Evidence 2: Review 1

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November 10th, 2025

Modeling of Multi-Agent Systems with Computer Graphics

Group 301

Team Information

Jimena Díaz Franco

Strengths:

- I'm responsible.
- I always ensure that everything is correct and complete, and that all deliverables meet the criteria.
- I have a good eye for spotting small errors or inconsistencies that others might miss.
- I always deliver my part of a project on time.
- I try to find solutions to challenges.
- I take the initiative to discuss ideas to solve challenges.
- I can learn concepts and some technical skills quickly.

Areas of Opportunity:

- Improve my communication skills, sharing my ideas with more clarity and keeping my teammates informed about progress and changes in the project.
- Enhance my knowledge of computer graphics software, like Unity, so I can contribute more effectively to the project.
- Develop my ability to anticipate roadblocks during this planning phase to help create a more robust workflow.

Expectations:
During this block, I expect to learn how to create and design multi-agent simulations using computer graphics tools like Unity and Blender, including learning and applying relevant algorithms that can help us provide an effective and intelligent system that addresses the challenge. Additionally, I hope to deliver a functional project for the client to help improve their processes and make them more intelligent based on environmental variables.

Ilan Gómez Guerrero

Strengths:

- I am a fast learner.
- I am very adaptable.
- I have creative thinking for solutions.

Areas of Opportunity:

- Improving my communication capabilities for sharing and explaining ideas.
- Improve logical thinking about future implementation or obstacles.

Expectations:

During this block I am very interested in the Multi-Agent System we will be creating due to my previous experience and knowledge in them. MAS has always been something very interesting for me, and also as the aspect of 3D Design of Environments and objects is something I left a little behind some years ago and connecting to my previous experience with it is exciting.

María Guadalupe Soto Acosta

Strengths:

- I'm a creative person who enjoys contributing ideas and finding innovative solutions.
- I adapt quickly to new tools, workflows, and challenges.
- I communicate well with my teammates and value collaboration.
- Even though I can be a bit disorganized at times, I always try to stay engaged and deliver good work.
- I like to bring a positive and open attitude to projects and team discussions.

Areas of Opportunity:

- Improve my organization and time management to better balance creativity and structure.
- Strengthen my focus and attention to detail, especially when handling multiple tasks at once.
- Continue developing my technical skills and familiarity with tools like Unity to contribute more effectively to the team.

Expectations:

During this block, I expect to learn how to apply Unity in contexts beyond video games ,for example, in simulation or intelligent systems. I also hope to apply methodologies related to both project management and software development. Overall, I aim to gain as much knowledge and practical experience as possible throughout this project

Francisco Raziel Andalón Aguayo

Strengths:

- I'm curious and analytical, and I enjoy understanding how things work, especially in complex systems.
- I'm good at connecting ideas from different areas to solve problems with creativity.

- I work well as a team player, supporting my teammates to make sure everything runs smoothly.
- I'm persistent when doing things. If something doesn't work, I keep trying until I figure it out.

Areas of opportunity:

- Sometimes I focus too much on technical details and forget to communicate clearly with my teammates about progress made.
- I would like to improve my 3D modeling and computer graphics skills, because most of my experience has been more on the logic and programming side.
- I want to manage my time better during the implementation phase so that all parts of the project stay synchronized.

Expectations:

I expect to better understand how multi-agent systems work, conceptually and with practical simulations, and I want to learn how to visualize intelligent behavior using computer tools like Unity. I also hope to improve my teamwork skills and be able to contribute to a final project that does what is required in a smart and efficient way.

As a team, we expect to achieve the following:
- Define multi-agent architectures based on system goals to detect anomalies through environment complexity and help to prevent pests in advance and avoid their spread to other crops.
- Identify and design autonomous agent interactions and communication.
- Improve simulation environments (Unity) for agent modeling and testing.
- Apply AI and vision techniques for detection tasks.
- Deliver a functional project that achieves all client criteria and helps improve their current technologies and processes.

We commit to:
- Participate actively and contribute meaningfully in all phases of the project, from planning and design to development and testing.
- Deliver high-quality work on time for every assigned task, milestone, and document..
- Communicate roadblocks, delays or challenges, and provide help and constructive feedback.
- Hold each other accountable while being ready to help, ensuring no one is left behind.
- Adhere to the team's agreed-upon workflows, including version control (in this case GitHub), code/documentation standards, and meeting activities.

1. Challenge Description

The agricultural sector currently faces a critical loss of 20% to 40% of global production caused by pests, diseases, and labor shortages. This issue is primarily due to the late detection of anomalies through visual inspections, which often leads to inefficient resource use, increased operational costs, and reduced productivity.

To address this challenge, the proposed project focuses on the development of a multi-agent system capable of autonomous and timely detection of anomalies in crops. Through this approach, we seek to enable the precise and selective management of infected plants or fruits, improving productivity and sustainability in controlled environments such as greenhouses.

2. Digital Representation

The system will operate in a simulated digital environment representing a greenhouse. The model will be built using Unity, employing grid-based navigation to allow each agent to move efficiently within the environment. The simulated crops will include healthy, mature, and infected fruits. Each agent will perform specific autonomous tasks that collectively maintain the health and productivity of the greenhouse.

3. Agents and Their Architectures

3.1 Agent: Analyzer

- **Role:** Detects infected fruits using camera input and marks their position for further action.
- **Possible Implementation:** Drone equipped with vision-based detection.
- **Architecture Type:** Deliberative Agent
- **Architectural Components:**
  - **Beliefs:** Current visual data, crop map, detection models.
  - **Desires:** Identify infected fruits accurately.
  - **Intentions:** Capture image data → Process → Mark coordinates of infected fruit.

3.2 Agent: Remover

- **Role:** Moves to the position of infected fruits marked by the Analizador and removes them from the environment.
- **Architecture Type:** Hybrid Agent
- **Architectural Components:**
  - **Beliefs:** Location of infected fruits, grid map, movement status.
  - **Desires:** Eliminate infected fruits efficiently.
  - **Intentions:** Plan and execute a path to the target location.
  - **Reactive Layer:** Detects obstacles dynamically while moving.
  - **Deliberative Layer:** Determines optimal path to target and updates goals as new infected fruits are detected.

3.3 Agent: Harvester

- **Role:** Detects and removes mature fruits ready for harvesting.

- **Architecture Type:** Reactive Agent
- **Architectural Components (Layers):**
  - **Perception Layer:** Detects mature fruits in the environment.
  - **Decision Layer:** Determines if removal is required.
  - **Action Layer:** Moves to and removes mature fruits.

4. Relationships Between Agents

Agent A	Agent B	Type of Interaction	Description
Analyzer	Remover	Communication	Sends infected fruit coordinates for removal.
Analyzer	Harvester	Coordination	Share environment updates to avoid interference.
Remover	Harvester	Cooperation	Collaboratively maintain crop quality and resource efficiency.

5. Work Plan

Task	Description	Responsible	Estimated Date	Effort (hours)	Status
Create GitHub repository	**Set up repo for code and documentation**	Jimena	November 10th	0.5	Done
Create communication channel	**(Teams, Discord, etc.)**	Paco	November 10th	0.1	Done
Define simulation environment	**Build initial grid and greenhouse in Unity**	Ilan	November 15th	2.0	Unfinished
Implement Analyzer agent	**Detection and marking system**	Ilan	November 18th	2.0	Pending
Implement Removedor agent	**Path planning and removal**	Jimena	November 23th	2.0	Pending
Implement Cosecha agent	**Harvesting logic**	María	November 25th	2.0	Pending
Integrate and test agents	**Validate agents coordination in simulation**	María	November 28th	1.0	Pending
Document progress	**Update proposal and learning**	Paco	November 30th	1.0	Pending