Post-Mortem for
Smart Garden System

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TABLE OF CONTENTS

Table of Figures 1

1.0 INTRODUCTION 2

1.1 Project Background 2

2.0 PRODUCT DESIGN PROCESS 3

2.1 Description of Project 3

2.2 Hardware Design 3

2.3 Software Design 3

2.4 Firmware Design 6

3.0 FINANCE 6

4.0 SCHEDULE 7

5.0 CHALLENGES 7

6.0 GROUP DYNAMIC 8

6.1 Individual Reflections 9

7.0 CONCLUSION 15

References 15

TABLE OF FIGURES

Figure 1: High level graphic of the smart garden system

Figure 2: Elastic Beanstalk Console with Health Monitor and Version Control

Figure 3: Web App Login

Figure 4: Web App Homepage

Table 1: Expect and Actual Cost

Table 2: Initial and Actual Schedule

1.0 INTRODUCTION

The following documentation describes the post-mortem of the E-garden project. High-level functionality of our proof-of-concept model and accompanying firmware and software will be highlighted. A comparison between the estimated schedule and costs will be compared to the actual schedule and costs incurred. In addition, a section describing the resulting group dynamics and individual reflections on the project will be provided. All meeting minutes will be in Appendix A at the end of this document.

1.1 Project Background

A study suggested that the average North American family uses 320 gallons of water per day, about 30 percent of which is devoted to outdoor garden usage. However, over 50 percent of the water used in the garden is wasted due to inefficient watering methods and system (EPA, 2015). Despite the water wasted in the garden, the traditional watering system is not flexible to changing weather and different plants types. In fact, the amount of water that is required can vary upon the type of plants, climate and locations. Particularly, in Southeast, where the climate is dry, a household can have 60 percent of its water used in their garden (EPA, 2015), whereas in Northwest, only 40 percent of its water is used in the garden because the weather is wet.

Traditional watering system may also do harm to the plant by over watering or lack of watering. People are natural to forget watering their plants, or they could use too much water when it is about to rain so the plants are drowning. Thus, the objective of our project is to design a garden system which you can access the real time moisture, temperature and weather information through our web application, and make watering schedule automatically or manually by tab a button on our web application (high-level graphic shown in Fig 1).

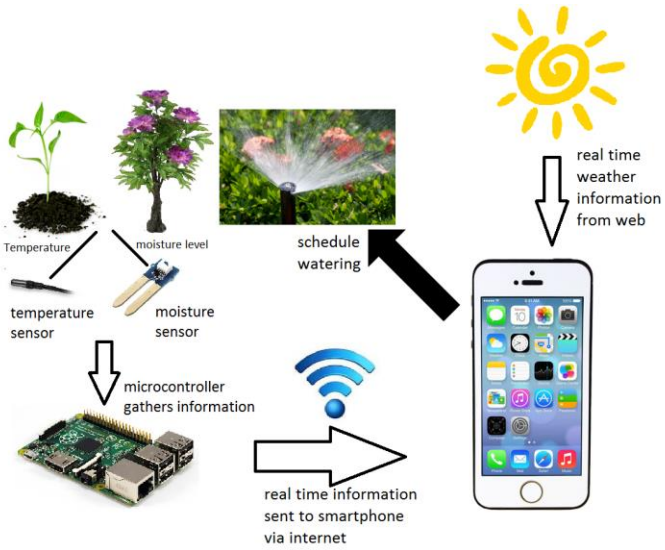

Figure 3: High level graphic of the smart garden system

2.0 PRODUCT DESIGN PROCESS

2.1 Description of Project

The Smart Garden System will detect the environment temperature and soil moisture, and automatically set the irrigation time based on the kind of plant which the user choice. The system will also send the information of temperature and soil moisture it detected to the user, so that the user can decide the irrigation time based on this information. This system design consists of three main parts: the hardware design, the software design and the firmware design.

2.2 Hardware Design

The hardware design part is composed of three components: the sensors system, the communication system and the irrigation system.

The sensors system contains one DHT11 temperature sensors and at least two YL-69 soil moisture sensors. The DHT11 sensor provides the air temperature information to the system by collecting the data from air directly. The YL-69 moisture sensor detects the humidity of the soil surround the plant. Based on the number of plants which the user wants to observe, we can add or reduce the number of YL-69 sensors to make the number of YL-69 sensors always equal to the number of plants which user choice. The DHT11 sensor can output digital signal directly, the system can read the temperature information without any transformation. The signal of YL-69 sensor outputs is analog signal; the system can convert it to digital signal by the formula “(1023-the reading of analog signal)/10”.

In the early stages of the project, the communication system was that connecting the sensors to the Raspberry Pi directly by some wires. However, the original communication system not only limited the communication range, but also could not ensure the safety of communication. Therefore, we made the communication system wireless by adding the Bluetooth module. Now, all the communication among the hardware parts are through the HC-05 Bluetooth module. After paring with the Raspberry Pi, the HC-05 module can provide a full-duplex communication through the serial in the Arduino Uno microcontroller [3]. The data can be transported without any change through this Bluetooth module.

With our end result, the sensors are connected with the Arduino Uno microcontroller, the microcontroller receives and converts the signal of sensors; send them to the Raspberry Pi through the HC-05 Bluetooth module. The servo motor could be controlled by the Raspberry Pi through the HC-05 Bluetooth module, too.

2.3 Software Design

Web Application was chosen as the primary interface to users, as web applications are accessible to all platforms with internet access. Elastic Beanstalk is a PaaS offered from AWS which allows the users to launch web app and push them to a definable set of AWS services including Amazon EC2, Amazon S3 and Amazon Simple Notification Service. For the proof-of-concept model, only the data for one user with two different types of plants is illustrated. However, the production model will potentially have a large number of users accessing their plants information with their own username and password. The

Elastic Beanstalk, which is a service offered by AWS, can handle the capacity provisioning, load balancing, scaling and application health monitoring (as shown in Fig 1). Thus, one of the reasons behind choosing AWS and Elastic Beanstalk to host the web app is that they make load balance and big data analyze much easier. User data will become a valuable resource in the future. AWS has the function that can easily analyze the data when our product comes to the production stage.

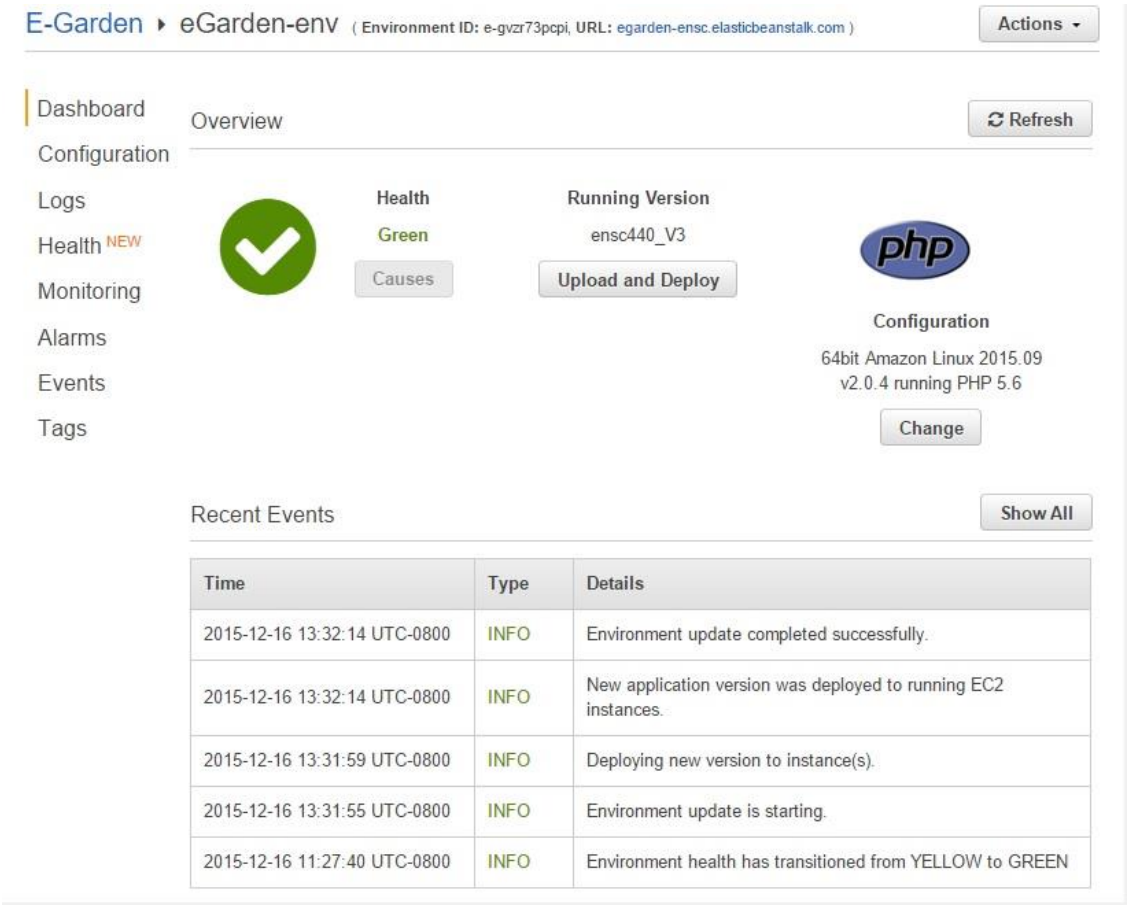

Figure 2: Elastic Beanstalk Console with Health Monitor and Version Control

The users will be asked to login to their own account before they can access the E-Garden home page of their own plants (as shown in Fig 2 below). The login function is used to handle multiple users, which means the website has the potential to become a community where people can post and share their

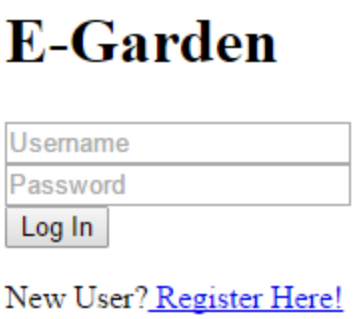

Figure 3 Web App Login

The homepage displays the moisture level and the soil temperature (as shown in Fig 3). There is also a button to turn auto-watering on or off, and another button to water the plant immediately. Since the soil temperature and moisture level would not change dramatically in a short time, the information is refreshed once every 10 minutes.

Figure 4: Web App Homepage

2.4 Firmware Design

The firmware design is basic on raspberry pi, and it is the main controller of the product. The raspberry pi helps to connect the device and webserver, in order to send and receive data. Since we have to collect the data from the temperature sensors and moisture sensors, so that we have to use Bluetooth to collect data from Arduino to Raspberry Pi. As the reason, we had used a Bluetooth receiver to collect data by using python script. And our system also has to run two process function, so that we put a code ('sleep()') in order to control the time of receiving data and separate two sets of data. Furthermore, we had written a code for connect MySQL server that can easily insert data from raspberry pi to webserver. And I also wrote a code and receive string numbers from Arduino Bluetooth, then I change the value into float number in order to let database receive the right value.

3.0 FINANCE

Smart Garden Inc. has received funding from the Engineering Student Society Endowment Fund (ESSEF) in the amount of $375.00. We are currently a little bit go over our initial budget of 374.83. Since it is our primary source of funding, this fund was used to purchase major hardware components. The current breakdown of parts used is shown below.

Item	Estimated Cost	Actual Cost	Difference
Raspberry Pi 2	65.99	$123.14	-$57.15
Soil moisture sensor	$14x2	$7.5	+$20.5
Temperature sensor	$4.99x2	$7.5	+$2.5
LCD display	$23.99x2	-	+$47.98
Micro Servo Motor	$14.99x2	$14.99	+$14.99
Plant water Sprinkler	$5x4	-	+$20
Small water pump	$21.45x2	-	+$42.9
Wi-Fi USB Adapter	$9.99	$7.99	+$2
SD card	$9.99	-	+$9.99
Amazon web Sever fee	$0	$10	-$10
Arduino	-	$33x2	-$66
Bluetooth	-	$35x3	-$105
3D-Printing Encloser	-	$36	-$36
Battery	-	$10	-$18
Other Cost	$60	$20	+$30
Shipping	$50	-	+$50
Totals	$374.83	$408.12	-$41.29

Table 1: Expect and Actual Cost

4.0 SCHEDULE

Smart Garden Inc. slowly fell behind the schedule. Research and selection of the system components took longer than initially outlined in the project proposal. While we planned for additional time for testing and integration, most design and development tasks took longer than expected. Documentation was always completed on time due to its hard deadlines, so other tasks were delayed and pushed back. By the end of October, we had some problems on the Web application integration and watering system. However, we still manage to finish the project on time. Table 2 illustrates our initial schedule goal and actual schedule for the project tasks:

Task	Initial schedule date	Actual schedule date
Research and Selection components	September 11, 2015	September 17, 2015
Research-Watering	September 26, 2015	September 30, 2015
Project proposal report	September 28, 2015	September 28, 2015
Functional specification report	October 20, 2015	October 20, 2015
Ordering and have all Materials by	October 31, 2015	October 23, 2015
Application programming	October 31, 2015	October 31, 2015
Oral Progress presentation	October 27, 2015	October 27, 2015
Design Specification Report	November 15, 2015	November 15, 2015
Hardware Design and Development	November 20, 2015	November 20, 2015
Firmware Design and Development	November 20, 2015	November 20, 2015
Testing & Combining all parts	November 31, 2015	December 11,2015
Written progress	November 29, 2015	November 29, 2015
Presentation	December 17,2015	December 17,2015

Table 2: Initial and Actual Schedule

5.0 CHALLENGES

The major challenges in the software part comes from the communication between the web application and the server. Combining MySQL query into PHP and AJAX webpage requires a deep understanding of web structure, which most Electrical Engineers are not familiar with. a In addition to communication issues, implementing the auto-watering function is also a challenging process. The auto-watering function was initially designed to be implemented on AWS by server trigger event. However, after the trigger was written, it could not be implemented on AWS due to the fact that AWS does not grant server trigger permission on their servers. To resolve this issue, auto watering is instead implemented on Raspberry Pi through Python scripts.

6.0 GROUP DYNAMIC

Our Smart Garden Inc. team is formed by two system engineers and threes electronics engineers: Siyan Chen, Tianguang Zhang, Bo Sun, Weidi Zhai, Duling Lai and Timmy Kwok. All of the team members have great industry technical training in various fields such as embedded software development, firmware engineering, web and app development, hardware and communication protocols. Thus for the technical distribution of roles, each member took on both development and testing tasks. Technical problems arose quite frequently, however all members took responsibility in debugging and resolving the issues. The table below outlines the responsibilities embraced by each member corresponding to their expertise.

Task	Siyan	Tianguang	Bo	Weidi	Duling	Timmy
Research	XX	XX	XX	XX	XX	XX
Proposal Report	XX	XX	XX	XX	XX	XX
Web-design			XX	XX	XX	
Design Specification Report	XX	XX	XX	XX	XX	XX
Application Programming			X		XX	
Firmware						XX
Design Specification Report	XX	XX	XX	XX	XX	XX
Hardware Design	XX	XX				
Written Progress	X	X	X	X	X	X
Motor Setup	XX	XX	XX	XX		
Soldering	XX	XX		XX		
Testing & Combining	XX	XX	XX	XX	XX	XX

6.1 Individual Reflections

Timmy Kwok (CEO)

I am very grateful to become the CEO in this company 'Smart Garden Inc.'. The company was formed in six Simon Fraser University students who are fourth year engineering students. It was a very good experience to work with other student in a huge project. In this project, there were lots of technical problems and communicate problems. However, at the end of the semester we were still able to finish the system and successful go through every point together. It is a very good experience in my life and it would be very helpful for our future work. This project leaded me to learn lots of different skills that I cannot learn on lecture or tutorial class, such as technical and communication skill.

Since it is the first time I use raspberry pi and terminal, it is very hard for me learn a new system in a short period of time. Therefore, I researched until 2 am everyday to achieve everyday goal. Since I am the only person that doing the Raspberry Pi and setup every device on the Pi, so that I had to research how to use the terminal and download application on terminal that totally different than Windows operation system. I also learn how to setup a database on the webserver, EC2, so that it is easily for me to test the code and see how does the connection work. Furthermore, it is the first time that I use python and using python to code the connection between Raspberry Pi and other devices. Least but not less, I had learnt how to setup the temperature sensors and moisture sensors by using Bluetooth to send out data to raspberry pi and carry the value to webserver.

As I am the CEO of the company, I have mange the schedule and make sure everyone is on the right way. However, I barely know my group members as we did not meet before in other classes, and I am not a native Chinese speaker in the group so that it is hard to tell them my idea to them. Therefore, I sometimes need to write out for them and explain the details. In the middle of the semester, one of my group member argue with me since he always sent me the documents and push all the works until the very last minute. I had tried to talk to him in face and ask him how to solve the problem. At the end of the semester, I tried to help him and finished the connection for him in order to finish our demo before due date. Sometimes it is very hard to understand others without communication, and I have to find some solutions to help or ask them what is the situation of the project. Working with people who do not like to talk is very hard; therefore, the most important things is to talk with them and communicate with others.

Finally, I would like to thanks to every group members and our professors who help me to finish ENSC 305W/440W. It was a very good time to work with others and I had learnt lots of skills

and communication skills. I really wish that SFU provide more these type of classes for us to learn and create product. I also really wish that I can have one more time to do the project again.

Weidi Zhai (CFO)

ENSC 440 is the most practical and different course I have ever taken at SFU. Now I have a better understanding of what I have learned during the past 4 years. By taking this course, I had a chance to practically apply most of the theoretical knowledge I have learned from my various courses, and ENSC 305 has taught me the importance of documentation writing.

As the CFO of Smart Garden Inc., my primary responsibility was to keep the E-garden project within the budget as possible. Aside from that, I would also need to make sure all the purchased electronics components and hardware components would arrive on time to meet the deadlines. In addition, I had to compare all the hardware components between online electronic shops and make the best decision for the team.

Other than the financial tasks in the team, I am also responsible in designing our E-garden system. With the rich experience in lab equipment, I was able to contribute an adequate effort to the team. However, even with the experience obtained in the past, I still encountered many problems in this project that I did not really expect, mainly the time management issue. Before taking this course, I was very bad on the timing management. At the beginning of the semester, the same attitude was carried on and I soon realized the problem. Fortunately, I was able to put myself back on the right track and follow the schedule in an efficient way.

Overall I am quite satisfied with the whole progress of making this project from the ground up with five other teammates. It was nearly impossible to finish the project and expect it to be exactly the same with the proposal that we handed in at the beginning of the semester. However, if the teammates would gather together few weeks before the semester starts, we would have been better prepared for the project.

As our project E-garden system finally coming to an end, I was actually pleased with the commitment that my teammates showed in attempt to complete this project. I would like to thank all the members in the group for giving me a chance to gain the technical and personal skills that will help me in the future career.

Bo Sun (Engineer and Procurement)

I have enjoyed being a part of this project for the past 12 weeks. To accomplish some purpose through working among a group can often be challenging because numerous members have to effectively agree and cooperate. I was recently privileged to have been part of a group that worked as a team and in doing so, was very successful. The group was comprised of five Simon Fraser University fourth year engineering students making up the new start-up company, Smart Garden Inc. In serving as a valued member on the prestigious team, I unconsciously experienced the stages with in group development and different roles that were taken on.

Of the experience and skills I have gained as part of this group, I believe that communication and time management have been the most notable. Although working in a team environment sometimes is more challenges than working individually, but respecting and hearing individual team member's point of views, and ideas for every issue is essential in achieving goals. During every meeting and one-to-one discussion, we are able to clearly and precisely present ideas and issues; every member was able to take into consideration different things that were brought up in this project. At these meetings, we also set deadlines and milestones for each team, such as hardware, software, and microcontroller, and ensured our goals were met during these times. Doing so, we were able to meet our milestones within time sets, and achieved our big goal, an auto irrigation system, before the deadline.

During this project, most of my efforts are engaged in the software team, working on Amazon AWS, login system, and software integration. Although I have no experience in PHP, HTML, and Database, this project gave me hands on experience to explore software skills. Additionally, this experience allowed me to learn how to be a motivated self-starter.

The Smart Garden group worked exceptionally well as a team. All team members contributed to tasks equally and were able to communicate with each other and finish the project on time. This opportunity was a great experience for me not only on knowledge learning but also on organization and communication skills. My experience with Smart Garden Inc. has been extremely constructive and I look forward to continuing further work with Timmy, Lai, Tianguang, and Siyan in the future for other projects. Our completion of this project could not have been attained without the support of Dr. Andrew Rawicz, and Steve Whitmore. I would also like to extend a special thanks to all of the TAs of ENSC305/440 who have helped us throughout this semester.

Tianguang Zhang (COO)

Coming into the capstone project this semester I was very nervous because the horror history I knew from my friends who had taken it previously. However, my nervous was overshadowed by my excitement to be able to work with a team that a half of the members I had worked with them in the previous courses as well as friends before the project started. Over the course during this semester, I worked as a part of this team to create the automate irrigation system. Having witnessed the entire course of our product from brainstorming project idea, designing features and making the objects, I got a lot of experience about be an engineer.

In my role on the hardware part of the project, I spent my time working very closely with Siyan. We began by working closely together on the initial research of the hardware components. We realized that most of the components were easily to use and easily to buy them in Vancouver. Therefore, we bought them immediately, and we were prepared to connect them to the Raspberry Pi by some wires. However, three weeks later after the beginning, we changed the plan so that the whole hardware part could work wirelessly. We re-researched the whole stuff and decided to use the Arduino Uno microcontroller and Bluetooth 4.0 module to make the hardware system wireless. The program codes took us about one month to finish it. During this period, we changed the Bluetooth module from HM-10 to HC-05 due to the library problem in Arduino. Lastly, we added another Arduino Uno board, because the hardware system has two programs (one is for the sensors system another is for watering system), one Arduino Uno board could only operate one program at one time. Now, the whole hardware system works very well.

With these experiences, I got a chance to apply my knowledge which I learned from class. By programming the codes of Arduino, I exercised the C language skill; by sending data to the Raspberry Pi, I used my knowledge of the communication protocol; by testing the operation of hardware, I got a lot of experience about design testing plan and trouble shooting.

Most importantly, I gained exposure and confidence in developing an industry level product. Our Smart-Garden system is marketable, and performs exceptionally well. Cost tradeoffs, ordering parts and PCB’s, and the entire design process I am now familiar with.

Duling Lai (CTO)

This course is the best preparation for our future career working in a small R&D team as an engineer. As we are working in a small team setting, our communication and problem solving skills has also been improved. The technical skills that I have learnt on website construction and database structure is a valuable resource. As an electronics engineer, I will almost never have a chance to study those computing science knowledge in our academic courses. Time management is also a gain from this course. Since we are doing a project with limited time, time management is crucial for the completion of the project. How the work is distributed is also very important, as the team can become much more efficient when the right amount of work is assigned to the right person.

As the only developer of the web application, it is my responsibility to make sure the web application can function properly with all features available as listed in the design document. The initial plan was to host the web server on Raspberry Pi. After the first meeting with the T.A., this idea was turned down because the trend is that all data are stored on the cloud. Thus, we switch to AWS in order to keep all the valuable data on the cloud that we can access anytime from anywhere. Amazon has also supplied us with a number of tools to analyze the data and account for load balancing and scaling.

Creating web application on AWS is not simple, without utilizing any graphical website builder, the whole website is scripted by ourselves. PHP and MySQL are new topics to us, I had a lot of challenges working on the communication between PHP and MySQL. Throughout this project, my PHP/HTML scripting skill and MySQL database management are improved the most. In present days, knowledge on coding is also essential to Hardware Engineers, as most projects would be a combination of software and hardware. I am very thankful for this opportunities where I can practice my coding skills and most importantly, communication skills and project management.

Siyan Chen (CCO)

In this semester I decided to choose ENSC 440 and ENSC 305W, this is actually a challenge for me because it is the first time that I am going to create a large and complex project with serval teammates. During this semester, I worked as a member of this team to create an automatic irrigation system. From the beginning of the project to the born of our final product, I feel extremely excited and happy to be in this team.

My main job is to focus on the hardware part of the project. I spent most of my working time with Tianguang Zhang because he is also hardware designer. We began our work by doing a lot of initial research for the hardware components and some hardware design. We found out that most of the components in our project can be bought in Vancouver and Amazon.ca. I bought the components and brought them to Tianguang. We spent serval weekends work in the lab1. However, our plan got changed after we met the TA, he gave us some useful ideas and gave us some extra works. One of them is to make the entire hardware part become wireless by using Wifi or Bluetooth module. After doing the research, we decided to use the Arduino Uno microcontroller and HM-10 Bluetooth 4.0 module to make the hardware system wireless. We then did some search on the Bluetooth coding and we edit the code by ourselves. About one month later, the code was finished. During this period, we changed the Bluetooth module from HM-10 to HC-05 because the library problem in Arduino and the data transfer between Bluetooth module and Arduino Uno. After that, I did some research on servo motor because we decided to use servo motor to control the valves in the watering system. This idea will cause us to add another Arduino Uno board, because these two programs are actually different and they work separately (one program is for the sensors and the other is for watering system). Finally, the entire hardware system works well.

During this course, I have gained a lot of useful experiences. I used the knowledge I have learned in the university to create a large project with some excellent teammates. During the programming for Arduino, I have learned more about the C language because I had to test the servo motor. This makes me have a deep understanding of servo motor and Arduino Uno. Also, I have improved my hand working skill and time management skill when I work in an engineering team. I felt extremely excited to have these experiences.

In conclusion, I will thank to every SFU staff that has provided me with this opportunity and always give our team helps. Also, I will thank to all my teammates and I really want to work with my teammates in the future if we have a chance.

7.0 CONCLUSION

This document encompasses all the results of our completed project detailing the development cycle and other relevant information such as the budget and time constraints. In less than four months, through close collaboration between team members, Smart Garden assisted all of us in applying knowledge gained from various courses in the field of engineering, mathematic, computing, business, and communications. We experienced the entire product development stages, from research to specifications, from design to bring-up and system integration, from technical debugging to market strategies. Indeed, ENSC440/305W has provided us the skill foundation, confidence, all of which will make us prepare and polish the skills we need to survive in the workplace after university.

REFERENCES

1. Department, N. R. (2015, September 27). *Water amd soil requirements*. Retrieved from www.fao.org/docrep/u3160e/u3160e04.htm
2. EPA. (2015). *Outdoor Water Use in the United States*. Retrieved from United States Environmental Protection Agency: http://www.epa.gov/watersense/pubs/outdoor.html

ENSC 440 – Capstone Project

MEETING AGENDA

Date: September 11, 2015

Time: 10:30-13:30

Location: ASB

Attendees: Timmy Kwok, Duling Lai, Tianguang Zhang, Siyan Chen, Weidi Zhai

Absentees: Bo Sun (out of Canada)

Purpose of Meeting:

- Introduce team members and determine the group members
- Determine project topics
- ESSEF funding for ENSC 440

ENSC 440 - Smart Garden Inc.

MEETING AGENDA

Date: September 18, 2015

Time: 16:00-17:30

Location: ASB

Attendees: Timmy Kwok, Duling Lai, Tianguang Zhang, Siyan Chen, Weidi Zhai, Bo Sun

Purpose of Meeting:

- Determine the project topic
- Determine the company name and Logo

Items for Discussion:

- Vote for the company name
  - **Smart Garden** (Winner)
  - E-Garden
  - Green Energy
  - Futures
- Vote for the project topic
  - **E-Garden (Winner): Auto irrigation system** (Winner)
  - Smart headphone: Auto adjust volume system
- Determine the presenter for ESEF
  - Timmy and Lai

Items for Discussion:

- Weekly meeting schedule
- The candidate topics for the project from each member
- Apply for ESEF and send the application email by Duling

ENSC 440 - Smart Garden Inc.

MEETING AGENDA

Date: September 23, 2015

Time: 10:30-12:00

Location: ASB

Attendees: Timmy Kwok, Duling Lai, Tianguang Zhang, Siyan Chen, Weidi Zhai, Bo Sun

Purpose of Meeting:

- Project tasks break down
- Determine the role for each member in Smart Garden Inc.
- Project Proposal

Items for Discussion:

- Role for each member
  - CEO: Timmy Kwok
  - CTO: Duling Lai
  - CFO: Weidi Zhai
  - Senior Hardware Engineer in Circuit Design: Tianguang Zhang
  - Senior Hardware Engineer in Communication: Siyan Chen
  - Engineer & Procurement: Bo Sun
- Project research tasks
  - Hardware: Siyan Chen, Tianguang Zhang
  - Software: Duling Lai, Bo Sun
  - Microcontroller: Timmy Kwok, Weidi Zhai
- Frist draft of project proposal need to be completed on 25 September.

ENSC 440 - Smart Garden Inc.

MEETING AGENDA

Date: October 02, 2015

Time: 12:30-14:00

Location: ASB

Attendees: Timmy Kwok, Duling Lai, Tianguang Zhang, Siyan Chen, Weidi Zhai, Bo Sun

Purpose of Meeting:

- Determine and review research progress
- Review and determine the hardware materials for project
- Determine the timeline for next meeting

Items for Discussion:

- Review the research progress
  - Raspberry Pi: Weidi and Timmy
  - Web and App: Bo and Duling
  - Sensors and Circuitry: Duling and Tianguang
- Research hardware materials and plan to purchase by this weekend. Bo will try to purchase at Amazon.
  - Raspberry Pi mode B will be purchased with cost $ 89.5 by 3-4 days shipping. Note: Will wait Duling's final decision about sensors to determine the final mode of Raspberry Pi

- Duling will determine the sensors (DHT-11, DS18B20) and other accessories (a connecting board for sensors)
  - Sensors may purchase in hardware warehouse if applicable, Duling will provide further information before next Monday.

ENSC 440 - Smart Garden Inc.

MEETING AGENDA

Date: October 09, 2015

Time: 10:30-12:30

Location: SFU-Library

Attendees: Timmy Kwok, Duling Lai, Tianguang Zhang, Siyan Chen, Weidi Zhai, Bo Sun

Purpose of Meeting:

- Research materials discuss
- Technical challenges
- Materials to purchase

Items for Discussion:

- Problems from Hardware team
  - How to solve the motor control?
  - Circuit development
- Problems from Software team
  - Control interface function design
  - Database build on Amazon AWS
- Problems from Microcontroller team
  - Set a database on Raspberry Pi
  - How to build the communication between database and sensors?

ENSC 440 - Smart Garden Inc.

MEETING AGENDA

Date: October 16, 2015

Time: 16:30-18:30

Location: SFU-ASB8800

Attendees: Timmy Kwok, Duling Lai, Tianguang Zhang, Siyan Chen, Weidi Zhai, Bo Sun

Purpose of Meeting:

- Technical challenges

Items for Discussion:

- Problems from Hardware team
  - Show the circuit design
  - Wi-Fi or Bluetooth?
- Problems from Software team
  - What function on web control interface?
- Problems from Microcontroller team
  - The database is saved under Microcontroller?
  - How to connect Bluetooth?

ENSC 440 - Smart Garden Inc.

MEETING AGENDA

Date: October 24, 2015

Time: 16:30-18:30

Location: SFU-ASB8800

Attendees: Duling Lai, Tianguang Zhang, Siyan Chen, Weidi Zhai, Bo Sun

Absentees: Timmy Kwok

Purpose of Meeting:

- Plan for oral presentation
- Review some modifications of production function and Finance
- Initial framework for design specification

Items for Discussion:

- Contend for oral presentation
  - Prepare the oral presentation materials
- Do we need a mobile app?
  - Will not include this function in the prototype product, but will develop it in the next product version
- Hardware progress
  - Sensors are purchased and starting to make the circuit
- Finance
  - The total budget is under control

ENSC 440 - Smart Garden Inc.

MEETING AGENDA

Date: October 30, 2015

Time: 10:30-13:30

Location: SFU-Library

Attendees: Timmy Kwok, Duling Lai, Tianguang Zhang, Siyan Chen, Weidi Zhai, Bo Sun

Purpose of Meeting:

- To update and discuss the design progress: software (web server)
- To determine the new hardware components: wireless sensors

Items for Discussion:

- How to outline the UI interface for web server?
  - Determine the function on control panel
  - What are the web server detailed design information?
- Do we need Wi-Fi or Bluetooth or our wireless sensors?
  - Will Wi-Fi function is the optimal function for our product?
  - How to use Bluetooth to communicate between both sides (sensors and web database)
- Select the material need to buy and review the project budget

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MEETING AGENDA

Date: November 04, 2015

Time: 18:00-19:00

Location: SFU-Library

Attendees: Duling Lai, Tianguang Zhang, Siyan Chen, Weidi Zhai, Bo Sun

Absentees: Timmy Kwok

Purpose of Meeting:

- Plan the work for design specification
- Feedback from hardware team about progress

Items for Discussion:

- How to organize and write design specification?
  - Summarize the project progress and outline for the design specification
  - Still face many undermined design details, need to extend the submission day?
- Any issues for hardware and wireless connection?
  - Need to start to build the communication by using Bluetooth

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MEETING AGENDA

Date: November 11, 2015

Time: 10:00-13:00

Location: SFU-Library

Attendees: Timmy Kwok, Duling Lai, Tianguang Zhang, Siyan Chen, Weidi Zhai, Bo Sun

Purpose of Meeting:

- The initial version of web application
- Communication issues between the microcontroller and sensors and servo motor
- Database on Amazon AWS

Items for Discussion:

- Prove of concept of web application
  - Prove and display the outlook and basic function on web application
  - How to communicate with the microcontroller?
- Consider to use Bluetooth for communication
  - How to solve the power issue?
  - How to send and receive the data by Bluetooth between the microcontroller and hardware components?
- Detailed specification to save the data from hardware component to Database
  - How frequently to save the data to database?
  - Need to save any data on the microcontroller?
- Next meeting will held on **20 November**. Teams need to complete tasks before this time. We will start to integrate from this date.

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MEETING AGENDA

Date: November 20, 2015

Time: 10:00-14:00

Location: ASB8800

Attendees: Timmy Kwok, Duling Lai, Tianguang Zhang, Siyan Chen, Weidi Zhai, Bo Sun

Purpose of Meeting:

- Review the unsolved problem from last two weeks
- Plan the integration schedule

Items for Discussion:

- Any issues from software, microcontroller, and hardware?
  - Software
    - Working on the script of irrigation by using web application
  - Microcontroller
    - Needs to have an IP to communicate with web server
  - Hardware
    - Bluetooth is built on Arduino, need to have a test communication with the microcontroller
    - Servo motor need to connect with faucet
- Plan the integration schedule
  - Integration will start by 22 November. Proposed schedule
    - 01 December: Able to communication without any problem
    - 10 December: Full system should work fine
    - 15 December: Prepare a demo video

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MEETING AGENDA

Date: November 29, 2015

Time: 15:00-17:00

Location: ASB8800

Attendees: Timmy Kwok, Duling Lai, Tianguang Zhang, Siyan Chen, Weidi Zhai, Bo Sun

Purpose of Meeting:

- Integration progress

Items for Discussion:

- Any issues from software, microcontroller, and hardware?
  - Software
    - Login need to connect with amazon database
    - Still need to different types of planes?
  - Microcontroller
    - Bluetooth has issues to connect with hardware
    - Microcontroller can delivery data to Amazon database, but not stable
    - Facing the issue of need two channels for data receive and send
  - Hardware
    - Need to change Bluetooth version
    - Need to consider how to connect moto servo to garden hose
    - Need to design a case to contain all the hardware parts

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MEETING AGENDA

Date: December 07, 2015

Time: 15:00-17:00

Location: ASB8800

Attendees: Timmy Kwok, Duling Lai, Tianguang Zhang, Siyan Chen, Weidi Zhai, Bo Sun

Purpose of Meeting:

- Integration progress

Items for Discussion:

- Any issues from software, microcontroller, and hardware?
  - Software
    - Some bugs with the auto irrigation script
    - Receive senor data too fast and with errors
  - Microcontroller
    - Need two Bluetooth to achieve send and receive data
  - Hardware
    - Need to purchase another Bluetooth
    - Need to consider how to connect moto servo to garden hose

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MEETING AGENDA

Date: December 15, 2015

Time: 11:00-18:00

Location: Richmond

Attendees: Timmy Kwok, Duling Lai, Tianguang Zhang, Siyan Chen, Weidi Zhai, Bo Sun

Purpose of Meeting:

- Performing the first demo for the prototype system
- Schedule the final demo time
- Prepare presentation PPT

Items for Discussion:

- Any issues for final system?
  - Microcontroller
    - Auto connect to Wi-Fi function need be done by tomorrow
  - Hardware
    - Need a battery case
- The final demo will perform by tomorrow
- Presentation PPT will prepare individually and integrate by tomorrow

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MEETING AGENDA

Date: December 16, 2015

Time: 11:00-18:00

Attendees: Timmy Kwok, Duling Lai, Tianguang Zhang, Siyan Chen, Weidi Zhai, Bo Sun

Purpose of Meeting:

- Record the Need to purchase another Bluetooth
- Presentation PPT

Items for Discussion:

- Presentation details on tomorrow
  - Arrival time?
  - Who set up parts?
- Finalize the project budget