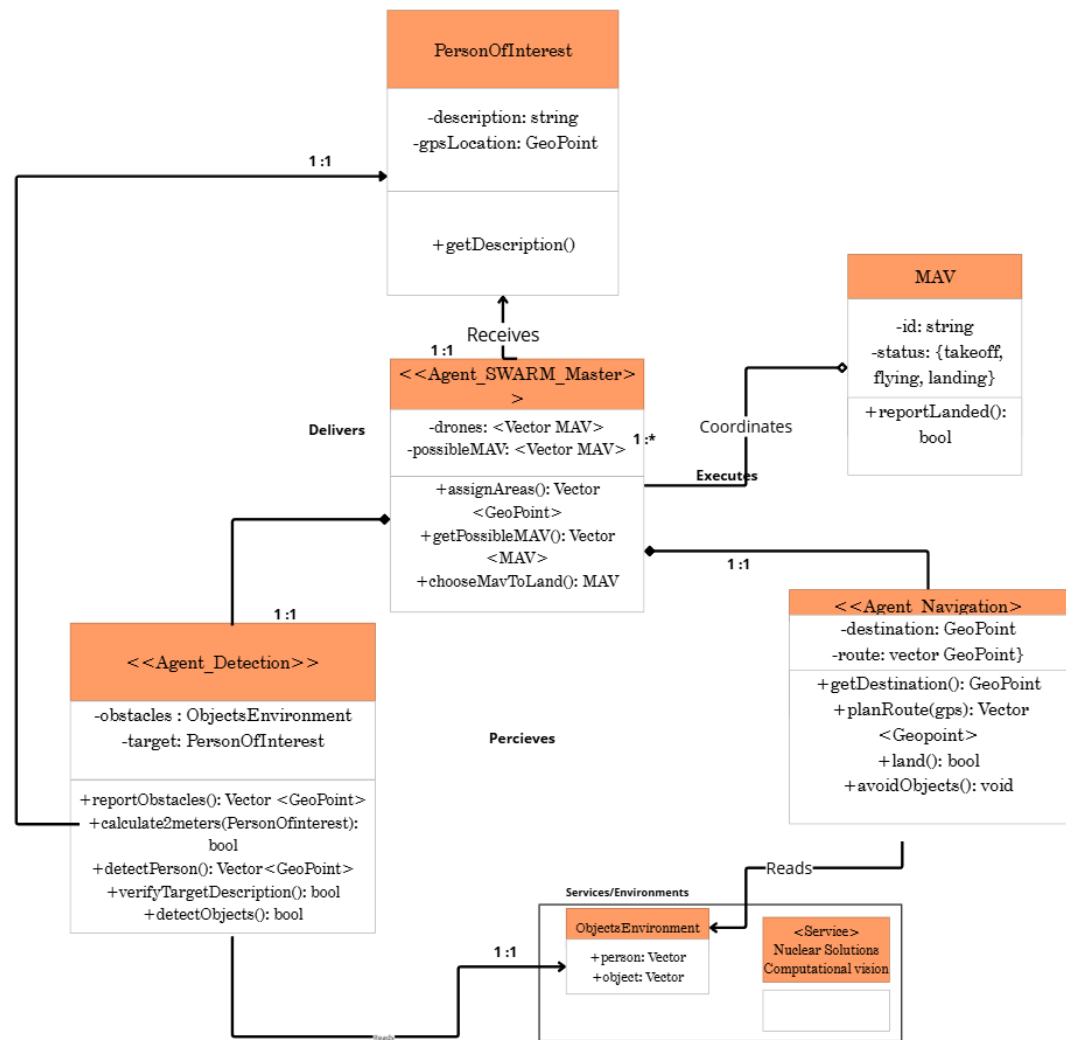
- 1) **Receive the mission:** The agent receives a text prompt with an instruction including a description of the person it's supposed to land next to and a close-by GPS location.
- 2) **Navigate autonomously:** The agent flies for at least 150 meters to the location of interest without human intervention.

- 3) **Search:** Once in the designed area the MAV initializes a search pattern, using its camera for scanning people. It must also analyze the collected data with the goal of identifying the person of interest described before.
- 4) **Perform final action:** Upon identifying the person of interest. The MAV must then perform an autonomous and safe landing 2 meters next to the target.

Agents & Responsibilities

The goal is that these drones are capable of performing tasks on their own with little to no intervention from the user and successfully completing the missions assigned. To achieve this, it is planned that each drone has 2 agents. The first agent would be responsible for computational vision, it will detect and recognize the characteristics, such as the clothes' colours, of our target. The second agent would be in charge of flying through the environment safely. The drones will be managed by an agent master, called SWARM master, this agent will designate them their search areas and give landing permissions when the person of interest is found.

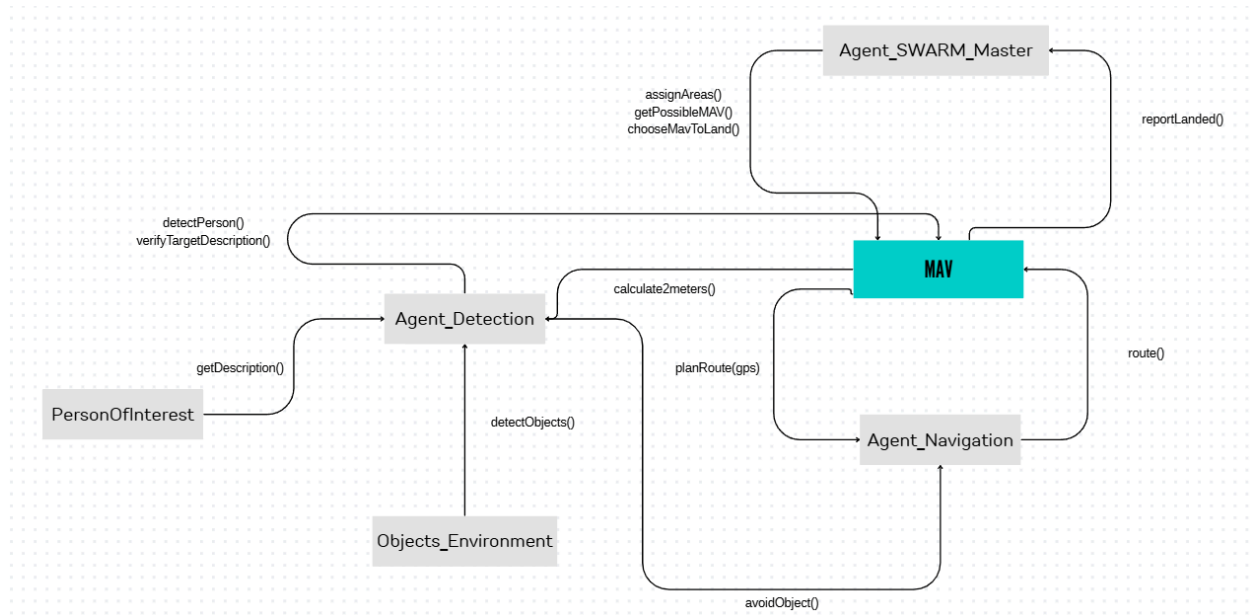
Agent Class Diagram



(In this first iteration of the Agent Class diagram we propose an outline presenting the different agents involved (e.g., MAV "Swarm", ground control, person of interest, people, etc.).

Agent Interaction Protocol Diagram

(A first iteration of the Agent Interaction protocol diagram.)



Work Plan & Acquired Learning

Pending Activities

For the next iteration the main pending activities and their responsables are the following:

Task	Responsible	Due Date	Estimated Effort
Refinement of Agent Diagrams	Team	23/08/2025	2 hours
Unity Project Setup	César	23/08/2025	1 hour
Agent Behavior Implementation	Ana	24/08/2025	1 hour
Plan Environment (sketch)	Demmi	25/08/2025	2 hours
Identify Elements to Model	Ariana	25/08/2025	1 hour
Formal Challenge Proposal Refinement	Luisa	26/08/2025	1 hour
Collaborative Documentation and Repository Update	Team	27/08/2025	30 minutes

First Review Plan

Task	Responsible	Dates	Effort
Repository Setup	Demmi	19/08/2025	30 minutes
Documentation	Luisa & Demmi	19/08/2025	1 hour
Agent Class Diagram	Team	20/08/2025	2 hours
Agent interactionProtocol Diagram	Team	20/08/2025	2 hours
Work Plan	Luisa	19/08/2025	30 minutes
Document Structure & Format	Demmi & César	19/08/2025	2 hours

Acquired Learning

As a team we basically have started to understand the basic theory of MAS, especially the different types of agents and how they can communicate with each other using simple messages or speech acts.

We also practiced with the idea of agents having roles and responsibilities, which helps us plan the challenge in a more organized way. For the practical side, we modeled some elements in Blender like a basic classroom and a rocket, even if these models are simple, they help us learn how to build the environment that the agents will use later in the simulation, so this gave us experience in creating objects that can be reused when we design the scenario for the final project.