Deliverable E: Project Schedule and Cost

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Abstract

This paper will discuss the projects overall cost, design drawings as well as a plan for task division and prototype planning.

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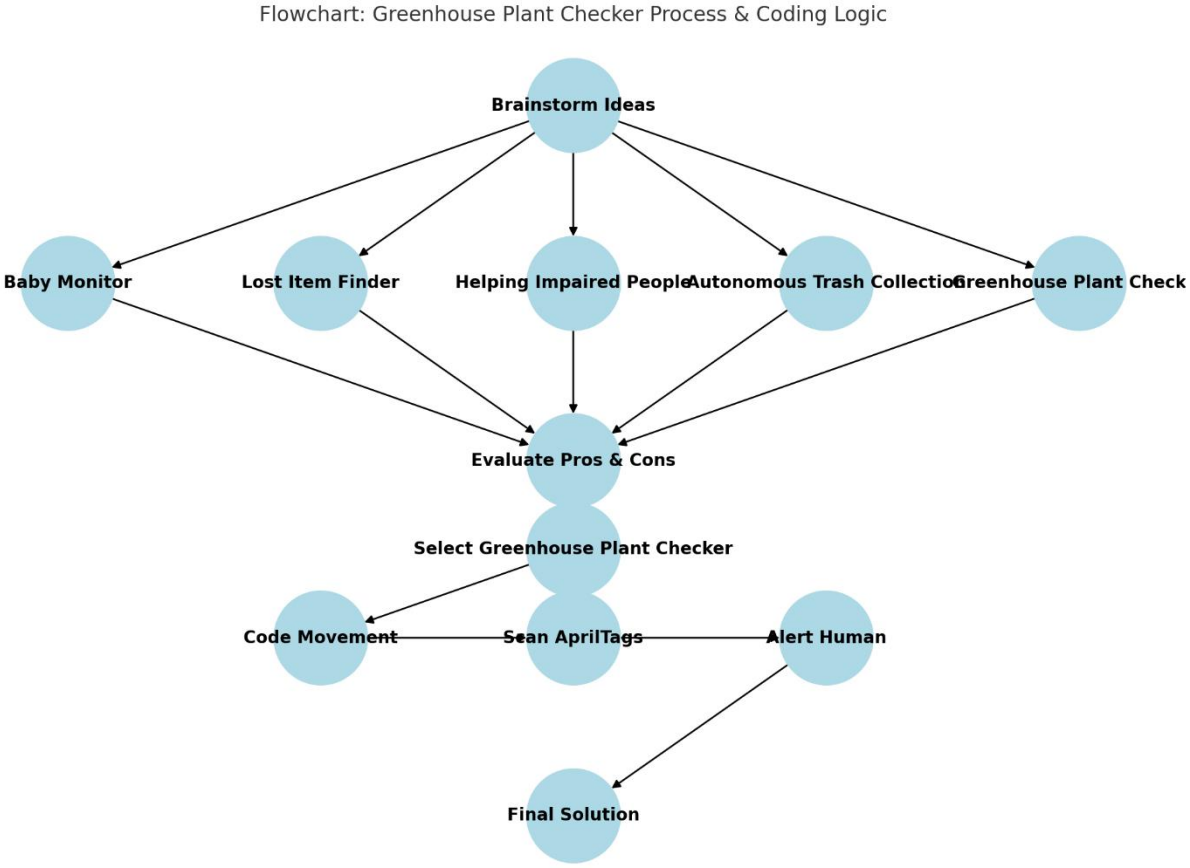
1.0 Introduction

The successful completion of this project requires planning and organization to ensure that all the necessary tasks are completed efficiently before the given deadline. This document outlines our project schedule, task planning, budget and prototype testing strategy to ensure that our team meets all design and functionality objectives.

The purpose of this deliverable is to provide a structured roadmap for our project detailing the tasks that must be completed, their estimated durations, and the team members responsible for each component. Additionally, we will outline the costs associated with the project, including materials, components, and any required software or hardware. Our testing plan will establish clear objectives and criteria for evaluating out prototype's functionality, allowing us to iterate effectively and refine our design.

By following this structured plan, our team will stay on track and mitigate potential risks, ensuring we deliver a high-quality prototype by the final deadline.

2.0 Design Drawing



This flowchart visually represents the steps taken to arrive at the **Greenhouse Plant Checker** as the final project solution and outlines the robot's coding logic.

1. Brainstorming Ideas

The project began with a brainstorming session, where the team generated five potential ideas:

- Baby Monitor using RoboMaster S1
- Lost Item Finder
- Helping Impaired People
- Autonomous Trash Collection
- Greenhouse Plant Checker

Each of these ideas was evaluated for feasibility, effectiveness, and practicality.

2. Evaluating Pros & Cons

Once the five ideas were listed, the team **weighed the advantages and disadvantages** of each concept. This included consideration:

- Technological feasibility
- Hardware & software requirements
- Practicality & usefulness
- Complexity of implementation

After careful evaluation, the team determined that the **Greenhouse Plant Checker** was the best option.

3. Selecting the Final Idea

After the assessment, the Greenhouse Plant Checker was chosen as the final project idea due to its practical application and implementation ability using RoboMaster S1.

Robot's Coding Logic

Once the final idea was selected, the coding plan for the robot was structured as follows:

1. Coding the Movement
    a. The RoboMaster S1 will be programmed to navigate a predefined path inside a greenhouse.
    b. This includes movement controls, gimbal adjustments, and ensuring smooth navigation.
2. Scanning April Tags
    a. The robot will scan April Tags placed near plants to identify their health status.
    b. These tags may represent different plant conditions (e.g., healthy, needs water, or unhealthy).
3. Alerting the Human

    a. After scanning, the robot will process the data and determine if an alert is necessary.
    b. If a plant requires attention, the robot will notify a human via a pre-recorded message or an LED/sound alert.
4. Final Solution
    a. The entire system will work together to ensure the Greenhouse Plant Checker functions autonomously, providing valuable feedback to the user.

3.0 Project task planning

When considering the flow chart above, it is necessary to have a good understanding of the task that need to be completed in order to reach our desired product. The following table will contain a list of the tasks that need to be completed, a description of those tasks with an estimate for its duration, the teams desired due date and who will be assigned to each task.

Table 1: Task division and planning for the 'Garden Helper'.

Task	Description	Desired Completion Date	Who will do it?
Coding the movement of the robot	This will involve the coding of the Robomasters movement around the area, how much to move its gimbal and how far it should travel. This should take about 2 days to complete	Wednesday February 26th, 2025	Aryan and Hassan
Coding the sensors	This will be the coding of the sensors to ensure the robot knows its surroundings and desired path. This should take about 1 to 2 hours of work.	Sunday March 2nd, 2025	Antonios, Kailas and Kiefer
Coding the scanners	This is to ensure the Robomaster scans the desired AprilTags to show the plants state and health. This task should take about 2 days.	Wednesday, March 5th, 2025	Kiefer and Hassan

Making AprilTag to scan	This will be done to make sure the AprilTags, profile is made to have something to test the scanning on. This should take approximately 2 days.	Wednesday March 5th, 2025	Aryan and Antonios
Testing #1	This will be the first test to see how the Robomaster moves and how it will do with the scanning. Should take 1 hour.	Friday March 6th, 2025	Entire group.
Adjusting and trouble shooting	This will be fixing the issues that arose from the first test and adjusting any faults during the first test. Should take about 3 days.	Wednesday March 12th, 2025	Kiefer and Kailas
Testing #2	This will be ensuring the robots issues are fixed and adjusted. Should take 1 hour.	Thursday March 13th, 2025	Entire group.
Creation of plant base	This will be 3D printing the bases for the plants to stand on and have the April tags on. It will take about 5 days.	Tuesday March 18th, 2025.	Antonios and Aryan.
Creation of multiple AprilTags	This will be creating 2 more AprilTags for us to have 3 tags total and have a set list of things the robot does for each plant/tag. This will take 2 days.	Tuesday March 18th, 2025	Hassan and Kailas.
Make set path for robot to follow	This will be to ensure the Robomaster's path is defined, and all its instructions are good to go for the final	Tuesday March 18th, 2025.	Kiefer

	product. Should take about 3 days.		
Testing #3	This will be a test to see how well our message is conveyed and will be shown to a couple random people in different programs to see if the robot looks like its fitting our desired message. Will take 3 hours	Tuesday March 20th, 2025	Entire Group
Testing #4	This will be done to test the final product and how it will function. Will take 2 hours	Thursday March 24th, 2025	Entire Group
Finalizing product	Will finalize and fix any issues from testing #3. Will take 3 days.	Monday March 25th, 2025.	Entire Group.
Testing #5	This will be the final testing and simulation to ensure the robot is running for its desired use and programming in preparation for design day. There should be no issues that arise at this final testing.	Tuesday March 26th, 2025	Entire group

As seen in the table above, there are many tasks that will need to be completed for this project to work properly by Design Day on the 27th of March. The main goal will be for the team to try to finish tasks ahead of the due date to be ahead of schedule and spend more time perfecting and finalizing the product. That being said, there are some concerns that need to be addressed when considering the tasks completions.

1. Tasks lasting longer than anticipated; this can happen at any point and slow our progress down, especially if a due date is missed. This is why all members assigned to a task need to work together to work on the task and ask for any help when necessary.
2. Procrastination and falling behind; this can happen when juggling other classes and assessments for those classes. Falling behind is less than ideal and can mean some

aspects of our design will need to be dropped to have a product to show on design day.

3. Difficulty of tasks; depending on the difficulty of certain tasks, our work may be cut out for us meaning, some components will need to be dropped. This is hard to know and predict until these problems arise from working on prototypes, but nonetheless is something that needs to be considered.

To make sure these risks don't come true, it is essential to communicate with each other and tackle tasks as a team. If one of these concerns or any other concerns arise, the team will meet to discuss alternatives and how to address the issue. With this plan, Group 10 should be capable of delivering its desired product by the time Design Day rolls around!

4.0 Budget and Required Components

This table outlines the essential materials needed for the project, detailing their purpose, cost, and where they can be obtained. Each item plays a specific role, from video props to AI-related components, ensuring the smooth execution of the project without additional expenses.

Table 2: Budget and equipment necessary for the 'Garden Helper'

Product	Justification	Price	Link
Plants (from outside)	- Props for video	$10	Dollarama In-store
April Tags	- Needed to represent the "AI" component for the robot	$0	N/A
DJI software	- Needed to be able to program the robot	$0	N/A
Robomaster S1	- Needed to represent "killer" robots	$0	In Makerspace
3D printed pots	- Needed to pot the plants for the video	$10(for material)	From the 3D printer in the Makerspace

Computer/laptop	- Needed to access the software	$0	Provided by the team members

As seen above, the project should stay within the 50$ budget range. In total the things needed for this project will cost approximately 20$, and receipts and proof of purchases will be provided further down the line.

5.0 Prototype Test Planning

The following table contains the information on the prototyping as well as a detailed explanation of the testing which will be conducted for the project on each given prototype.

Table 3: Prototype test planning for the 'Garden Helper'.

Test					Prototype			
N°	Objective	Test Method	Usage of Results	Test Duration	Type	Objective	Fidelity	When to realize
1	Test Motion and scanning	See how well it performs and how long it takes to scan.	Determining distance traveled before turning to scan, if the scan is successful and how long it takers to transmit information	2 hours	Focussed physical	Performance of robot in motion and basic scanning	Low	06-03-2025
2	Test to see if any problems persist from test 1	Again, evaluate its performance and see if all issues from test 1 are resolved	Verify and compare times between this test and test 1	1 hour	Comprehensive	Performance of robot in motion and basic scanning	Low	13-03-2025
3	Test message and transcribe	Ask people who aren't in engineering	Evaluate people's responses via	2.5 hours	Technical focused	Ethical concerns and meaning/	Low	20-03-2025

	d meaning seen by others	what they think the meaning of the robot is and evaluate/quote their answer to show when presenting	recordings and quoting. Will be a live poll of sorts.			look of robot		
4	Test the product with all added features	Testing how well the product performs with all final features and added code	Evaluate performance of robot when scanning all three plants, how well information is transmitted, and how well the path is followed (is it smooth?).	2 hours	Comprehensive	Performance of robot with added tasks and code	Low	24-03-2025
5	Final testing for the final product	Evaluating the overall final performance of the robot and how well it accomplishes its task.	Seeing if everything runs smoothly by comparing numbers form test 4 to the numbers from this test.	1 hour	Comprehensive	Performance of final product before development/design day	Low	26-03-2025

As seen in the table above, the test planning for each prototype and its type is planned out according to the task plan for the project leading up to the design day. Doing these tests should ensure the desired goal is reached with an excellent product, with no faults or errors. This testing will also be done with the goal of making the robots movement and actions as smoothly as possible for when design day comes to be.

6.0 Conclusion

The completion of this project will require careful planning and organization to ensure all design and functionality objectives are met within the given timeline. By structuring our approach through detailed task planning, budgeting, and prototype testing, we will be able to create a well-documented process for the development of our solution.

Our design drawing will provide a comprehensive visualization of how the system functions, outlining the logical flow of the robot's operations and the code execution. (Add details about the design drawing after completion.)

Throughout the development process, we will carefully plan each phase to avoid delays and ensure steady progress. The task planning section will outline clear roles and deadlines for team members, minimizing risks associated with missed deadlines or unforeseen difficulties. Budget considerations will also play a critical role in ensuring that all necessary components are acquired without exceeding resource limitations.

To validate our work, prototype test planning will be a key component, allowing us to iteratively refine the system based on test results. (add stuff about test plan, what we found, and improvements)

By following this structured methodology, our team will aim to navigate challenges and work toward developing a functional prototype aligned with the project goals. This approach will help ensure that the final design meets all requirements and performs as intended.