EASY WAY

Post Mortem Report for Auto Shopping Guide System

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GLOSSARY

ADC	Analog-to-digital converter
ASG	Auto Shopping Guide
AWI	Approved new Work Item
EEPROM	Electrically erasable programmable read-only memory
GUI	Graphical user interface
IC	Integrated circuit
IR-Transceiver	Infrared transceiver
ISO	International Organization for Standardization
IEC	International Electro-technical Commission
LED	Light-emitting diode
PC	Personal computer
PCB	Printed circuit board

SRAM	Static random-access memory
UI	User interface
USB	Universal Serial Bus

1. Introduction

The idea of the Auto Shopping Guide System is enlightened based on the shopping experience of part of the people, especially new immigrants and foreigners who are not familiar with the layout of local supermarkets. The system will offer the services of quickly locating consumers' targeting items and physically guiding consumers to the locations.

The ASG, Auto Shopping Guide, is a system that allows users to be able to locate the items on their shopping lists. The system consists of hardware, software and firmware. The hardware part that features a robotic car and line tracing sensor for accurate motions is mainly in charge of guiding users to their targeted location. The software and firmware part that is comprised of a user interface, database and robotic programming is primarily taking care of data manipulating, signal processing and route calculating. By inputting item names into the user interface, users are able to acquire the information of the items such as prices and locations in the form of coordinates. The fundamental functionality of the system is to help consumers, who are not familiar with layouts of local supermarkets, easily find what they desire to purchase. As a user friendly development team, we aim the design purpose of the system at people at all ages without any technical training.

The visual procedure of how ASG system helps users with their shopping experience is illustrated in the following figure.

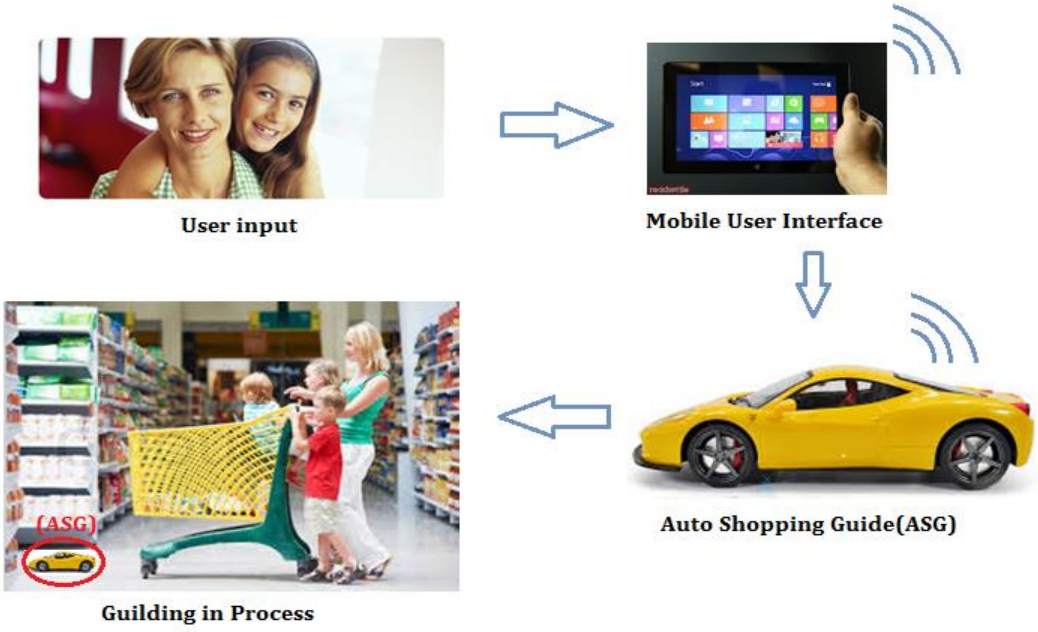

Figure 1 Shopping with ASG System

2. System Overview

The Auto shopping guide is a revolutionary design of the current shopping method. It will help customers find what they need quickly. The top level system can be modeled as shown in the following Figure.

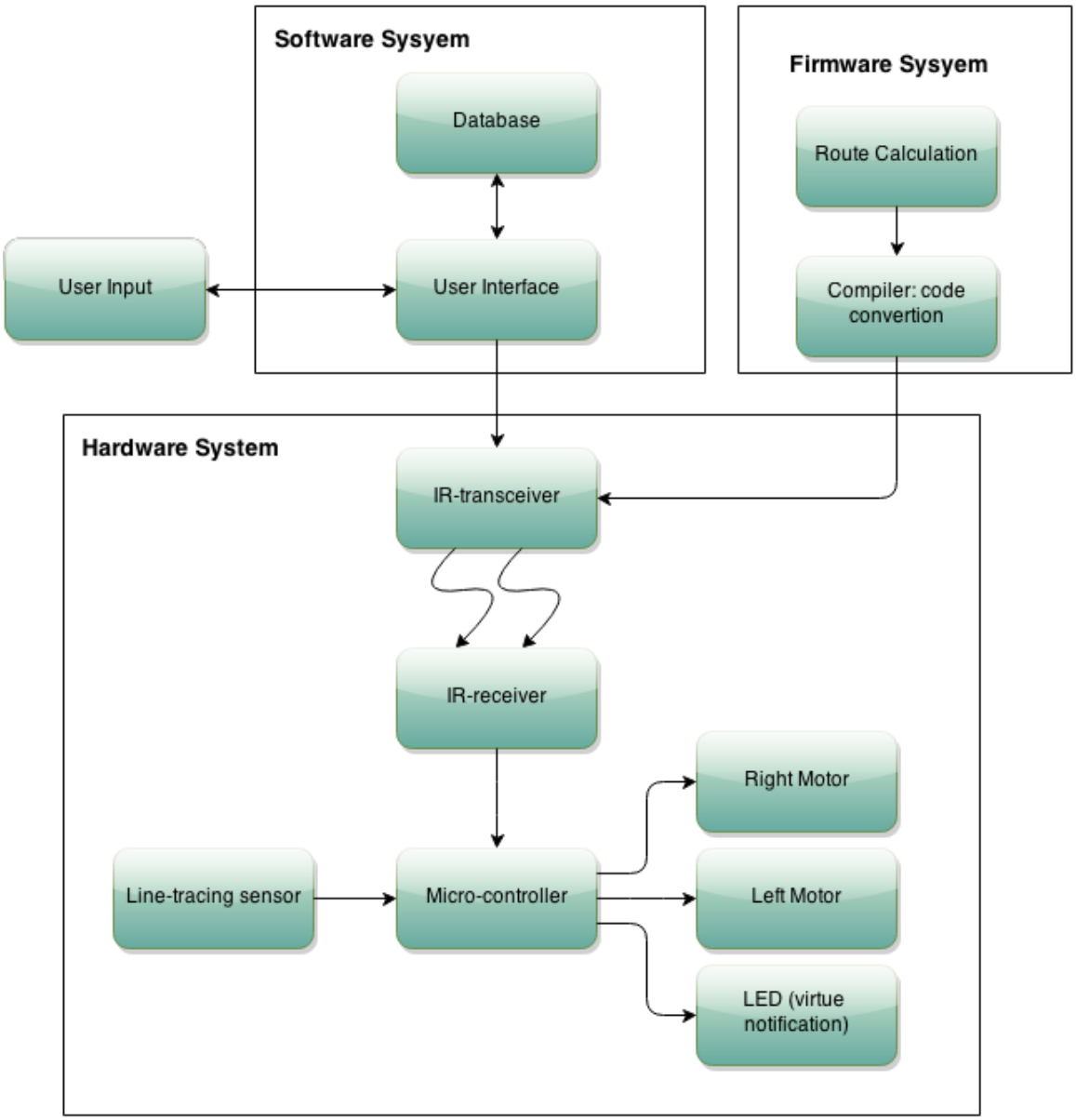

Figure 2 System Overview: System is separated to 3 parts: mobile software system, firmware and hardware system

The design consists of three major parts: mobile application (software system), firmware and Robotic car (hardware system), and each part contain several individual modules. Software system contains user interface (UI), database. Firmware is in charge of route calculation and robotic programming compiler. Hardware system contains IR-

transceiver/receiver, micro-controller, line tracing sensors, two independent motors and LEDs.

2.1 Hardware System

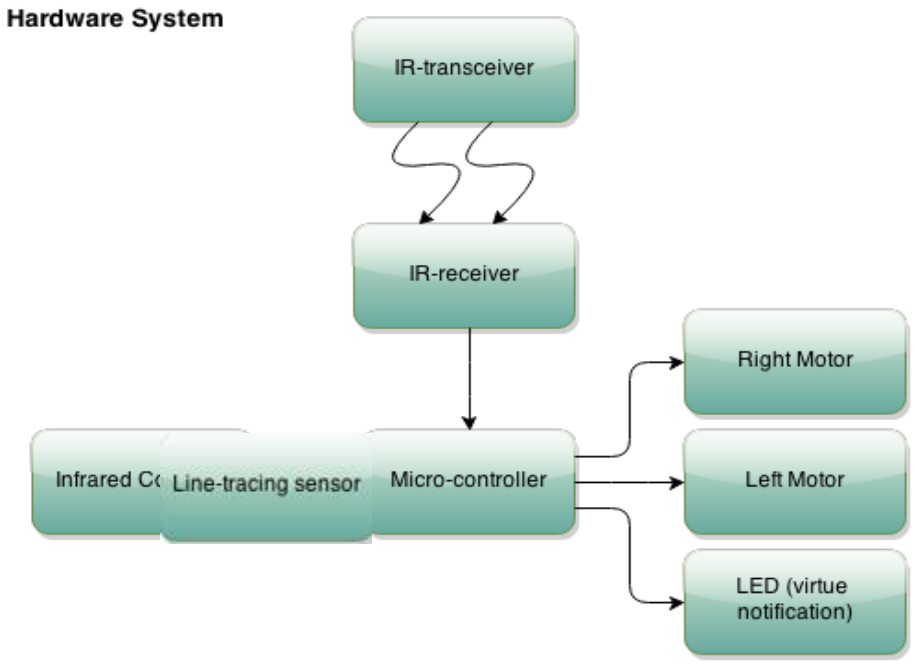

Figure 3 ASG's Hardware Top-level Block Diagram

As the figure shows, the ASG's hardware system contains Micro-controller, USB-transceiver, IR-transceiver, motors (engine), line tracing sensor, and status LED. Once all the modules are powered, the system should automatically configure them to perform all the functionalities. When the IR-receiver receives the route data from the IR-transceiver (software system), the micro-controller will store the received route data in the micro-controller memory. Micro-controller will control the two independent motors, and calculate the routing conditions. By changing the rotation speed of each motor, the robotic car will be able to move forward or backward, and make a turn on the black taped lines sensed by line tracing sensor at the bottom of the robotic car. Status LEDs will monitor the status of the hardware system including environment brightness regulation. There are also deviations for our hardware system such as excluding ultra-sonic sensors and collision sensors. The new modified robotic car is shown in Figure 4.

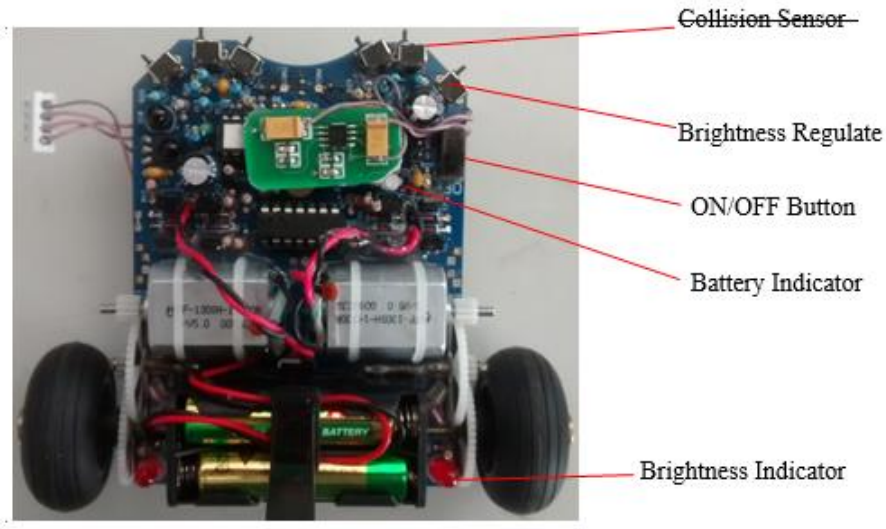

Figure 4 Robotic Car with Modified Components

The deviations took place due to the issues and challenges we encountered during the development phase.

2.2 Hardware Challenges

The hardware team was successful in completing the primary functionalities outlined in the functional specifications with several changes from the original design specifications. Some of the issues that were encountered and solutions or alternatives will be outlined in this section.

2.2.1 Sensors Require Extra Memory Spaces

The micro-controller for the robotic car is ATmega8, which is an 8-bit micro-controller based on Harvard architecture and made by Atmel. ATmega8 micro-controller contains 3 types of memory: SRAM, flash-memory and EEPROM. The capacity of SDRAM is 1024 Byte and the stored data will be cleared after power off. ATmega8 contains an 8k Byte flash-memory with an endurance of 10,000 write/erase cycles to store the program; however, 1k Byte of the flash-memory is reserved for boot loader, therefore, the available flash-memory is 7k Byte. Additionally, ATmega8 has a 512 Byte EEPROM with an en endurance of at least 100,000 write/erase cycles. Our development team realized that the route calculation took place inside the microcontroller which would occupy most of the spaces in the microcontroller in March. This issue results in the situation that we lack memory space to implement the sensors. Changing the microcontroller will cause the entire re-design of the PCB which is extremely time-consuming. Hence, we have decided to exclude the sensors in our final design and modify our market layout

design. The sensors, however, are included in our future development which is an important aspect of real life situation simulation.

2.2.2 Accuracy of Car Movement is hard to control

Our original design was to allow the robotic car freely select routes calculated and move to target locations. During our testing and sample running, it was nearly impossible to control the accuracy of its movement. The issue results in failing the primary functionality of our project. As a result, we decided to use the line tracing sensor that came within the robotic kit. And the robotic car would move on the taped black lines that are sensed by the line tracing sensor. The solution dramatically improves the accuracy of robotic car movement and locating ability. This solution requires extra design of an environment brightness calibration button to regulate the operating brightness for the robotic car.

2.3 Software System

Figure 5 ASG's Software Top-level Flow Diagram

As the figure shows, the Software part of the ASG includes the graphical user interface, database and the flash tool. The user interface provides a user friendly framework for entering original inputs as well as visually displaying necessary information regarding the inputs. The user interface will allow customer to input item names with the virtual keyboard. Once input data is received by UI, the UI will match the item information from database, and show this item information to customers. Meanwhile the coordinates (item location data) will be delivered to the microcontroller to do the route calculation based on the algorithm inside C code. The route calculation controls the two independent motors on the robotic car and handle the line tracing sensor. The C code is compiled and converted to machine code by the compiler [1]. Then the machine code (firmware) is transmitted using the flash tool. The view of UI is provided in Figure 6.

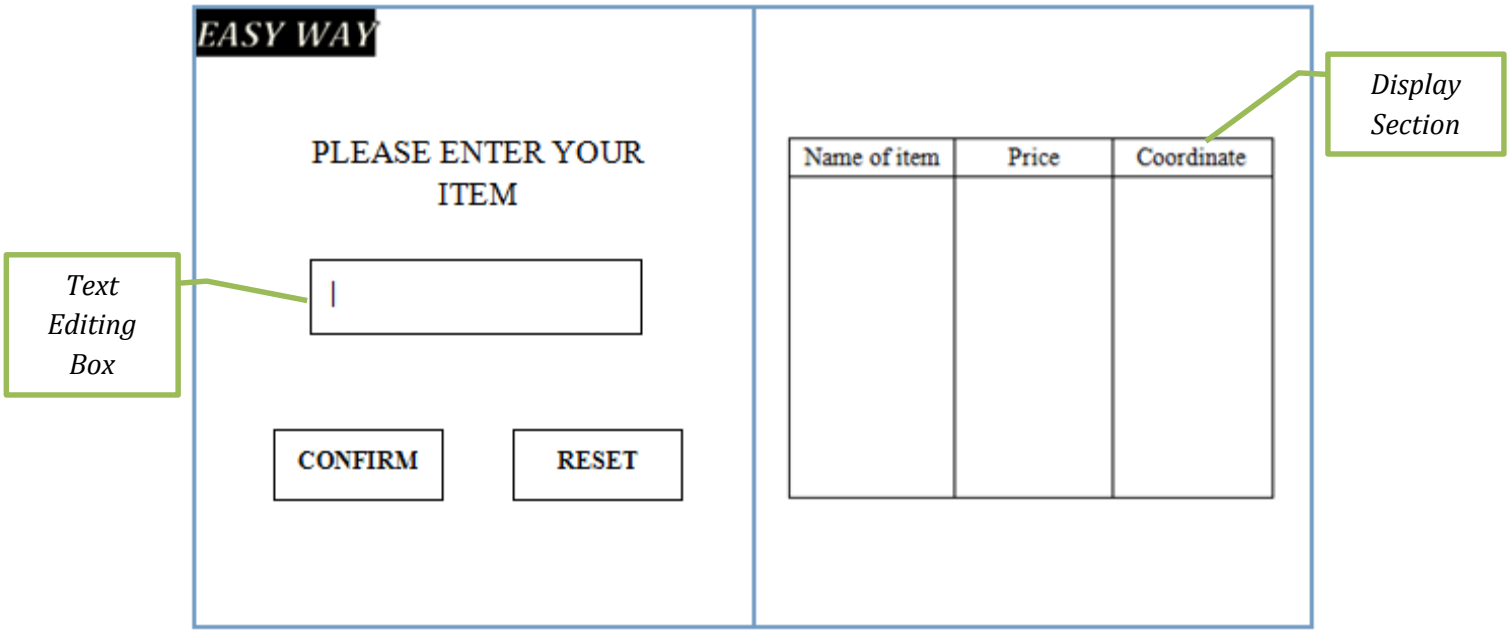

Figure 6 User Interface Design

2.4 Software Challenges

The software team has done an incredible job of creating UI and program routing algorithm. Since there have been issues coming up from time to time. Software development has taken nearly two months. And we tried to seek help from the TAs and friends with coding ability. The final version of the software system satisfies the primary functionality of the project. However, deviations do exist for our software system.

2.4.1 Adding a New Item Requires Route Re-calculation

During our meeting with Lukas regarding our project proposal, he proposed a challenge question of adding a new item during the shopping trip. Our original design was to input all items from the beginning. According our research and study, adding a new item requires route re-calculation. After putting a lot of thinking into it, considering our programming capabilities, our software team decides to proceed with an alternative that is input each item individually throughout the shopping trip. After inputting one item, the robotic car will guide users to its target location. Following that, users will input the next item and continue with the guiding.

2.4.2 Connection between UI and robotic programming firmware

Since the route calculation is written in C language, we were attempting to create our UI with C or C++ to ensure the compatibility. Our members have never done MFC development, therefore, we were not able to create UI with C or C++. Throughout our development phase 2, our software team realized the firmware could be loaded via flash tool in advance of sending IR signal during the shopping trip. The IR signal now

contains only the outputs of the UI which are coordinates. And the calculation is done in the microcontroller. Thus, the connection becomes unnecessary for our design. We have designed UI with HTML/JavaScript (Web based) which our members had experience with and C# (Windows Form Designer) that is built on the syntax and semantics of C++. Our final selection is the C# (Windows Form Designer) with COM interoperation (for IR transmission).

3. Financial Status

As a self—funded project, Easy Way Inc. tends to spend every dollar sufficiently. The following table is our original financial budget that was presented in the project proposal.

Equipment	Estimated Cost
Tweezers and Soldering Accessories	$40.00
USB IR Transceiver	$40.00
Parts and Components (such as wheels)	$80.00
ULT-Board	$40.00
Snake-Board	$90.00
Maker	$20.00
Hardboard	$25.00
Cable	$15.00
LCD Panel Board	$80.00
Motors	$50.00
Power Supply	$30.00
Total Cost	$510.00

Table 1 Original Tentative Budget

In fact, we have spent approximately $390 on all the components for the system that is lower than the original tentative budget, since we purchased a package of our robotic car that includes all components, maker, tweezers and soldering accessories from China. As the matter of fact, we refund the Snake-Board and ULT-Board. Furthermore, we purchased one extra package of robotic car in order to be prepared for any contingency. The final budget is shown below in Figure 8.

Equipment	Quantity	Cost
Robotic	2	$200
Motors	2	$50
USB IR Transceiver	1	$60
Barrier Sensor	1	$50
Power Supply	1	$30

Table 2 Final Budget

4. Scheduling

The following figure 7 Schedule shows the plan to complete our product. During the beginning of the January till Mach 15th, the progress of the project was on the expected schedule. However, the figure 8 Actual Schedule shows the real progress to achieve our goal. Compared these two tables, it describes we were behind the planning on the March. Since the product's software and hardware designed got some changed, we spent more time software development. As a result, we started our debug later than we expected as it is shown in figure 8. If we had more time, we could improve more on our prototype.

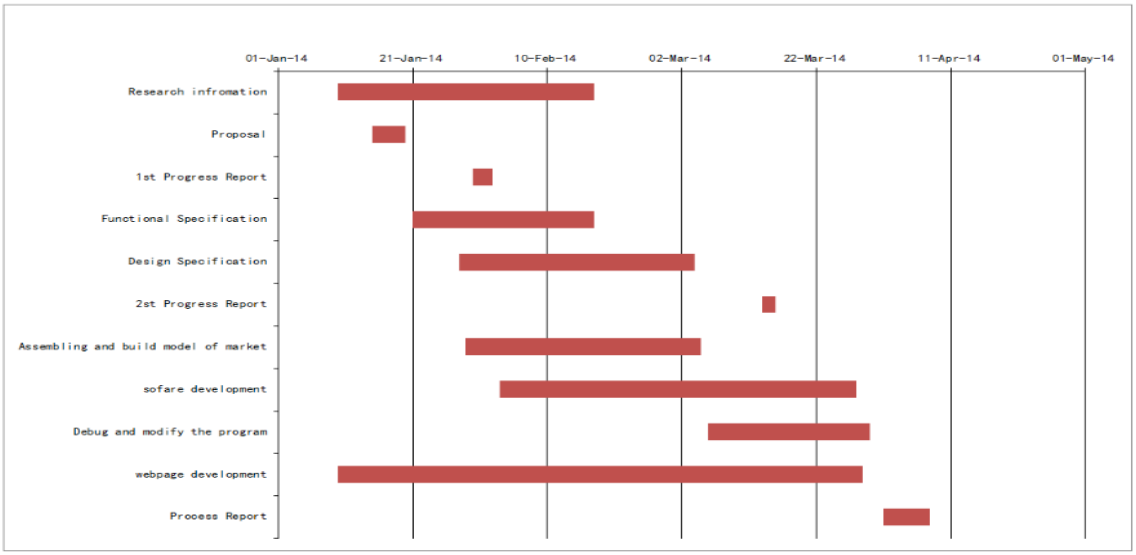

Figure 7 Expected Schedule

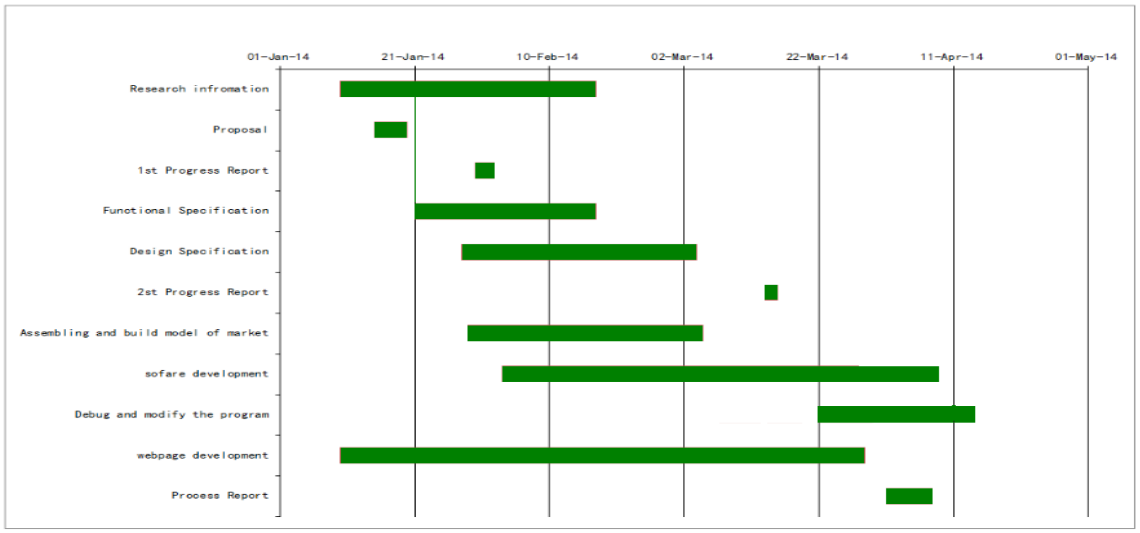

Figure 8 Actual Schedule

5. Group Dynamics

As Easy Way Inc. has five members, the group was split into two main working groups, a hardware team and a software team. Each team was then further split into individual tasks. The hardware team consists of Enzo and James, while the software team includes Jacqueline, Tao and Joseph. Although both teams have specifically separated objectives, all of us have worked very closely in developing, testing and solving issues.

5.1 Hardware Team

Being in charge of the hardware assembly, testing and final functionality testing, the hardware team has been involved in the progress throughout the entire project. Enzo, who has high proficiency in soldering and hardware assembly was the primary operator of soldering components and testing functionalities. He also proposed and implemented suggestions to improve the hardware system. James who is well experienced with embedded software was mainly in charge of our firmware development for route calculation.

5.2 Software Team

The members of the software team had different tasks. Jacqueline has been designing Web based UI and database using HTML and JavaScript. Tao and Joseph tried to create UI with MFC, and then transited to designing UI with C#, which was the time Jacqueline completed her design and joined the C# development task.

Due to the fact that none of us was a coding expert, we had been seeking helps from a SFU ENSC graduated friend who is currently an employee of Teradici. As well, the team had worked well to mutually support each other during the learning process.

5.3 Work Breakdown

The work breakdown for our group is illustrated in the following table, where XX means primary responsibility and X means some responsibility.

High—Level Task	Joseph	James	Enzo	Jacqueline	Tao
Robotic Car Assembly	X	X	XX	X	X
Robotic Car Test Run & measurements	X	XX	X	X	X
IR Signal Enhancement			XX		
Line Tracing Sensor			XX		
Voltage Stabilization			XX		
Firmware Development		XX	X		
MFC UI Design	X				X
JavaScript & HTML Design (Web based UI)			X	XX	
C# UI Design	XX			X	X
UI Code Debugging	XX			X	X
System Testing	X	X	X	X	X
Layout Design	X	X		XX	X
Part Sourcing	X	X	X	X	XX
Documentation	XX	X	X	X	X
Administrative Tasks	XX	X	X	X	X

Table 3 Work Breakdown

6. Individual Learning

Joseph Lu (CEO)

It is complete new experience for me to accomplish a team—based high—level design project. As the CEO, aside from providing the technical helps and knowledge, team organization, communication, and planning are also significant causes of success. Throughout these four—month development, various valuable skills have been picked up for myself that will certainly play important parts in successfully and professionally completing tasks in the future.

The project consists of both hardware and software including elements that I never had technical experience with. As a result, this project could be considered as a learning—applying process for myself. From assisting Enzo, who is an expert in hardware assembly, knowledge regarding sensors, microcontrollers, circuit debugging, and other types of ICs has been gained. Jacqueline (who was also responsible for HTML/JavaScript web based UI design), Tao and I were primarily in charge of UI design with C# Windows Form Designer, towards which I have more interests for career options. By studying tutorials and samples online, and having personal tutoring with a C# expert friend, I was able to create simple UI that worked well with the system. Last but not least, professional documentation skill is dramatically improved as there has been always a better grade than the last one towards the end of the semester.

In addition to the technical skills that I have gained via this project, there are other acquisitions that will strongly affect myself. As I mentioned earlier, being the CEO, there are more tasks that I need to be responsible for besides providing technical helps. Every meeting arrangement, every task assignment, every work distribution, and every progress follow—up are what I need to take care of. Team organization ability is the most valuable reflection which will offer considerably contribution to my future career.

Certainly, there were hard times during these four months such as receiving low grades for documents, learning a completely new scripting language or ICs that I had no exposure to and encountering issues that we did not have the background knowledge with. Furthermore, all the difficulties happened under significant time constraints. Fortunately, I was able to put the team together, face the challenges and come up with solutions.

My experience with Easy Way Inc. has been overwhelmingly grateful. And I feel immensely privileged to continue future work with my talented group members: James, Enzo, Tao and Jacqueline on our ASG system. It will never become real without the dedication and contribution from all of you.

James Lin (COO)

This semester is just a learning course for me. We have planned, designed and built our own project as engineer. This semester has been an experience to remember to me. I enjoy working with a group of talented teammates with various ideas and background. In this short three and half months, we share our ideas and make the huge innovation 'Auto shopping guide system'. With no others, the project will not be successful.

My row in this team is designing, writing and testing the firmware for the real hardware module. My responsibility decides that I have learned the processor firmware developing and debugging tool, IAR. Through the development cycle, I have picked up a lot of new and valuable skills that will stand be out in future.

From the technical perspective, I have improved my programing and coding skills in different language, especially in C, and also I have been experienced in playing with different kind of sensors, such as ultrasonic-ranging sensor and inferred compeller. The most important experience is I applied what I learned at school to the real project. This is really a wonderful experience that I suddenly feel that what I learned is really useful, and could be seen by other people.

Certainly, I have improved my English communication and writing skills. In my opinion, the most excited part is making this big project with a group of engineers. I have learned that the communication is one of the most import points to deliver a successful product. Everyone in the group needs to make contribution in order to success. This is really a busy semester to me, as I am taking 6 courses during the semester, and this makes me really hard to manage the time, especially during the final exam period. However, this does really require me to have a good time management. Good time management is the skill I have developed during the project. I think this is an aspect which would highly contribute my future career.

We have faced a lot of the problem in the project. We learn when we see the problem. When see the problem, we get together and them together

Overall, this experience has been really precious to me and I am really enjoying working with such talented teammates. We faced, learnt and solved the problem together. I look forward to continuing working with Jacqueline, Joseph, Enzo and Tao.

Enzo Guo (CTO)

Over this course of this semester, I am pride that I had the chance to be a part of Easy Way Inc. and I had a great time with these people. We have been through the whole parts of industrial procedure, which includes brainstorming for project ideas, designing & implementing features, debugging & redesigning, and testing. It was a great challenge for us to build a project by our own and it was the first time for me to design and build a whole project rather than finishing assigned tasks. The experience of this course is totally different from my co-op experience. When I was doing my co-op, I always want to challenge myself and design my own project but I have no clue that the entire design process is this hard. This project requires intense team works and brilliant individual works, I have to say it is my honor to work with these talented engineers and our success is closely related to all of our team members.

I was focusing on the hardware part of this project. I was primarily responsible for hardware assembly, debugging, modification and testing with other members' assistances. This position is similar to my position at Sierra Wireless; however, the working station and equipment is not good as Sierra Wireless. I have to learn and practice to deliver the same work quality with basic tools. Since I didn't built our first robotic car with enough caution, we wasted time on fixing bugs and we build a second robotic eventually. I have learned that I have to practice my skills and adapt the new working environment/equipment before I start to work.

In addition, I have learn that during the design/testing process, fatal mistake can occupy and completely ruin the whole project. For our project, since our original design is not good for accurate movement, we have to change our algorithm and start to work from beginning stage. For further projects, I will predict the risk of design solutions and prepare back-up plan.

Beside the technical skills and project management skills, the biggest benefit I have gained from our project is team work and communication skills. We worked together for the most of time and we kept informing all team members about the changes/updates, which saved a lot of time and there is almost no misunderstand between all team members.

Overall, all of us did a great job on this project. Thanks all the team members: Jacqueline, James, Joseph and Tao. I will remember my experience at Easy Way Inc.

Tao Xiong (CFO)

Over the course of this semester, I had the chance to work as part of the Easy Way Inc. to create Auto shopping Guide system. It was truly memorable experience.

Though the period of learning and developing our project, I have acquired reasonable time management. Being able to have self-motivation, and doing well at work planning and time arrangement. I realized the importance of good teamwork. Only efficient teamwork and communication could enable us to get project done on time.

I have got the duty of handling money to reduce the unnecessary expenses because I am the CFO in Easy Way. Besides handling the money, I was responsible for drawing all of designed circuit schematics by AutoCAD, which made me become more skillful at it. My other responsibility was working with Joseph and Jacqueline to build User Interface as the software part of our project. At the beginning of developing our User Interface, we needed to know which method would satisfy all the required conditions for our project. I was first learning how to use MFC to build User Interface with Joseph while Jacqueline was designing web based UI using HTML and JavaScript. We encountered a big challenge due to the fact that we had never experienced MFC design. We had to do self-learning in order to understand sample codes downloaded from the Internet, which was a difficult process. We made a decision of giving up the method of MFC and adopting C# to build the User Interface as the result of getting suggestion from our friend, Frank. We were told that learning C# would be much easier than MFC regarding designing of the User Interface. Throughout several weeks of hard working, our User Interface has been safely accomplished.

Besides the technical difficulties, I also realized that lacking English oral and written communication skill generated deep impact on completing documents and receiving good grades. Dictionary became my best helper while doing documents. Our CEO, Joseph, did a lot of extra work of proof reading, clearing structure and spelling mistakes, as well as enhancing our documents with professionalism. The exceptional administrative and organizing capabilities, as well as impressive English language skills of him helped a lot while completing our project. Enzo and James, the main designer of hardware and firmware, also demonstrated their strong technical knowledge that I have learnt a lot from them. Last but not least, my team partner Jacqueline impressed me with her dedication, and web design skills.

I am very thankful for working with my talented group members and completing our project within the timeline. I am more than willing to work with them again for future development of our ASG system.

JiaQi (Jacqueline) Li (VP)

I enjoyed taking this course in this semester very much. This course not only offers an opportunity to work with the talented teammates, but also it was good and memorable experience to design, build and test our own project as an engineer. I appreciated our TAs always provided lots professional help to us. Moreover, our group kept hard working in these three and half months. Without one of our group members, our own project cannot be achieved.

From these three and half months, I gained lots of experience on the technical skills from the project. In the project, I was working on software development and product testing. At the beginning of the project, we discussed and agreed making an auto shopping guide car as our project topic. Joseph, Tao and I focused on developing user interface. I tried to build up the UI by using JavaScript, HTML and PHP. Since we could not find a solution which is converting JavaScript code to C file, we had to find another language to develop the UI. Finally, we decided to use C# Windows Form to write the UI. Because we were lack of C# knowledge, we studied it from a friend and online sources. During the UI development, I had more experience on web base design. Also, I learned one more useful and interesting language for my future career. I believe as an engineer, I have to keep learning and applying new knowledge in working.

Additionally, I got experience to develop the relationship with team members. This project is big and integrated. I believe without any of us, it could not be completed. The importance of teamwork spirit was shown from this project. When one of the teammates met any difficulties, others would like to offer helps to find all possible solutions. Also, communication skill plays a significant role in the teamwork. We always shared and discussed our ideas as a group, so we could understand the progress.

Moreover, I could get some improvement in writing skills. In this semester, we submitted some documents for our project. We got lots good suggestions about the writing skills from our TAs such as Lucas and Jamal. Also, I learned time management is very important to contribute a big project. If the progress of the product is behind the schedule, it will affect and delay the later progresses. For example, we did not have enough time for product testing, so there are still some flaws and future improvements when we present the product.

From this course, I learned and gained more experience how to be an engineer before I leave the college. I found lots of improvements for myself. However, I believe the memorable experience will contribute my future career. Also, I am looking forward to working with James, Joseph, Enzo and Tao again.

7. Conclusion

The members of Easy Way Inc. has met and exceeded their goals and objectives for the prototype of their Auto Shopping Guide system. The system works as expected with some deviations from the original design. The hardware assembly and testing was completed ahead of the schedule with several issues that were addressed and resolved within the timeline. The software design has gone beyond our expectations as the system now only requires one—time input to proceed the guiding. The mutual assistance and team communications were exceptionally good and all documentations and work loads were equally distrubuted and done as a team. It does have flaws and there is certainly future development that needs to be taken care of, such as the implementation of sensors for collision and range detection capability and the better algorithm for smoother motions of the robotic car. Aside from the future development, the primary function of ASG system, that is being able to guide users to targetted locations is well demonstrated via the prototype. The group is very proud of the project and would definitely like to work together again in the future.

8. Reference

[1] WinAVR compiler:
http://www.webring.org/l/rd?ring=avr;id=59;url=http%3A%2F%2Fwinavr%2Esourceforge%2Enet%2F

[2] Assembly and Operation MANUAL:

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[3] ATmega8 Data Sheet

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[4] SFH5110 Data Sheet

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[5] ASURO Ultrasonic ULT-10

http://www.produktinfo.conrad.com/datenblaetter/175000-199999/191360-as-01-de-ASURO_ULTRASCHALL_SATZ_FUER_ARX_03.pdf

[6] http://www.arexx.com/arexx.php?cmd=goto&cparam=p_asuro_downloads

APPENDIX A – MEETING MINUTES

Easy Way Inc.

AGENDA

January 12, 2013
13:30—15:10
CEO's Apartment on University High Street

Purpose of Meeting: To initiate the project, decide on a topic and possible details

Present: Joseph (CEO), James (COO), Enzo (CTO), Jacqueline (VP), Tao (CFO)

Minutes:

Select the topic of our project

- Parallel parking system by Jacqueline
- Back in parking system by Tao
- Guiding robot for blind people by Joseph
- Shopping guide by James (selected)

Purpose of the project is to guide customers to where items are in order to save time and reduce impulsive shopping.

Design Aspects

- Hardware: a guider (robot), sensors, signal transmitting (IR, Bluetooth), Terminal (smartphone, tablet, PC)
- Software: UI, database, robotic programming

Company Name

- Smart Life
- Easy Life
- Easy Way (selected)

Logo: James is designing a simple logo for the group.

Things to Do: search for existing solutions; search for useful information and components for our solution; prepare for the project proposal.

Easy Way Inc.

AGENDA

January 16, 2013
14:30—15:30
ASB ENSC LAB 4

Purpose of Meeting: Assign tasks to every member in order to complete project proposal that is due on Jan 20th.

Present: Joseph, James, Enzo, Tao, Jacqueline

Minutes:

Everyone should go through the sample proposal and Rubric.

Work Distribution:

Joseph: Executive Summary, Introduction, Conclusion

James: System Overview

Enzo: Cover Letter, Team Organization

Jacqueline: Possible Design Solution, Proposed Design Solution

Tao: Source of Information, Budget and Funding, Scheduling

Everyone: Company Profile, Reference

Things to Do: Complete the individual parts by Saturday; Proof—reading and formatting on Sunday.

Easy Way Inc.

AGENDA

January 21, 2014
11:30—12:45
ASB ENSC LAB 4

Purpose of Meeting: Decide to order components for our project.

Present: Joseph, James, Enzo, Tao, Jacqueline

Minutes:

Hardware requires a robotic car that does the real time guiding. Tao found a company that manufactures open source development robotic kit, AREXX Engineering.

Package includes: pre—designed PCB, electronics components, microcontroller, ultra—sonic sensors, collision sensors, motors, wheels, USB IR transceiver and receiver.

Due to our budget, Tao suggests that we make the purchase from China for lower price. The package requires soldering and testing which Enzo will be primarily in charge of. Shipping takes 4 to 5 days.

Software needs to be run on mobile devices such as smartphones or tablets. None of us has any experience with Android or IOS development. Enzo proposed that we could use his Microsoft Surface which is a laptop with the size of a tablet.

Things to Do: Study ASURO robotic kit from AREXX website; get ready for hardware assembly once the package arrives.

Easy Way Inc.

AGENDA

January 28, 2014
15:30—16:05
CEO's Apartment on University High Street

Purpose of Meeting: Picking up robotic kit and review graded proposal.

Present: Joseph, James, Enzo, Tao, Jacqueline

Minutes:

- Proposal grade is much lower than what we expected
- Review every comment on the graded proposal
    1. English language usage
    2. Marketing target needs changes. It was focusing on supermarket owners, and needed to change to consumers
    3. Graphs and diagrams
    4. Formatting
- Discuss explanations and email Lukas to arrange a meeting
- Opened the robotic kit and checked all the components—missing resistors and wires can be obtained in Lab1
- Enzo did measurements on the components to ensure there was no damage

Things to Do: Start hardware assembly after Jan; Development phase 1 (hardware) should be finished by Feb including testing; Prepare for meeting with Lukas.

Easy Way Inc.

AGENDA

February 4, 2014
15:30—16:40
ASB ENSC LAB 1

Purpose of Meeting: Discussion regarding Lukas' comments and suggestions

Present: Joseph, Jacqueline, Tao

Minutes:

- English skills. Various grammatical and spelling mistakes. Need better proof reading.
- Correct formatting including table of contents, referencing, and figure captures, list of figures, etc.
- Technical Contents: System explanation was unclear
- Marketing purpose was not strong enough such as intended buyers, investors.
- Scheduling needs re—do.
- Points will be noticed and taken care of for next document: functional specification.
- Enzo started soldering the PCB. We will be assisting him with soldering and measuring.
- Meanwhile, James is working on the test code for component testing after assembly is done.

- Test code is written in C on WinAVR open source software development platform, corresponding to the microcontroller, Atmel AVR 8—bit microcontroller.

Things to Do: Try to finish hardware assembly within reading break; start thinking about the functional specification.

Easy Way Inc.

AGENDA

February 13, 2014
13:20—17:50
ASB ENSC LAB 1

Purpose of Meeting: Complete the requirements part for functional specification and assign individual tasks regarding the document.

Present: Joseph, James, Enzo, Tao, Jacqueline

Minutes:

- Requirements completed for overall system and modules
- Tasks assigned individually
    1. James—system overview
    2. Tao—adding points to the requirement list for each module
    3. Enzo—midterm coming up, finish the cover letter, and final formatting
    4. Jacqueline—system test plans
    5. Joseph—executive summary, introduction, conclusion and proof—reading
- By now, 50% of soldering is done including microcontroller, IR receiver and some electronic components.

Things to Do: Complete functional specification by Sunday, Feb 16th.

Easy Way Inc.

AGENDA

February 21, 2014
13:20—17:50
ASB ENSC LAB 4

Purpose of Meeting: Testing hardware and prepare for development phase 2.

Present: Joseph, James, Enzo, Jacqueline, Tao

Minutes:

- Enzo has completed soldering
- Tao and Jacqueline helped with measurements
- James and I completed some test code to test the microcontroller, IR transmission and motors.
- Motors and wheels respond to the signal by spinning and functioning
- LED light shows red when the robotic car is on.
- Angular speed controls robotic car's motions: left turning, angular speed on right is larger than it on left. Vice versa.

Things to Do: research for software system and prepare for development phase 2 including UI, database, and route calculation.

Easy Way Inc.

AGENDA

February 27, 2014
14:30—16:35
ASB ENSC LAB 1

Purpose of Meeting: Software development has started. Tao and I had difficulties designing UI with MFC.

Present: Joseph, James, Enzo, Jacqueline, Tao

Minutes:

- Start preparing for oral progress report
- Assign individual tasks
    1. Joseph is in charge of introduction, general questions and any possible technical questions that any members could not answer
    2. James takes robotic programming, routing algorithm
    3. Jacqueline and Tao will do UI, database, financial and scheduling
    4. Enzo will introduce the hardware system progress
- Write down information and practice
- Oral progress report is held on March 6th, 15:30—15:45 at ASB 9705
- Scheduling an appointment for Monday meeting with Prerna for technical help

Things to do: preparing for meeting with Prerna; Jacqueline starts designing UI with HTML and JavaScript. Tao and Joseph seek another solution for UI design.

Easy Way Inc.

AGENDA

March 6, 2014
11:30—12:15 then 13:05—15:00
ASB ENSC LAB 1 and Outside LAB 1

Purpose of Meeting: Final preparation for oral progress report.

Present: Joseph, James, Enzo, Jacqueline, Tao

Minutes:

- Peer review every member's handout
- Practice as much as possible individually and together as a group
- Prepare for possible questions and answers

Things to Do: After presentation, continue working on the design spec which is due Mar, 10th with possible 3 days extension; Enzo has realized issues with hardware, please figure out the cause and solutions; Tao and Joseph start learning C# for UI design.

Easy Way Inc.

AGENDA

March 12, 2014
14:30—17:05
ASB ENSC LAB 4

Purpose of Meeting: Finishing up the design spec and collect members' progress.

Present: Joseph, James, Enzo, Jacqueline, Tao

Minutes:

- Joseph finished abstract, introduction, conclusion and software system
- James completed system overview, and robotic programming (firmware)
- Enzo is in charge of the hardware system and final editing
- Jacqueline completed the system test plans
- Tao spent days drawing electrical schematics using AutoCAD
- Tao and Joseph has studied several UI design samples with C# Windows Form Designer.
- Jacqueline is finishing up the HTML web—based UI. The coordinate calculation will be done in JavaScript.
- James is having progress with the route algorithm.
- Enzo is still looking into the sensor issues

Things to Do: Complete design spec by end of today; start UI designing with C#; resolve sensors issues within two weeks.

Easy Way Inc.

AGENDA

March 16, 2014
13:45—15:00
ASB ENSC LAB 4

Purpose of Meeting: Tasks Re—distribution. Issue addressing.

Presented: Joseph, James, Enzo, Jacqueline, Tao

Minutes:

- C# UI design is partially done by Joseph
- Jacqueline and Tao are working on the communication part of C# code
- Issue addressed by Enzo and James: route calculation is done in the microcontroller which requires high memory usage. We lacking memory to implement ultra—sonic sensors and collision sensors.
- Possible solutions: change microcontroller which might cause an entire re—design of the PCB; exclude sensors and therefore, exclude obstacles in our layout design.

Things to Do: Study sample codes online regarding C# COM handling; go ahead with excluding ultra—sonic sensors and collision sensors.

Easy Way Inc.

AGENDA

March 25, 2014
17:30—18:40
ASB ENSC LAB 1

Purpose of Meeting: Discussion on encountered issues after meeting with Jamal. Confirm deviations to functional specification.

Present: Joseph, James, Enzo

Minutes:

- Consider suggestions from Jamal

1. Motion accuracy is currently a big issue

- We proposed solution in order to solve inaccurate movement by using line tracing sensor that is included in the kit. So that the robotic car would strictly move on the taped black lines

2. Improve build quality

- Enzo will complete the assembly of our back—up robotic car
- Deviations are recognized by the group. Time is short, we have to make changes on our design.

Things to Do: Enzo will complete the second robotic car and implement the line tracing sensor by the end of this week; Joseph will continue improving UI, adding functions; James will continue working on firmware development; Tao and Jacqueline will complete COM part of UI. Hopefully all the remaining tasks will be done by the first week of April.

Easy Way Inc.

AGENDA

April 5, 2014
14:45—16:10
ASB ENSC LAB 4

Purpose of Meeting: Combine software, debug codes and design layout.

Present: Joseph, James, Enzo, Jacqueline, Tao

Minutes:

- UI design is nearly completed, Joseph, Jacqueline and Tao got together to combine the program and start debugging the code to clear errors and warnings
- The market layout has been designed and built with wooden boards and black duct tapes (3x3)
- Sensors are excluded, therefore, obstacles are excluded in layout design
- James has partially completed firmware, and yet it is not usable currently

Things to Do: James needs to speed up with the firmware design, complete by Friday, April 11; Software team will focus on debugging the code; Enzo will make improvements to the hardware system and ensure the line tracing sensor works fine, and this needs to be done by Friday, April 11.

Easy Way Inc.

AGENDA

April 11, 2014
13:35—19:40
CEO's Apartment on University High Street

Purpose of Meeting: Combine all modules, confirm modifications and deviations, and start system testing.

Present: Joseph, James, Enzo, Jacqueline, Tao

Minutes:

- James has completed firmware development
- Enzo has completed improvements on hardware system
- Software team has completed debugging
- Final stage—system testing is initiated
- First test was not quite successful, slow angular speed leaded to unexpected movement of the robotic car
- Speed is modified
- Batteries have been replaced with news
- Minor changes were made to the taped black lines

Things to Do: Continue with system testing and make sure to videotape successful runs; start preparing for final Demo (Apr 16).

Easy Way Inc.

AGENDA

April 14, 2014
12:15—20:35
CEO's Apartment on University High Street

Purpose of Meeting: Final stage system testing, videotaping, complete PPT, practice presentation, and discuss post mortem.

Present: Joseph, James, Enzo, Jacqueline, Tao

Minutes:

- Everyone needs to complete their part of the PPT by today
- Sections of PPT are corresponding to members' primary responsibilities
- Continue with system testing and videotaping successful runs
- After modifications and trials, system testing was successful for several times and test routes
- Practice presentations individually and as a group
- Finish individual learning of the post mortem

Things to Do: Members haven't slept well for nearly a month, get some rest and be ready for the final rush tomorrow. Demo is at 1:30 PM on April 16. Good Luck!