Wireless Solar Powered DC Valve Controllers Executive Summary

The purpose of this project is to design a wireless farm irrigation control system that is powered by solar panels. Proper irrigation and watering is necessary for growth and return on investment on farms. To automate and simplify this process, our team has developed a solar powered system that will be controlled through an online web server that can remotely turn the irrigation system on and off.

The system is split into three main systems: the irrigation nodes, the control system hub, and the webserver. The control system hub communicates with a webserver to give the user an overview of the entire system, any errors occurring in the system, and control over the watering schedule. Solar powered irrigation nodes connect to solenoid controlled valves that stop or allow water flow through pipes. A primary hub wirelessly commands the irrigation nodes and requests data from them. Finally a web server connects to the primary hub which allows for watering schedules to be created to run automatically throughout the day by sending commands to irrigation nodes, show the current status of the system, and generate warnings if something is wrong in the system.

This project was developed using a 30 week development cycle split into 3, 10 week stages. The first stage involved creating team standards and developing project requirements that fulfill the project partner's desires for the final product. During this first stage, we created a block diagram and the high level descriptions of the system. The second stage involved the previously created diagram and high level descriptions and we will built and verified that our system works. The final stage was the presentation stage, where we presenedt the fully completed project and transfered the technology developed for a future team to work on. During each phase of the design, the Project Documentation served as a hub for the work we had done and had yet to do - and it was continuously updated as we completed different tasks. There were checkpoints built into each stage, wherein we had the opportunity to evaluate our designs and ensure we were still meeting project requirements. We split the project design into 8 independently created blocks with pre-defined interfaces, where each team member owned 2 blocks and was in charge of ensuring the block met interface properties. Those blocks then came together for system integration, creating the fully completed system.

We learned a lot during this project, with lessons ranging from how to better design PCBs to how to effectively communicate as a team. Many of the recommendations in the Project Documentation center around two key points: starting early enough to give ample time for design and debugging and ensuring that technical knowledge is not isolated to one team member. Starting early and having a good basis for the designs is key to a design's success, while it is easy to create a quick design for a deadline, it will harm the project's overall success later. While each block has one lead engineer, distributing the knowledge of the design information of the block to at least one other team member increases the amount of work that can be done, as few team members are needed to have complete understanding of the system. This cannot be understated, while it is more work to keep 2 people up to speed on a design and all of its inner workings, it becomes paramount during system integration.

The project design process and future recommendations are further elaborated on in the Project Documentation artifact.

Project Timeline and Task Descriptions

Stage 1

Week	0	1	2	3	4	5	6	7	8	9	10
Dates	9/22 - 9/25	9/26 - 10/2	10/3 - 10/9	10/10 - 10/16	10/17 - 10/23	10/24 - 10/30	10/31 - 11/6	11/7 - 11/13	11/14 - 11/20	11/21 - 11/27	11/28 - 12/4
Task 1.1			Team Standards								
Task 1.2				Team Risks							
Task 1.3				Gap Analysis							
Task 1.4				Executive Summary							
Task 1.5					Project Requirements						
Task 1.6					Project Risk Analysis						
Task 1.7							Top Level Block Diagram				
Task 1.8								Block Descriptions			
Task 1.9								Interface Definitions			

Stage 1 Task Descriptions

Task	Champion	Stakeholder	Status
1.1 Team Standards	Ekaterina Rott	Team	Completed
1.2 Team Risks	Salem Almazrouei	Team	Completed
1.3 Gap Analysis	Isaac Goshay	Instructors	Completed
1.4 Executive Summary	Orion Hollar	Instructors	Completed
1.5 Requirements	Orion Hollar	Project Partner	Completed
1.6 Risk Analysis	Salem Almazrouei	Team	Completed
1.7 Block Diagram	Orion Hollar	Project Partner	Completed
1.8 Block Descriptions	Ekaterina Rott	Instructors	Completed
1.9 Interface Definitions	Isaac Goshay	Instructors	Completed

Stage 2

Week	11	12	13	14	15	16	17	18	19	20
Dates	1/3 - 1/8	1/9 - 1/15	1/16 - 1/22	1/23 - 1/29	1/30 - 2/5	2/6 - 2/12	2/13 - 2/19	2/20 - 2/26	2/27 - 3/5	3/6 - 3/12
Task 2.1	Block 1 Verification									
Task 2.2					Block 2 Verification					
Task 2.3									System Level Integration	

Stage 2 Task Descriptions

Task	Champion	Stakeholder	Status
2.1 Block 1 Verification	Team	Instructors	Complete
2.2 Block 2 Verification	Team	Instructors	Complete
2.3 System Level Integration	Team	Team	Complete

Stage 3

Week	21	22	23	24	25	26	27	28	29	30
Dates	3/28 - 4/2	4/3 - 4/9	4/10 - 4/16	4/17 - 4/23	4/24 - 4/30	5/1 - 5/7	5/8 - 5/14	5/15 - 5/21	5/22 - 5/28	5/29 - 6/4
Task 3.1	Presentation Preparation									
Task 3.2	System Final Touches									
Task 3.3					Project Closing					
Task 3.4										Tech. Transfer

Stage 3 Task Descriptions

Task	Champion	Stakeholder	Status
3.1 Presentation Preparation	Ekaterina Rott	Instructors	Complete
3.2 System Final Touches	Ekaterina Rott	Instructors	Complete
3.3 Project Closing	Ekaterina Rott	Project Partner	Complete
3.4 Technology Transfer	Orion Hollar	Project Partner	Complete