MOTUS CONTROL

April 20, 2016

Dr. Andrew Rawics
School of Engineering Science
Simon Fraser University
Burnaby, British Columbia
V5A 1S6

Re: ENSC 440W - Post Mortem for a Smart Room Control System

Dear Dr. Rawics,

The attached document, post mortem of *Smart Room Control System*, outlines *MOTUSCONTROL*'s proposed project for Engineering Science 305W and 440W (Capstone Engineering Science Project). The aim of our project is to implement a room system that will control and secure electrical devices within the room based on hand-gesture recognition.

This document will provide an overview of the proposed product, a business case, a comparison of the actual and projected budget, a tentative projected timeline and information regarding our members' contribution. Reflections on learning of each team member are also included in this document.

Our team at *MOTUSCONTROL* consists of five highly dedicated and hardworking fourth year engineering students: Moha Alharbi, Saad Alkhalifah, Ryadh Almuaili, Adrian Fettes, and Yuhui Jin. Should you have any questions or concerns regarding our project, please do not hesitate to contact me by phone at (604) 500-5416 or by email at salkhali@sfu.ca.

Sincerely,

Saad Alkhalifah
CEO, MOTUSCONTROL

Enclosure: *Post Mortem for a Smart Room Control System*

MOTUS CONTROL

Post Mortem for a Smart Room Control System

Project Team:
Moha Alharbi
Saad Alkhalifah
Ryadh Almuaili
Adrian Fettes
Yuhui Jin

Contact Person:
Moha Alharbi
malharbi@sfu.ca

Submitted to:
Dr. Andrew Rawicz
Mr. Steve Whitmore
School of Engineering Science
Simon Fraser University

Issued Date:
April 20, 2016

Revision:
1.1

Executive Summary

With the evolution of technology and the continuous enhancement of people's standard of living, interactions between human and electrical devices have become quick and easy. However, elders and individuals with disabilities may find it tough to communicate with machines without external aid. Although there has been great development of different technologies with regards to smart home control systems, elders and disabled people still have many troubles in managing their space. Alternatively, hiring home care professionals to provide an environment, which is conducive to keeping the client safe and independent, could put a financial and emotional squeeze on physically impaired individuals and their families. In addition, physically impaired people may feel frustrated and stripped of their independence and privacy. *MOTUSCONTROL* is eager to fill this void and provide this necessary supervised care to disabled people in an affordable manner, regardless of their Impairment.

MOTUSCONTROL is creating the *Smart Room Control System* to give disabled people the ability to control their own space by using expressive and meaningful hand gestures, which get converted to signals that are sent to a computing system. The system is programmed to operate lighting, temperature control, security, appliances, and many other features specifically chosen to ensure that our final product be a valuable utility for the physically impaired individuals.

MOTUS CONTROL

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Glossary

Wi-Fi: Wireless Fidelity
SMS: Short Message Service
GSM: Global System for Mobile Communications
IMU: Inertial Measurement unit
ESSEF: Engineering Science Student Endowment Fund
ASIC: Applications Specific Integrated Circuit

1. Introduction

As a physically impaired person or as a someone close to a physically impaired person, you are aware of the difficulties that these people face in their everyday lives. Everyday tasks that are seemingly easy to perform by people without disabilities are extremely difficult or in some cases impossible to perform by physically disabled people. The aim of our project is to give disabled people the ability to complete simple, everyday actions with no more difficulty than anyone else.

Presently, so much new technology is aimed at bringing people to greater heights, providing us with new senses, new abilities. Google glass would provide us with a constant stream of information about our surroundings, and keep us constantly aware of the happenings of our digital lives. The Oculus Rift allows new entertainment opportunities such as Virtual Reality movies and games. Fitness tracking watches and other devices allow people to constantly monitor their bodies in a way which was, until recently, impossible. It is easy to forget, as these new senses and controllers are created, that some people do not have the same base capabilities that everyone else takes for granted.

The *Smart Room Control System* is solution that aims to give disabled people the ability to control them with simple hand gestures. Some abilities which our solution will grant the user are to turn lights on and off, change the thermostat, check other parts of their house for movement, and be alerted if an alarm goes off. Our hope is that by removing the burden of completing these common tasks, we can significantly improve the quality of life for the differently abled.

2. System Overview

The system consists of three main components: hand gesture controller, main controller, and peripherals controller. The wearable sensor is responsible for recording the coordinates of each hand movement using an inertia measurement unit sensor. Then, the information of the coordinates that corresponds to a specific peripheral will be sent via Bluetooth to the main controller, which will then analyze the received data. The main controller bridges the connections between all the components of the system, and it is programmed to take different actions based on the signal it receives from the sensor. Depending on the signal, it will communicate with the peripheral's controller and change the state of a different peripheral. Some peripherals also have the ability to send feedback to the main controller. Figure 1 shows the high-level model of the *Smart Room Control System*

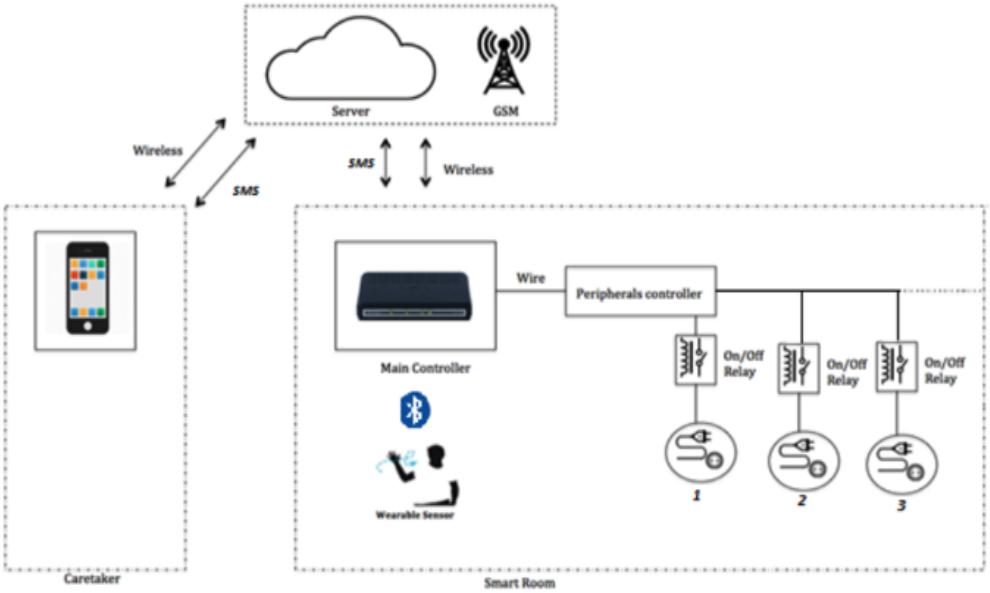

Figure 1: High-Level Model of Smart Room Control System [1][2]

The main controller saves the current status of the peripherals and passes it to the server. The server will then communicate with our smartphone application via internet connection to reflect the changes made. Moreover, the user's caretaker can

use the application to monitor the room remotely to ensure the safety of the person inside our smart room. Besides notification via internet, the caretaker also has the option to receive SMS alerts from the system in possibly dangerous cases, such as extreme cold or smoke detection via smoke alarm.

3. Business Case

The *Smart Room Control System* is a solution that targets homeowners, as well as people who have disabilities, giving them the ability to control the peripherals surrounding them with simple hand gestures. There are similar products exists on the market that provides similar solutions such as INSTEON. INSTEON is a home automation system that allows to control light bulbs, wall switches, outlets and thermostats using their smartphone application only. However, the price of their full system is around $480, which is higher than the price of our solution, while providing less features [1]. Our *Smart Room Control System* solution includes all the features on the current market solutions, additionally we grant the user the ability to control the peripherals using our hand gesture controller. The idea of controlling peripherals using hand gestures has not been developed in home automation systems that are currently on the market, which will give us a great advantage in marketing our product. We estimate that with dedicated manufacturing techniques, we could drop the manufacturing price of our product by at least 50%, allowing us to sell it at a much cheaper price then INSTEON. Table 1 shows the features of our solution comparing to INSTEON's solution.

Table 1: *MOTUSCONTROL* Vs. INSTEON's Solution

Features	MOTUSCONTROL	INSTEON Solution [3]
Light Control	✓	✓
Wall Switches	✓	
Thermostat	✓	✓
SMS	✓	
Control using phone Application	✓	✓
Control using hand gestures	✓	

4. Financial Summery

We received a $370 from the Engineering Science Student Endowment Fund (ESSEF). Table 2 shows our initial cost estimation for the different parts needed to complete our system.

Table 2: Estimated Costs of the Components

Equipment	Estimated cost
Arduino Uno Board	CAD $33
Arduino Yun Board	CAD $90
Sensor, PIR Motion	CAD $13
Triple Axis Accelerator & Gyro Breakout – MPU6050 * 2	CAD $40 * 2
Arduino GSM Shield	CAD $105
Logitech C270 Webcam	CAD $50
Flame Sensor	CAD $1.2
Contingency (20%)	CAD $74.44
Total Cost	CAD $446.64

However, as we proceeded further into our research, some of our plans have changed so we decided to use different parts that matches the need of completing our system. Table 3 shows our actual and final costs for the different parts needed to complete our system.

Table 3: Actual Costs of the Components

Equipment	Cost
Arduino Uno Board	CAD $33
Arduino Nano Board	CAD $45
Arduino Bluetooth Mate Silver * 2	CAD $ 46 * 2
Triple Axis Accelerator & Gyro Breakout	CAD $40
Wifi Module Huzzah	CAD $14.25
Arduino GSM Shield	CAD $105
Battery Holder, 9V * 2	CAD $ 6.90 * 2
9V Battery	CAD $9.5 * 2
LED Spot Light	CAD $12 * 2
Flame Sensor	CAD $1.2
Digital Humidity & Temperature Sensor	CAD $13
Enclosure, Instrument Case * 2	CAD $11.50
Total Cost	**CAD $401.75**

5. Schedule

We initially underestimated the complexity of our system. And we did not have a clear idea about how are we going to build it. We expected our research to end around the 5th week, however, we felt more research is required, so we extended our research for few more weeks. We encountered issues while building our hand gesture controller and the feedback controller which led to a delay on performing the integration stage that was estimated to be performed starting from the 9th week. Figure # summarizes our actual and estimated schedule.

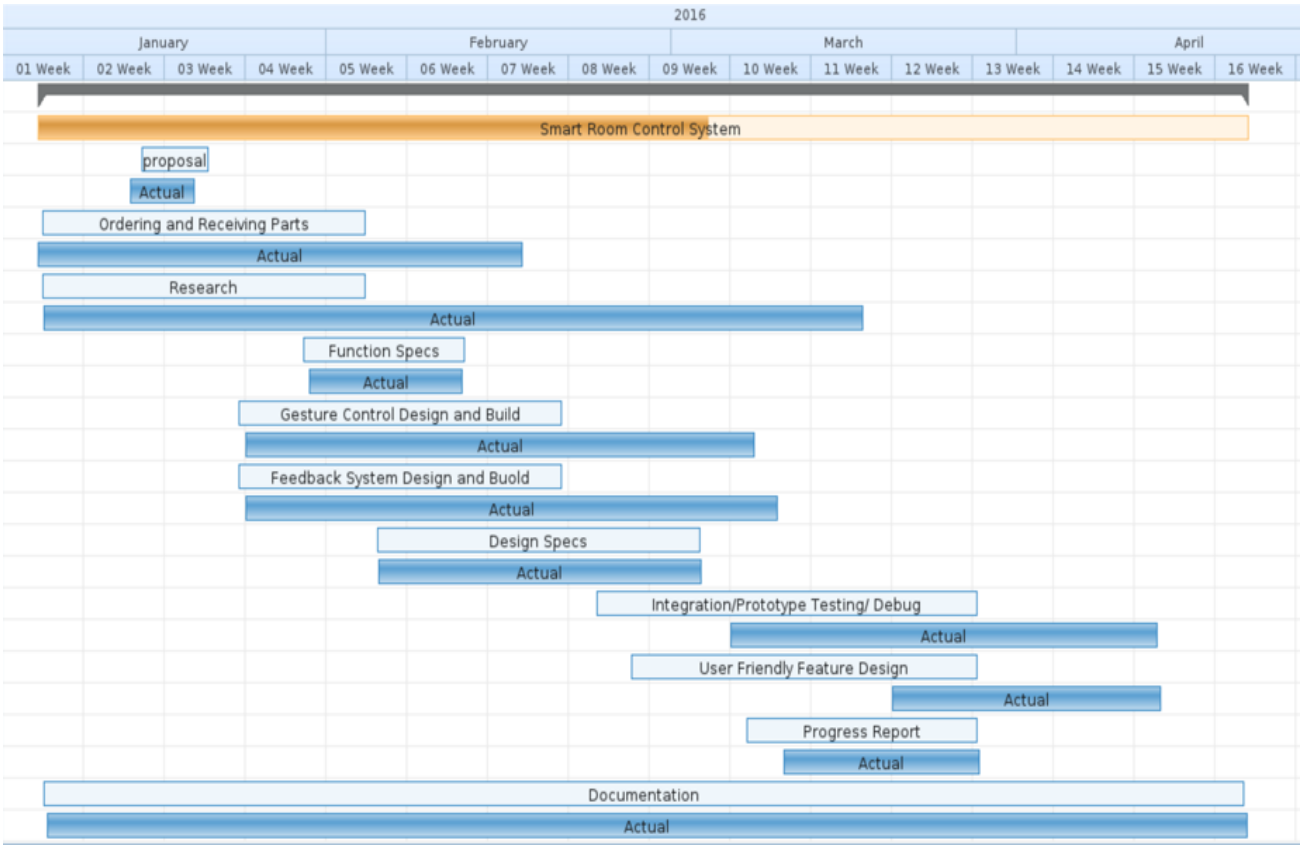

Figure 2: Highlights the Actual and Estimated Milestones of the Project

6. Problems/Challenges

There were a few problems that *MOTUSCONTROL* encountered during the implementation of this project. This section describes the largest problems when constructing the different parts of our project.

6.1 Web application/server creation

The implementation of the companion application for our project ran across a few problems. None of us had ever worked with server creation before, and we had no idea how to work out the implementation details. Details such as where to host a server, whether we actually needed one, protocols we would use, and other similar details were difficult for us to work out.

6.2 Arduino Sensor and Module Setup

We used multiple sensors and modules for our project. We had some difficulties using the libraries for each module, in particular the Wifi module. The connection with the Wifi module was very inconsistent, and difficult to troubleshoot. When at the school, we had to create hotspots with our phones in order to connect to anything with the module, something which could have been adding to the inconsistency of the module.

6.3 Battery Setup

For our hand sensor module, we needed a 9V battery to provide power to the Arduino. However, this battery was too large, so we had to buy 3 smaller lithium cells in order to provide power. Unfortunately, there were no battery snaps which could be used with these cells, so we had to improvise using electrical tape and wires. This caused some inconsistencies with providing power to the Arduino, and required a few iterations until we were able to create a stable 9V cell.

6.4 Hand Module Casing

We wanted to create a small case for our sensor module. However, none of us had ever done work-creating models for 3D printing, so we decided to buy a box at an electronics store to house the project. However, we were not able to find an appropriately sized box, and had to slightly resize our circuit board in order to house it properly.

7. Group Dynamics

The workload was distributed based on team member's interests and technical experience. *MOTUSCONTROL* ensured that all technical tasks of our product were accomplished by more than one member to ensure that *MOTUSCONTROL*'s deadlines are met. The team breakdown is presented in Table 4.

Table 4: MOTUSCONTROL Team Breakout

Team Member	Main Role	Contribution
Saad Alkhalifah	CEO	**Chief Executive Officer** • Main controller coding (Relay) • SMS functionality • Bluetooth connection • System integration • Testing • General assembly
Ryadh Almuaili	CFO	**Chief Financial Officer** • Main controller coding (Relay) • Bluetooth connection • Subsystem integration • Testing
Adrian Fettes	VP Operations	**Vice President of Operations.** • Motion control coding • Solidworks design • General assembly • Sensor setup and coding
Yuhui Jin	CTO	**Chief Technology Officer** • Wifi module setup and coding • Companion application • Testing • Sensor coding
Moha Alharbi	COE	**Chief Operating Engineer** • Motion control coding • Relay setup • General assembly • Sensor setup and coding • SMS functionality • Testing

Table 5 shows the workload chart for all *MOTUSCONTROL* members. A single 'X' represents a low contribution while 'XX' represents a high contribution.

Table 5: Workload Chart for all *MOTUSCONTROL* Members

Name	Moha Alharbi	Ryadh Almualili	Saad Alkhalifah	Adrian Fettes	Yuhui Jin
Documentation	XX	XX	XX	XX	XX
Documentation Editing	XX	XX	X	XX	
Research	XX	XX	XX	XX	XX
Organization	XX				
Conceptual Design	XX	XX	XX	XX	XX
Hand System	XX		X	XX	
GSM Configuration	X		XX		
APP Development					XX
Sensors Configuration	XX			XX	X
Main-Controller	XX	XX	XX		
Lighting	XX	XX	XX		
TV Configuration	XX		X		
Wireless Connections	XX	XX	XX		XX
Solid-Works				XX	
Assembly	XX	XX	XX	XX	XX

8. Conclusion

MOTUSCONTROL team has successfully completed the second prototype of the *Smart Room Control System*, as planned. The team was able to overcome the timeline issues and was able to deliver a working product prior to the due date. Considering it is built on a prototyping board, the product is not ready for market, and there are multiple improvements that could be made with proper manufacturing techniques. For future plans, we will use an ASIC chip to process our motions instead of the MPU attached to the Arduino Nano, allowing us to greatly decrease the size of the gesture sensing module. Furthermore, we have plans to add a rechargeable battery so that the user can charge the device instead of using external batteries. Finally, we would replace the main controller with a dedicated specific-purpose chip, greatly decreasing it's cost and size.

Reference

[1] Bestbuy.ca, "Modems : Hubs, Switches & Modems - Best Buy Canada", 2016. [Online]. Available: http://www.bestbuy.ca/en-CA/category/modems/21105.aspx. [Accessed: 15- Feb- 2016].

[2] N. Heinz, "Relay - HomoFaciens", Homofaciens.de, 2016. [Online]. Available: http://www.homofaciens.de/technics-base-circuits-relay_en_navioff.htm. [Accessed: 13- Feb- 2016].

[3] I. Kit, "Costco Wholesale", *Costco.ca*, 2016. [Online]. Available: http://www.costco.ca/.product.100213882.html?cm_sp=RichRelevance-_-itempageSeoHorizontal-_-CategorySiloedViewCP&cm_vc=itempageSeoHorizontal|CategorySiloedViewCP. [Accessed: 11- Apr- 2016].

Appendix I: Reflections

Adrian Fettes

Over the course of the semester, I was very glad to be a part of the MOTUSCONTROL team. We had an idea at the start of the course of what to create, and going through the entire process to complete it was a great learning experience. Not only did I gain a lot of technical experience and knowledge, but I also learned a lot about working on long term projects in groups, something which will definitely benefit me in the future.

With regards to technical systems, I learned about motion control, accelerometers, and a bit about microcontrollers. Prior to this course, I had never used an Arduino board, although I'd of course heard of them. I was very surprised at how easy they were to program, with a very user friendly interface and design. I think that in the future I definitely want to pick up some simple personal projects involving the Arduinos. With regards to the motion control, it was interesting to process the information into something useful. I wrote some of the code which processed the motions into actions, and I think I learned a bit about that sort of work. Finally, I learned about how hard it is to troubleshoot high level devices. When you don't have a good grasp of each layer of the device, it becomes much harder to troubleshoot. We came across this issue inparticular with the Wifi module, where we knew it wasn't working, but didn't have enough feedback to fix it for a long time.

With regards to group dynamics, I also learned a couple things about working in a group. Firstly, how hard it is to organize meetings and groups for 5 people with different schedules and tasks they need to complete. Multiple meetings, particularly later in the semester, were only attended by 4 people. However, I also learned that with proper communication this isn't a big deal, as long as there are enough people at the meeting to agree on decisions. Another thing I learned about working in a group is that it is important to play to every member's strengths. I think we did this quite effectively. I did less of the bulk work, but due to me being a native English speaker, I was tasked with doing final editing and grammar checking on most of the documentation. Splitting up the work like this allowed us to work more effectively and produce higher quality documentation.

Overall, I think this was a very useful course, although there was more than one busy night spent writing and editing the documents. I'm glad I was able to work with the rest of my group members, and hope that our paths may cross sometime in the future.

Yuhui Jin

I have heard from my friends that capstone course is really a challenge for everyone before I took this course. After finishing this 5 credit course, I truly feel the same thing as they did. This course is challenging in because it requires you both of the communication skills and technical skills. During this course, I have experienced stages of developing a new product. Developing a new product is not easy.

I was assigned to make a feedback system which allows the user to control the appliance via phone application. The main challenge is connect the microprocessor(Arduino UNO) and phone application via the server. I don't have any knowledge in this field before. Fortunately I am able to find out the solutions from online open sources.

During the developing phase, I learnt how to use the App Inventor2 to create Android Application and how to link devices and control application together by creating links following the data transmission protocol. These experience really helped me improve my self-studying skill. Besides software techniques, I also have the chances to design and solder circuits on PCB. Sometimes we have to make some specific circuits to meet the specific voltage level.

Moreover, I have improved my communication skill and co-working skill. The most important thing I have learnt from this capstone project is that researching is never more than enough. You have to keep researching for techniques and related documents, otherwise you will get lost.

The Capstone project offered us a great chance of practicing real-life job. It gave us the opportunity to interact with people with different specialties. I think I will be benefited by the experience of this capstone course.

Ryadh Almuaili

First of all, I would like to thank all of my MOTUSCONTROL team members for their dedication and hard work throughout the semester. I had a wonderful experience , and I received full support from my team members whenever I needed. When we agreed upon designing a smart room control system, I knew that it is going to be a challenging task to complete in four month duration since it contains variety of subsystems.However, I am proud that we came across all the obstacles we faced and we were able to successfully present the demonstration of our fully integrated smart room control system.

One of the great things I learned from this project was how to set up a goal and work to achieve it under a specific time. Since I was taking another project based course, the pressure was significantly increasing throughout the semester. However, experiencing this situation gave me the chance to push myself to the limit and manage my time in order to contribute in finishing our project on the giving time. When I graduate and work in the industry as an engineer, I will be giving a specific task that must be delivered on a specific time , I beleive this course has familiarized me with the experience I will be exposed to after I graduate and work in the industry.

Before doing this project, I did not have any experience in wireless connections and electrical relays. I did a lot of research about the relays and how they work, and what type fits perfectly in our system. The research was time consuming however once we found the exact type we needed, the construction was straightforward. I also did a lot of research about connecting two microcontroller using bluetooth modules. Getting the bluetooth to work was not hard, however, the connections gets lost sometimes for unexpected errors. The most annoying part was when integrating the hand gesture controller with our main controller using the bluetooth modules. The codes sometime does not work from the first time , and it was hard to troubleshoot where the error might be coming from,since there are multiple systems connected together in the same time.However, after spending sometime working on it we became more familiar with the bluetooth functionality and we were able to easily spot any bug that we face and fix it immediately.

Overall, from this project I got a sense of how to think in an entrepreneurial perspective. I learned how to design a product in a way that will give it a potential to compete on the market. On my future projects, I would focus more on improving my time management skills in order to be able to work on multiple projects at the same time.

Saad Alkhalifah

That capstone semester is the course that I have always look forward to take with excitements. I have developed numerous skills and obtained much valuable experiences. By utilizing knowledge that I have gained over the past years at school, this project simulates a real life design situation that could aid people in the near future. This project gives me an opportunity to learn something new and helped me improving my interpersonal skills such as teamwork, leadership and time management. Additionally, this project gives me a clear structure on how the process of developing new product in real world is approached, from brainstorm to the process of prototyping and documentation.

From the technical aspect, I have learned a lot on research and development during the project. I have gained experiences in programing Arduino uno using C language. The beauty of Arduino uno is that it is an open-source product, which gives everyone the ability to learn and share experience with the world. I worked on various parts of our product. I started with MPU sensor which I spent lots of time on understating its functionality and usability before my members continue working on it. Moreover, I worked on GSM shield and bluetooth model with other members. From the many components we used in our project, I learned how to read datasheets effectively to quickly acquire what I need from the manuals. I also improved my soldering skills greatly from soldering a great deal of electrical connections throughout this project.

Overall, the capstone project course was an interesting experience. It provides us with a practical experience on designing a real world-engineering project. I do believe the interpersonal skill learned in this project will be extremely useful in my future career. I really enjoyed working with everyone over this semester, and I have learned a valuable lesson from each member.

Moha Alharbi

I would like to express how pleased I am to work with four responsible colleagues during the past four months. Having such a highly dedicated and hardworking group of people to work with made it easy and enjoyable to come up with an exciting and interesting product such as Smart Room Control System.

ENSC305W/ENSC440W integrated course is my actual first experience to develop a technical project from the product planning stage to the achievement of a fully functional prototype. Throughout project, I gained the opportunity to improve both my time management and organizational skills. Additionally, because of the project's workload, each member of the group had two or more tasks assigned; therefore, following milestones was greatly important for me in getting tasks with higher priority done first. And to manage time efficiently, I learned to set priorities for things that I needed to do on that day.

My primary responsibility of the project is to look at the whole project and also to be able to fill in many roles where the group needs it, with focus on the hand gesture system. My roles include component development, system integration, designing, and testing. This gave me the opportunity to learn as much as possible from this course.

Generally, I improved my software skills on Arduino environment and gained valuable experience with data processing and communications protocols, and enhanced my hardware-related knowledge. More importantly, I was assured that with strong team professionalism and organization, motivation, and a basic understanding of simple engineering principles, the dedicated team could bring about anything someone imagines. The Smart Room Control System provided me with a greater level of confidence in implementing and designing future products by using different embedded systems and components.

AGENDA

January 15, 2016
9:30 am-10:30 am
SFU Library meeting room

Purpose of Meeting: To discuss the feedback system and how to be implemented
Items for Discussion:

- Feedback system by using SMS
- Feedback system by using a smartphone app

MINUTES

January 15, 2016
9:30 am-10:30 am
SFU Library meeting room

Present: Moha, Adrina, Joseph, Saad, Ryadh
Absent:
Purpose of Meeting: To discuss the feedback system and how to be implemented
Minutes: Meeting called to order at 9:30 am

A. Feedback system ideas

Discussion: The final idea has been narrowed to the use of SMS since the user may not have access to the wifi. A smartphone app may be built to enhance the feedback system.

Action: Group members will look up the components needed for the system.

B. Next Meeting Date

The next meeting is arranged for January at
Meeting was adjourned at 10:00 am

AGENDA

January 18, 2016
9:30 am-11:05 am
SFU Library meeting room
Purpose of Meeting:

- To discuss the different parts of our system
- Distribute the work for our proposal document

Items for Discussion:

- How peripherals will be controlled?
- Algorithms needed to integrate our system?

MINUTES

January 18, 2016
9:30 am-11:05 am
SFU Library meeting room

Present: Moha, Adrina, Joseph, Saad, Ryadh
Absent: none
Purpose of Meeting:

- To discuss the different parts of our system
- Distribute the work for our proposal document

Minutes: Meeting called to order at 9:30 am

A. System Integration ideas:

Discussion:

- We will have a room control system and a feedback system
- We will develop an application for the feedback system that will connect to the room through server via Wi-Fi, which will allow viewing the room real-time using video camera.
- We will have two controllers on the room. Main one will controller the peripherals and the other one will be connected to the MPU to process the coordinates
- We will use Bluetooth for the connection between the two controllers, and wire/wireless connection between the main controller and the peripherals

B. Project proposal

Moha: will do introduction / Risks/ Letter of Transmittal
Adrina: will do executive summary/ conclusion/ grammar editing
Joseph: will do budget and funding/schedule/ Benefits
Saad: will do Market competition and research/ introduction to system overview
Ryadh: will design logo/ scope/ style of the document/ cover page/ table of content/ list of figures and put everything together on one file and send it to the group for editing
Everyone: Reference/ Glossary

C. Next Meeting Date

The next meeting is arranged for Feb 1st at 1:30 pm

Meeting was adjourned at 11:05am

AGENDA

Febuary 1st, 2016
9:30 am-11:05 am
SFU Library meeting room
Purpose of Meeting:

- To discuss the different parts of our system
- Distribute the work for our proposal document

Items for Discussion:

- How peripherals will be controlled?
- Algorithms needed to integrate our system?

MINUTES

Febuary 1st, 2016
9:30 am-10:35 am
SFU Library upper area
Present: Adrian, Joseph, Moha, Ryadh
Absent: Saad
Purpose of Meeting:

- To discuss the work to complete on the function specification
- To plan out a rough outline for the functional specification
- To split the work for the functional specification

Minutes: Meeting called to order at 9:30 am

A. **Function specification outline discussion**

Discussion:

- Discussed how best to split the parts of our project for the functional specification
- We will split the work into 5 main parts, some larger then others
- These parts are the main controller, gesture controller, feedback controller, software, and peripheral controller

B. **Functional specification work splitting**

Moha: Will to general specifications/formatting
Adrian: Will do work specifications for the gesture controller
Joseph: Will do specifications for the software/server
Saad: Will do main controller specifications
Ryadh: Will do peripheral controller specifications
Everyone: Reference/ Glossary
Function specification first draft should be completed by Feb 10th

C. **Next Meeting Date**

Decided to meet the next week, once we have completed a draft of the functional spec
Meeting was adjourned at 10:35

AGENDA

Febuary 26th, 2016
9:30 pm-11:00 pm
SFU Library meeting room

Purpose of Meeting:

- To discuss the work that needs to be done for the design specification

Items for Discussion:

- Discuss the actual design, and the forms of our first and second prototypes
- Algorithms needed to integrate our system?

MINUTES

Febuary 26th, 2016
9:30 pm-11:00 pm
SFU Library meeting room
Present: Adrian, Joseph, Moha, Ryadh, Saad
Absent: None
Purpose of Meeting:

- To discuss the work that needs to be done for the design specification
- Separate the design specification into different parts
- Discuss the actual design, and the forms of our first and second prototypes

Minutes: Meeting called to order at 9:30 am

A. **Wrote out structure of Design spec**

Discussion:

- Looked at rubric and examples from previous group
- Keep a same structure as our functional spec: separate our project into 5 distinct parts
- These parts are the main controller, gesture controller, feedback controller, software, and peripheral controller

B. **Discussed and decided forms of first and second prototypes**

- First prototype will have separated controllers for feedback system and light system. Light system will be connected to the lights, as well as the motion sensor via wireless.
- The server and phone application will not be included in the first prototype
- In the second prototype, we will have one central controller
- In the second prototype, we will connect this central controller to the server and phone application

B. Discussed and decided forms of first and second prototypes

Split the work for the design spec and decided on the format:

1. System Overview
    a. Arduino Boards
    b. Feedback/Peripheral Control system
    c. Motion Controller
    d. Server
2. Main Controller/Peripheral Controller
    . Switch Controller
        i. Electronics
        ii. Software
    a. Peripherals Controller
        . Sensors
        i. GSM
    b. WIFI Module
    c. Bluetooth module
3. Wearable sensor
    . MPU
    a. Bluetooth module
    b. Physical design
    c. Battery
4. Software/Server
    . Phone app
        . User interface
        i. Connection to server
        ii. Framework/language
    a. Server
        . Framework
        i. What information goes in and out

C. Next Meeting Date

Meet the following monday at 9:30 in the library

Meeting was adjourned at 10:35

AGENDA

March 3rd, 2016
12:40 pm-2:00 pm
SFU Library meeting room
Purpose of Meeting:

- Complete powerpoint slides for design review presentation

Items for Discussion:

- Separate the work for design specification

MINUTES

March 3rd, 2016
12:40 pm-2:00 pm
SFU Library meeting room
Present: Adrian, Joseph, Moha, Ryadh
Absent: Saad
Purpose of Meeting:

- Complete powerpoint slides for design review presentation
- Separate the work for design specification

Minutes: Meeting called to order at 12:40 pm

A. Design specification outline

Discussion:

- Discussed what to include on the powerpoint slides
- Discussed what parts of the design specification paper to be done before the next meeting

Actions:

- Finished the powerpoint presentation on the meeting
- Split the work for the design spec and decided on the format (DUE BEFORE NEXT MEETING)
  - Test plan (Ryadh)
  - Conclusion/Reference (Moha)
  - Introduction ,scope and audience (Saad)
  - Design a case for our main controller and hand gesture controller on SolidWorks (Adrian)
- Email the Steve to ask if we can use our extension (Moha)
- Email the TA to check our paper on the coming monday or tuesday (Moha)

B. Next Meeting Date

Meet the following monday at 9:30 in the library

Meeting was adjourned at 2:00 pm

AGENDA

March 7rd, 2016
9:30 AM-10:35 AM
SFU Library meeting room
Purpose of Meeting:
Review currently done work for design spec
Combine work from different people into one document for design spec

Items for Discussion:
Decide if we should use 3 day extension

MINUTES

March 7rd, 2016
9:30 AM-10:35 AM
SFU Library meeting room
Present: Adrian, Joseph, Moha, Ryadh
Absent: Saad
Purpose of Meeting:

- Review currently done work for design spec
- Decide if we should use 3 day extension
- Combine work from different people into one document for design spec

Minutes: Meeting called to order at 12:40 pm

A. Review currently done work

Discussion:

- We have at least half the work done
- The work that still needs to be done is test plan, battery, conclusion, main controller case, GSM, server, intro, bluetooth module, wifi module

B. Decide to use 3 day extension

Discussion:

- We want to meet with a TA to give us a review of design spec
- We need to complete it first, should take extension so we can finish

Action:

- Moha will email a few TAs to ask about reviewing our document
- Moha will email Steve and ask to use our extension

C. Split up remaining work for document

Discussion:

- We will have content done by tuesday night, put together doc on wednesday
- Hopefully meet with TA on wednesday and do some final editing for extended deadline on thursday

Action:

By Tuesday at midnight we will finish

- Riyadh: Test plan (incomplete), abstract summary
- Moha: Battery, conclusion
- Adrian: Humidity sensor, case for main controller
- Joseph: GSM, server (incomplete)
- Saad: Intro, scope, audience, bluetooth module, wifi module

B. Next Meeting Date

Meet the following Wednesday at 9:30 in the library

Meeting was adjourned at 10:35 pm

AGENDA

March 15, 2016
9:30 pm-10:30 pm
SFU Library meeting room

Purpose of Meeting:
Review currently done work of HG module

Items for Discussion:
Check the progress on FB system

MINUTES

March 15, 2016
9:30 pm-10:30 pm
SFU Library meeting room
Present: Joseph, Moha, Ryadh,Adrian,Saad
Purpose of Meeting:

- Review currently done work of HG module
- Check the progress on FB system

Minutes: Meeting called to order at 10:30 pm

A. Review currently done work

Discussion:

- Talked about the method of implementing feedback system.
- Talked about the method of implementing server.
- Talked about the sensors we have and the codes we have got for now.

B. Next meeting date:
March 18th 9:30 pm

AGENDA

March 18, 2016
9:30 am-10:20 am
SFU Library meeting room
Purpose of Meeting:

- To further discuss the design of the product

Items for Discussion:

- Communication between the main-controller and the sensors
- Plan the microcontroller-sensors integration
- Review all components for the product

MINUTES

March 18, 2016
9:30 am-10:20 am
SFU Library meeting room
Present: Adrian, Moha, Ryadh
Absent: Saad, Joseph
Purpose of Meeting:
· To further discuss the design of the product
Minutes: Meeting called to order at 9:30 am

A. Microcontroller-sensors integration

Discussion:
. All sensors needed for the product are purchased from China.
. The operation of the sensors need to tested.

Actions:
. Meet on Monday 21 of the following week to test the sensors.

B. Review the design and integration of the product

Discussion:
. The first prototype product seems to be working as planned.
. The GSM needs to be purchased and integrated with the product
. A phone app is in progress.

Actions:
. Purchase the GSM, with the Canadian standards, ASAP .
. Meet on Wednesday 23 on the following week to discuss the app's features.

C. Next Meeting Date
Meet the following Monday at 9:30 in the library
Meeting was adjourned at 10:20 am

AGENDA

March 21st, 2016
2:30 pm-4:35 pm
SFU Library meeting room
Purpose of Meeting:
· Review currently done work
Items for Discussion:
· Communication between the main-controller and the sensors
· Be able to read data from sensors ,and solder components that need to be soldered

MINUTES

March 21st, 2016
2:30 pm-4:35 pm
SFU Library meeting room
Present: Adrian, Joseph, Moha, Ryadh
Absent: Saad
Purpose of Meeting:

- Review currently done work
- Be able to read data from sensors ,and solder components that need to be soldered

Minutes: Meeting called to order at 2:30 pm

A. Review currently done work

Discussion:

- We have 60% of the work done
- The work that still needs to be done is test plan, battery, main controller case, GSM, server, wifi module

C. Be able to read data from sensors

Discussion:

. The first prototype product seems to be working as planned.
. The GSM and WiFi needs to be purchased and integrated with the product.
. Temperature, flame and light sensors are soldered and were able to communicate with our controller successfully
. A phone app is 70% done but still need to revive data from server for display..

B. Next Meeting Date

Meet the following Wednesday at 1:00pm in the library
Meeting was adjourned at 4:35 pm

AGENDA

March 23rd, 2016
2:30 pm-4:35 pm
SFU Library meeting room
Purpose of Meeting:

- Review currently done work of phone app

Items for Discussion:

- Decided the UI of phone application and final features of it.

MINUTES

March 23rd, 2016
2:30 pm-4:35 pm
SFU Library meeting room

Present: Joseph, Moha, Ryadh
Absent: Adrian,Saad
Purpose of Meeting:

- Review currently done work of phone app
- Decided the UI of phone application and final features of it.

Minutes: Meeting called to order at 2:30 pm

A. Review currently done work

Discussion:

- phone application was built and tested using emulator
- UI of phone app
- Should be simple and easy to use
- Should be able to be connected to server (discuss with adrian on Friday)

Next meeting date:
March 25th 2:30 pm at Lab 1

AGENDA

April 1st, 2016
9:30 am-10:30 am
SFU Library meeting room
Purpose of Meeting:

- Review currently done work of phone app

Items for Discussion:

- Check the functionality of the app.

MINUTES

April 1st, 2016
9:30 am-10:30 am
SFU Library meeting room
Present: Joseph, Moha, Ryadh
Absent: Adrian,Saad
Purpose of Meeting:

- Review currently done work of phone app
- Check the functionality of the app.

Minutes: Meeting called to order at 10:30 am.

A. Review currently done work

Discussion:

- phone application was built and tested on android phone
- UI of phone app looks good
- Need add more modules to the app(setting, help)
- Need to be more stable

B. Next meeting date:

April 8th 10:30 pm at Lab 1

MOTUS CONTROL

AGENDA

April 8, 2016
10:00 am-1:00 pm
SFU Lab1
Purpose of Meeting:

- Construct the PCB of the hand system.
- Implement the GSM with the sensors (flame, humidity, light, and temperature sensor).

Items for Discussion:

- PCB model needs to be implemented using Arduino nano.

MINUTES

April 8, 2016
10:00 am-1:00 pm
SFU Lab1
Present: Adrian, Joseph, Moha, Saad
Absent: Ryadh
Purpose of Meeting:

- Construct the PCB of the hand system.
- Implement the GSM with the sensors (flame, humidity, light, and temperature sensor).

Minutes: Meeting called to order at 1:00 pm

A. Construct the PCB of the hand system.

Discussion:

- PCB model needs to be implemented using Arduino nano.

Action:

- The PCB was constructed and is capable of performing its functionality.

B. Implement the GSM with the sensors

Discussion:

- The GSM needs to be connected with the sensor, and a message with the reading values should be sent.

Action:

- The GSM is implemented and connected with the main controller, and it works as expected..

Next meeting date:
April 9th 2:00 pm at Saad's home

AGENDA

April 14, 2016

2:00 pm - 10:00 pm
Saad's house

Purpose of Meeting:
- Test the functionality of the wearable sensor by controlling both lights and TV

Items for Discussion:
- The wearable sensor needs to be tested with home appliances to ensure it is able of performing its functionality.

MINUTES

April 14, 2016
2:00 pm - 10:00 pm
Saad's house
Present: Moha, Saad
Absent: Ryadh, Adrian, Joseph
Purpose of Meeting:
- Test the functionality of the wearable sensor by controlling both lights and TV

Minutes: Meeting called to order at 2:00 pm

A. Test the functionality of the wearable sensor by controlling both lights and TV

Discussion:
- The wearable sensor needs to be tested with home appliances to ensure it is able of performing its functionality.

Action:
- The IR was not able to send a signal to the TV. Therefore, the PCB was adjusted such that the IR is connected to pin 3 instead of pin7.
- The TV IR remote signals were decoded and integrated with the wearable sensor.
- The wearable sensor could not communicate with the main controller to turn on/off the lights. This happened because of wiring connections in the PCB. Therefore, a soldering iron is used to fix the problem.
- Lights and TV were controlled using only the wearable sensor.

Meeting was adjourned at 10:00pm