Executive Summary

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Contents

1 Design Problem

The purpose of this project is to design and implement a smart system that provides recommendations and automatically controls a user's irrigation system to increase the garden's outputs.

This system will initially be designed for a home garden, but may be extended for use in a commercial setting. Ideally, this system can be added to any existing garden but may be a great tool to consult when designing a garden. The system will include a friendly user interface, through a web-app, that will contain information from a multi-purpose soil sensor, which may include humidity, temperature, soil nutrient composition, and possibly other relevant data. The web-app will also interface with local weather data to adjust the amount of water given to plants. The data would then be used to assist the user in scheduling their sprinklers and creating a task list for the user to complete in order to make caring for the garden as straight-forward as possible, while also ensuring that the garden is being properly cared for. Furthermore, the user can manually control the system and make schedule changes as needed.

2 Approach

In terms of the task management process we will be tracking tasks with Trello. The project team will be able to track which team members are working on which tasks for the project. We will be using a scrum-style development method, where we meet weekly and create tasks and assign them. We will update regularly with task progress and communicate early if a task needs to be changed or reassigned. We will be tracking all of our source code with git and will have specific guidelines for code syntax and branch management to reduce confusion.

The first phase for this project will be to develop a list of minimum viable product (MVP) requirements that the project will have. The second phase will be to research how to best create and design the necessary components of the MVP. Next, we will begin creating and implementing the components. The final phase will consist of debugging and testing to ensure that the final product meets the standards that were outlined by our project partner.

The project will focus on serving the project partner specifically. During development, we will be designing the hardware and software in the context of the project partner's back yard. However, we will be designing the software in a way that would make it applicable to other irrigation projects as well. The goal is to design a general software that is compatible with different irrigation systems.

At the end of the project, the project partner will have a smart irrigation system that will provide feedback and recommendations to the user based on sensed data and globally available data. Additionally, the project partner will have a mobile device that will be able to check the quality of the soil when probed. A significant difference between what we will be creating and what exists on the market is that current irrigation controllers do not dynamically react to weather information and typically have an unpolished user interface. We will be using information from sensors, paired with a scheduling system and live weather information to water plants in the most beneficial way possible.

The project partner has very flexible project guidelines, and encouraged refining the project to fit our needs for a project. The initial project that we have decided reflects the conversation with our project partner.

3   Project Timeline

3.1   Group Timeline

Week 3	Team formed, meet with project sponsor, engineering requirements draft
Week 4	Communication evaluation meeting, risk register (individually), research individually
Week 5	Writing workshop
Week 6	(draft, sub-teams) block diagram, bi-weekly progress video,
Week 7	Update sponsor, instructor system architecture meeting, project charter
Week 8	Teamwork reflection video, bi-weekly progress video
Week 9	(sub-teams) engineering requirements, (sub-teams) block diagram
Week 10	Research implication report, project partner update, bi-weekly progress video, block validation(s)
Fall Finals	Prototype demonstrations
Week 13	Majority of blocks of system is done
Week 15	All blocks of system design done
Week 17	PCB sent out for fabrication
Week 23	Integrate hardware and software
Week 24	Build PCB
Week 25	Film the project summary video

Table 1: Groups Timeline

3.2   Individual Timelines

Caleb:

Week	Task
Week 1	Research
Week 3	Similar systems
Week 4	System Requirement
Week 7	Enclosure expectations
Week 8	Design schematic for power supply
Week 11	Enclosure drafting
Week 13	Verify requirements
Week 14	Design aesthetics
Week 17	Build enclosures
Week 22	Build PCB
Week 24	Mount enclosure and PCB
Week 26	Film Verification's

Table 2: Caleb's Timeline

Boyuan:

Week	Task
Week 3	Reasearch
Week 4	Humidity, temperature, light
Week 5	Water required by plants
Week 6	Design a PCB
Week 8	Order PCB
Week 13	Design a code for Sprinkle
Week 14	Try to connect the sprinkler and Controller
Week 16	Run Sprinkler code
Week 17	Assemble the PCB
Week 18	Put the PCB in the enclosure
Week 20	Begin testing the Sprinkler
Week 21	Try to connect the controller and Sensor controller
Week 23	Film the sprinkler and controller in action

Table 3: Boyuan's Timeline

4   Lessons

In team projects, communication is very important, and working alone may have serious consequences. In the final stage of this project, I received an email informing me that a team member had given up participating in this project for some reason, and I was not in the United States for some reason. In the final stage of this project, the communication between team member Caleb and me helped us a lot. And the communication between the mentor and me played an important role. In a team project, there is a connection between the modules that everyone is responsible for, so the team project can only be completed if they understand each other's tasks and communicate adequately. In the future work, there may be situations such as members leaving or project delays. I am lucky to learn how to deal with these situations in advance.