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January 21, 2007

Mr. Patrick Leung
School of Engineering Science
Simon Fraser University
Burnaby, BC V5A 1S6

Re: ENSC 440, *Project Proposal for a Wireless Parked Car Finding System*

Dear Mr. Leung:

The attached document contains our proposal for a Wireless Parked Car Finding system. The goal of the project is to create a product that would assist users in finding their car in a crowded parking lot.

The purpose of the proposal is to present the product and give an overview as to how the product will work and how we will complete the project. The proposal includes a description of the product, sources of funding, the best estimate for our projected costs and description of the team dynamics of our company, Weiibo Inc. Furthermore, this proposal will outline other methods/products that could be used by a user to find a car in a parking lot.

Weiibo Inc. is a company formed by Karl Simard, Hooman Jarollahi, Dennis Xu and Diwaker Malla. We are all 3rd or 4th year Engineering students and are very motivated about this product. We are confident that developing this product and going through the development cycle will allow us to apply the knowledge and experience we have gained so far. Should you have any questions or comments about our proposal, please do not hesitate to contact us via phone at (778) 862-2242 or e-mail at hjarolla@sfu.ca.

Regards,

Hooman Jarollahi
CEO, Weiibo Inc.

Enclosure: *Proposal for a Wireless Parked Car Finding System*

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Proposal for a Wireless Parked Car Finding System

Project Team: Diwaker Malla
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Submitted to: Patrick Leung – ENSC 440
Steve Whitmore – ENSC 305
School of Engineering Science
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Issued Date: January 21, 2008

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Executive Summary

Have you ever had a tough time finding your car in a large parking area after being away? We are confident that this has happened to most of us and has probably caused a lot of frustrations and exhaustions. This situation would become even worse and more stressful especially at nights or foggy days when the visibility is poor or times with poor weather conditions. Amongst all the frustrations, we might have even used the panic button or similar tools to find our cars. However, these methods can be very disturbing and inconvenient aside from the fact that these systems are not really designed for such a purpose.

This situation has definitely aggravated the ignorance of people to car alarms. The disturbances that car alarms have caused have even led Vancouver Councilor, Tim Stevenson, in 2004 to propose the following: “Well over 95 percent of alarms are false, well above 95%, maybe 99%, doesn't deter from crimes. So I think it's time to move along and ban them" [1]. In contrast, ICBC has stated that various forms of anti-theft devices have decreased auto-theft by 70%. However, ICBC also states that the purchase of car alarms has remained stable since 1997 [2]. Part of this decreasing popularity of the car alarm system can be accounted for by people misusing lock/unlock or panic buttons for finding their cars.

This document proposes the development of a device that can be integrated into existing car alarm, keyless entry or as a stand alone system to help find parked cars. The device consists of two parts: a fob key with a display system and a module that is installed in the car. It will assist drivers to locate their cars by displaying them the proximity between the car and the driver. Additionally the device has a feature that accepts entries from the user to store location information of a parking lot.

This device will quietly and conveniently help people save their time in finding their cars especially in large parking lots. It will prevent people from misusing car alarms that are annoying to the public. Also, this device will largely contribute towards the increase of the proper usage of car alarm systems which can be very effective means of preventing auto-thefts.

Weiibo Inc. consists of four engineering students that have recently teamed up to work on a project that would definitely make many lives simpler. We all bring distinguishable skills and knowledge to Weiibo Inc. Whether it is software/firmware programming, hardware design experience or simply leadership, the company has the caliber to bring this new wireless parked car finding system to the market.

The prototype development of this product will consist of research, design, development, testing and documentation. We propose that this will be completed in 13 weeks starting January 7, 2008. We forecast that the completion of the prototype will cost us 790 dollars.

Table of Contents

List of Figures

1. Introduction

There is a great necessity for a product that can guide drivers to find their cars, especially in large parking areas. The wasted searching time also makes drivers exhausted and annoyed, especially the elderly group of the society. This fatigue and frustration can cause the drivers not to be able to drive to the best of their abilities. There are several major reasons why finding a car in a parking area can be very tough. These reasons can be used as proofs for the need of this product.

Many cars look alike in terms of shape and color. There can be numerous cars of the same model in a parking lot. Therefore, reading the license plate of the car can be a way to tell cars apart. For this and similar methods to work, one should get fairly close to the car to be able to recognize the plate. The reason obviously is that the vision of human beings has a limited recognition range. This issue gets even worse at nights or during foggy or snowy days when visibility is limited.

The purpose of this project is to design and implement a product that can be installed in cars either as a built-in feature by car manufacturers, integrated in remote car control systems, or as a product people can purchase off shelves at warehouses or electronics stores. This device will be used to inform the drivers whether they are getting closer to their car or farther away. Our product will have two major parts: the car module, which needs to be put inside the car, and the driver display module, which needs to be carried by the driver. As an extra feature, this device can store information about parking area, such as lot number or parking floor number. When needed, the driver can view the information for more guidance.

In this document, a general outline of our product will be proposed, indicating possible design solutions and alternative solutions to this problem. Furthermore, we will outline the benefits of our product that other related solutions lack. Also, we will briefly explain how we estimated our budget and funding, milestone scheduling and deadlines. We will also give details on how our group dynamics is going to look like as well as state any references we used. Finally, since this is a new and original product, we have begun our feasibility study and design methodology research period prior to the semester's beginning.

2. System Overview

Figure 2.1 shows how the system should behave as seen by the user. The remote control should allow the user to input data as needed through its easy to use interface. The user interface includes a large and visible screen used to display pertinent information to the user.

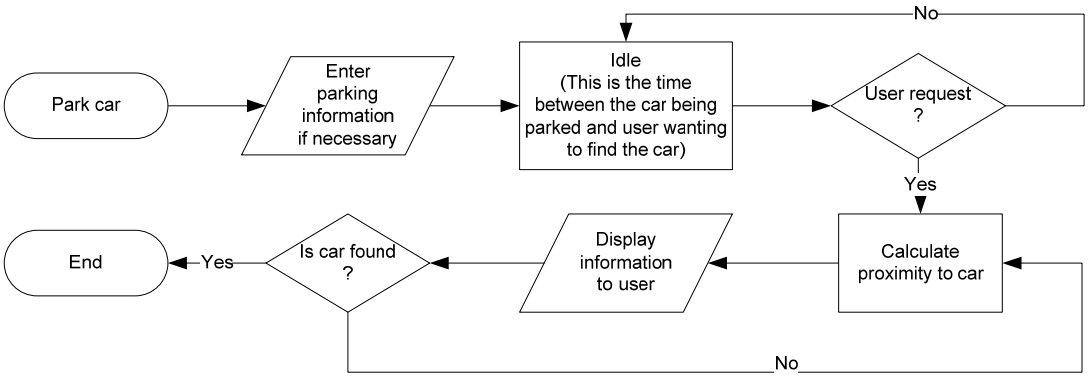


Figure 2.1 Flow chart of system

As you can see from Figure 2.2 and Figure 2.3, the user of the system has a remote control in his possession that will display the information about the relative location of the car. Inside the car, there is another module that will be in communication with the remote control. The two devices will interact together in order to determine information about the car's location.

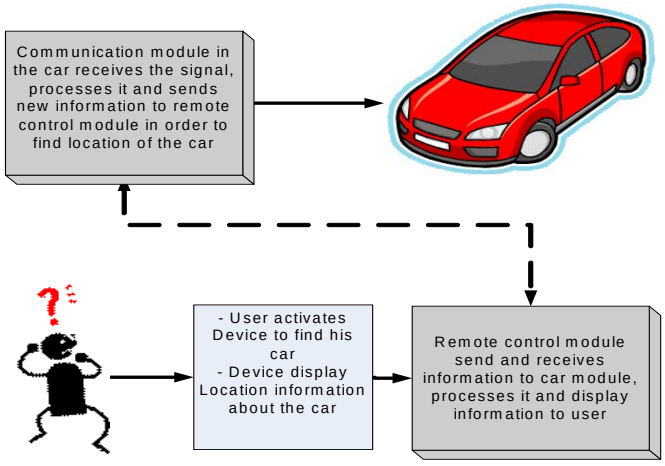


Figure 2.2 System block diagram

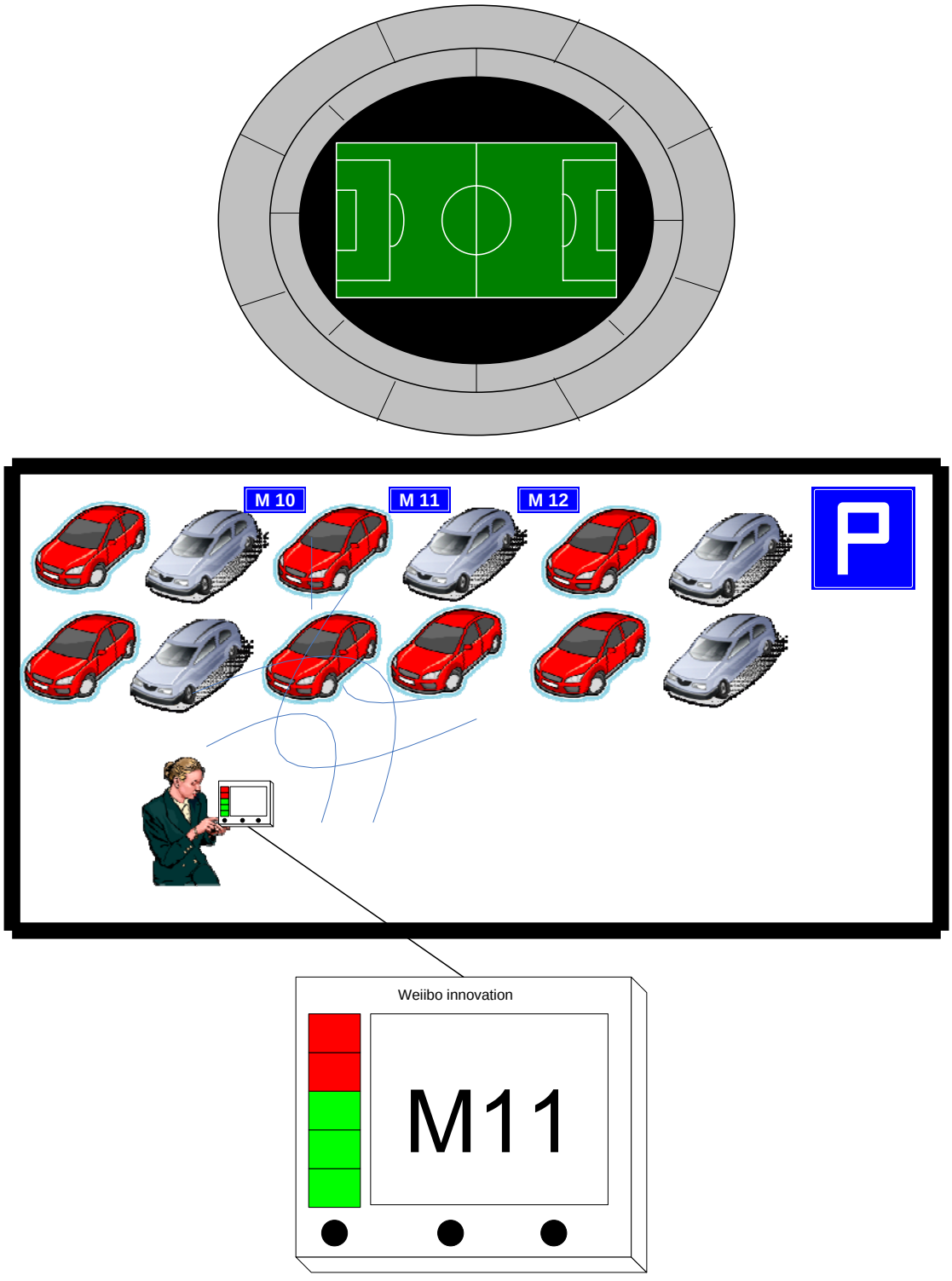


Figure 2.3 Graphical application example – Soccer field parking area

3. Possible Design Solution

There are currently products available in the market that can be helpful to drivers to find their car in parking lots. However, most of these products are not designed for this purpose and are sometimes misused by drivers to find their car. For example, the lock/unlock features which activate the alarm system in a car are not meant to find parked cars. However, there are many drivers, who on a daily basis use this feature to guide them to their car which can scare and annoy people in the area where the car's alarm system is blaring. The following summarizes the current methods used by drivers to find their car in parking lots and their disadvantages. Then, a proposed solution will be introduced that is designed specifically for this purpose that resolves the issues with current products on the market.

3.1. Remote Car Alarm and Light System Activation

This product comes with a remote control carried by the driver and a system installed in the car which is usually meant to be used to lock or unlock the cars. However, we have observed that a lot of drivers use this feature to activate the alarm (Panic button) and turn on the lights to guide them towards their car. In most cases this method works. By itself, it is a proof that a car finder has become necessary in order to help drivers find their cars. The current method can be very annoying and inconvenient to people in the car's surroundings, especially late at night when people are sleeping. Moreover, this product does not cover long distances as the device is meant to be used in close proximity of the car. It is only designed for the purposes explained above, which do not really require long range coverage. The other limitation of the lighting system is that it does not work well in daytime, since sun light limits the visibility of the car lights when they are on. Another disadvantage of this product is that it can confuse people, for instance, they may not know whether the sound of alarm system is related to anti-theft device installed in the car or to the lock/unlocking feature. This can have a negative impact on both of these products' market since people get annoyed by false alarms.

3.2. GPS Systems

There are various GPS products that can be used to locate cars although their primary use is not to find parked cars in parking lots. These products require a line of sight of GPS satellites which may not be available in every parking area such as underground concrete parking lots. Also, the accuracy of these products is under question since the resolution of GPS is not very convenient for finding cars in parking lots. Above all else, GPS products can be very expensive, not so portable and unaffordable by majority of people if they were to implement this only to find their cars.

3.3. Miscellaneous methods

Other ways to achieve this goal is to use brain memory to remember the parking lot location. Some people may use a piece of paper to write down the parking lot information such as lot number and level. One may even take pictures of the parking lot using their cellular phone or digital camera. It can be easy to remember small parking lot information but for larger and more advanced parking areas recalling this information can be hard especially after leaving the car for a long time. The other mentioned methods are not very convenient for many people as they may forget to use them or have the proper equipment to apply them.

4. Proposed design solution

Our proposed solution is to build a device that drivers can carry in their pockets and would display parking information such as lot number or floor level (entered by the driver). It will also inform them whether they are getting farther or closer to the car using a display unit such as a bar graph. This design solution will resolve most of the issues with currently available products we discussed in section 3 above. This innovation will eliminate the challenge of memorizing the parking lot information or the misuse of the current remote control features. It also will not require line of sight that is needed by GPS systems. It will be very convenient since it won't produce any annoying sounds and could be used anytime of day whether or not it is sunny, rainy, foggy or dark. It will be much less expensive than GPS systems and will have much larger range of coverage than current car alarm systems.

This product can potentially improve the market for the anti-theft and lock/unlock devices since it will avoid false alarms and reduce noise pollution in the environment. Moreover, this device could be helpful to people with impaired hearing since they will no longer be required to listen for the noise of the car alarm to find their car.

There can be other applications for this kind of product. For example, it can be used to find pets to get a rough idea where they are. The demand for this kind of device was proposed by many people in that they use alternative methods to solve this issue but of course in an inappropriate misusing way. Therefore, we are proposing an inexpensive and simple design to implement this idea.

As a Capstone project, we have limited time and funding. Therefore, we will build a simple device, a prototype, and we expect that with more time and funding, we will develop a more portable and attractive device that people will like, while potentially adding more features to the device such as showing the direction to the car and distance between the car and the user.

5. Sources of Information

To research and determine the feasibility of the device, we will use the following sources of information: course instructor, teaching assistants, textbooks, product specifications and datasheets, websites, electronic journals, and publications.

The idea for this project came to our group when one of us lost his car in the SFU parking lot. This was following one of our first meetings for coming up with a product for this course. In the beginning, we were obviously skeptical as to the need for this kind of device. After a lot of asking around, we were overwhelmed by the number of people that wanted a FOB key that could perform what a Seeker will likely perform, seek the location of the car.

Internet will be the primary source of information from researching the need of the Seeker to the completion of the Seeker. We have used credible internet websites for writing this proposal and we will heavily rely on credible sources in the internet for the later stages in the completion of the Seeker.

On top of the use of the internet, our most reliable and motivating sources of information will definitely be the faculty members and experts in various fields of electronics such as Master's students, PhD students, post-doc fellows, and industry workers. For instance, to determine the viability of the device, we have approached Mr. Patrick Leung numerous times and will continue to do so to ensure that we are indeed headed in the right direction. We have also talked to Bradley Oldham and Dr. James K. Cavers to see if this device is functionally viable.

6. Budget and Funding

6.1 Budgets

The cost estimation details have been outlined in Table 6.1 keeping in mind the four month goal for the project. "Our four months goal is to devise a fob key that will assist a person to locate his/her car by relaying the proximity between the car and his/her location at a parking lot." Table 6.1 shows the actual cost of the microcontroller as we had ordered a microcontroller to get a head-start on this project even before the semester had started. The other costs have been overestimated by fifteen percent for contingency.

Table 6.1Budget Planning

Equipment	Cost
Communication Modules	380
Controlling Modules	120
User Interface and Display	80
Enclosures	40
Internet Hosting/Domain	30
Miscellaneous parts(cables, wires, connectors, boards, power components, antennas, other hardware components, etc)	140
Total	**790**

6.2 Funding

We are hoping that Engineering Science Student Endowment Fund (ESSEF) will support us to purchase some of our components required for the research and development of the prototype. With the intention of venturing the product to the market, we plan on making the prototype as close as possible to the final product that can be integrated into a car.

To accomplish a finer prototype, we will be applying for ICBC Auto-crime Prevention Grant, lobbying for contributions on our company website and lobbying to friends and family. Additionally, we will be lobbying to the Vancouver MLA and MP for possible funding of this project. As a contingency plan for covering costs that might not be covered through the accumulated funds, we have all decided to split the uncovered costs amongst ourselves equally. We will make sure that a credit card will be used as a more authentic proof of payment and keep all the receipts for application to funds, grants, and reimbursements to the project members.

7. Schedule

Table 7.1 shows the Gantt chart of the expected time for each activities leading to the completion of our product.

Table 7.2 shows the milestone chart, which outlines the expected completion date of each task to be executed in order for the final product to be completed in time.

Table 7.1 Gantt chart

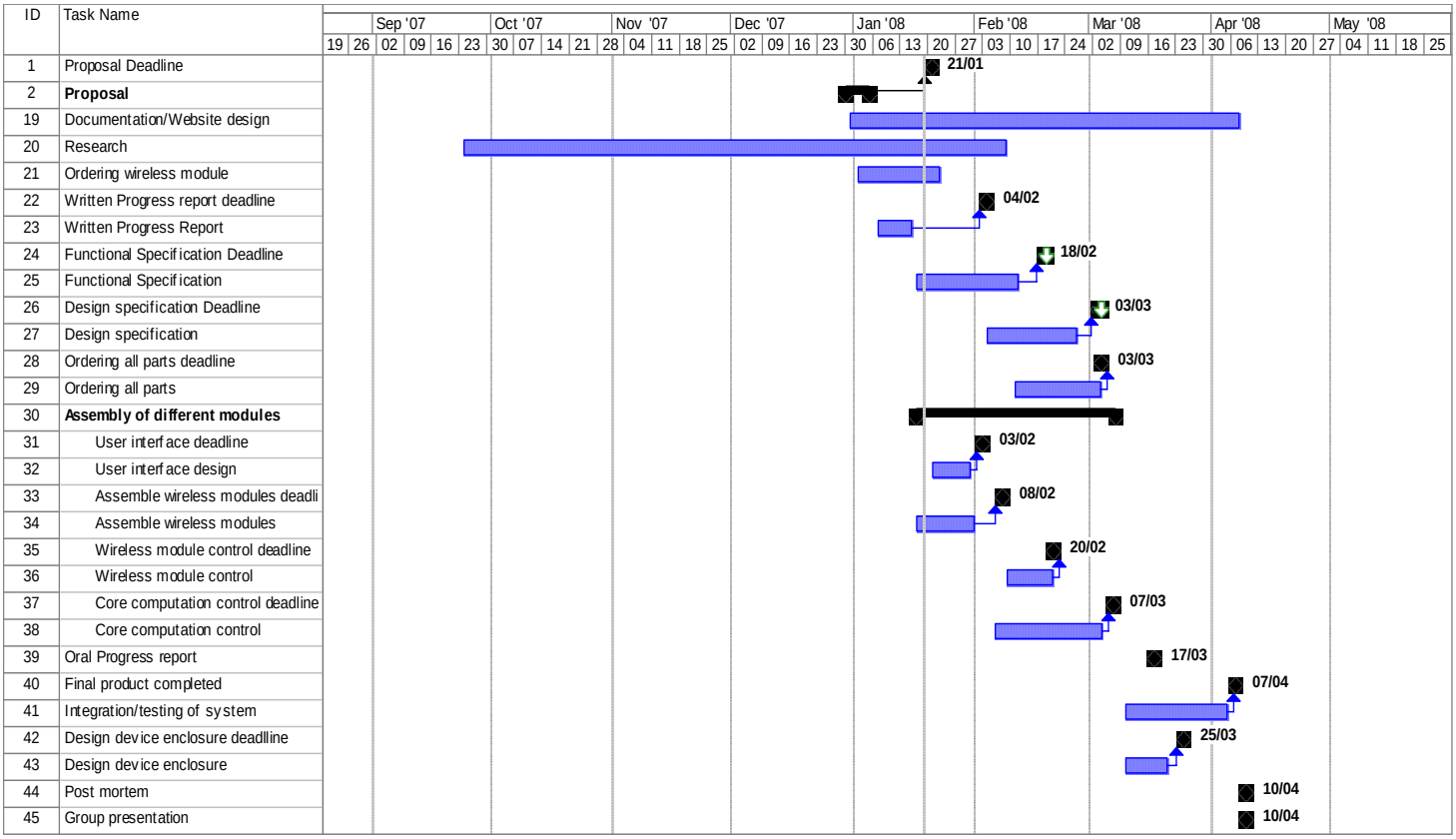
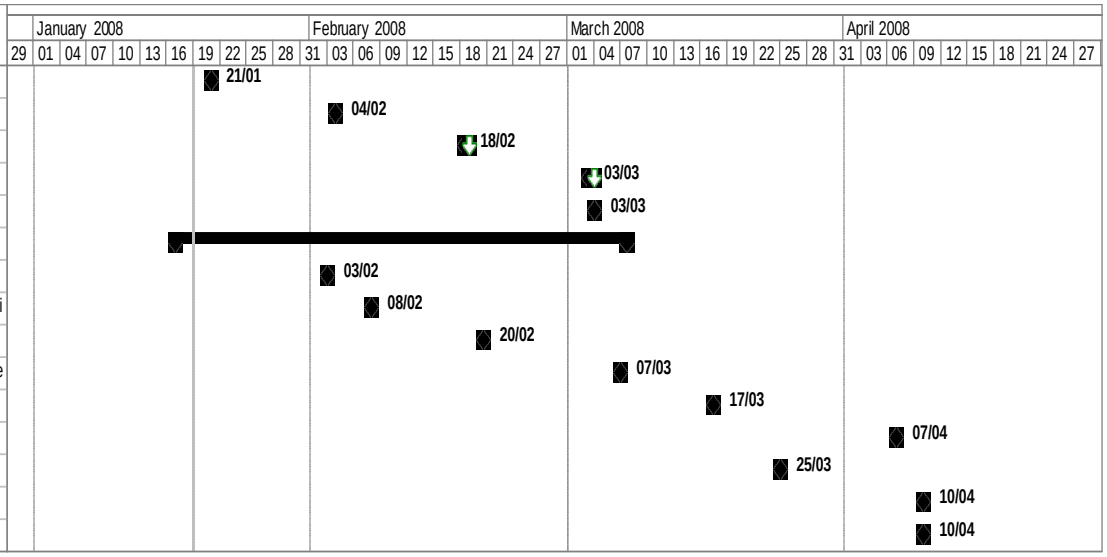


Table 7.2 Milestones chart

ID	Task Name
1	Proposal Deadline
22	Written Progress report deadline
24	Functional Specification Deadline
26	Design specification Deadline
28	Ordering all parts deadline
30	**Assembly of different modules**
31	User interface deadline
33	Assemble wireless modules deadli
35	Wireless module control deadline
37	Core computation control deadline
39	Oral Progress report
40	Final product completed
42	Design device enclosure deadline
44	Post mortem
45	Group presentation



8. Team Organization

Weiibo Inc. is a company that consists of four engineering students. Each member of the team is a 3rd or 4th year engineering student. While forming the team, we ensured that the group would have expertise in as many domains as possible. This was done in order to cover all parts of the products we decided to work on. For instance, we have members interested in hardware design, wireless telecommunication and firmware programming. We also ensured that each person is able to perform well under time pressure and to deliver excellent quality work.

Weiibo is structured in a hierarchy-like fashion such that the work is distributed efficiently towards all members of the team. We will also ensure that the time is carefully managed such that prototype development, testing as well as documentations will be completed by the scheduled deadlines.

Hooman Jarollahi will take command of the company by assuming the role of CEO, Diwaker Malla will be responsible for the company's finances as a CFO and will ensure that the product gets full public attention filling the role of VP of marketing, Dennis Xu will ensure that the product will be created according to engineering standards while filling the role of VP of engineering. Finally, Karl Simard will ensure that technologies are being used to their full potential as VP of technology. It is important to note that all members will participate in the development of the product efficiently and that these roles are for the purpose of running the company as an entity.

Within the team, we need to have an excellent interaction between team members. Therefore, we started to hold weekly meetings since October 2007 to prepare for the spring 2008 semester. These meetings will be held until beginning of April 2008 as this date marks the final milestone of the project. To improve communication between team members we created a mailing list such that any information that needs to be shared amongst other members can be done quickly and efficiently. Moreover, we created a forum using a third party host(i.e. not using SFU domain name) for extended communication to avoid loosing contact with each other in the case that SFU e-mail becomes unavailable.

We believe that this product idea has a very high market potential. At first sight the project seems to be fairly complex, but as the team meets weekly we have managed to divide the project into several sub-projects that either one person or a group of two should be able to complete within a reasonable time frame. Each week the whole team meets to inform all team members about the updates of the entire project and resolve possible problems. We have estimations for the completion of each sub-project. We also created a Gantt chart that can help us achieve our goals on time. We have talked to numerous students that have worked on their Capstone Projects and found that lack of planning was one major problem their team came across. For that reason, we have created two schedules, worst case and best case scenario, and we extrapolated a schedule that would be somewhere in the middle.

Given the amount of planning we have done until now, we are confident that we have all the resources we need to complete the project on time.

9. Company Profile

Hooman Jarollahi – CEO

I am a fourth year electronics engineering student. During the major engineering design courses I completed, I have had many chances to be selected as a team leader. I have academic and industrial design experience. I also have research experience in hardware and software projects from software Graphical User Interface (GUI) design, Very Large Scale Integration (VLSI) digital system design, FPGA's, Multi-media communication systems codec design to analog circuit design. Previously, I was awarded Natural Sciences and Engineering Research Council of Canada (NSERC) Undergraduate Student Research Awards (USRA) at Simon Fraser University and Ken Spencer joint Business-Engineering competition first place award. I am very positive that with excellent communication skills in our group, I will be able to ensure that work load amongst team members is fairly distributed and completed on schedule.

Dennis Xu – VP of Engineering

I am a third year computer engineering student at Simon Fraser University. I have coop experience in real-time embedded systems and various engineering projects using C/C++/Assembly languages. I have solid problem-solving and troubleshooting skills. I am particularly interested in the digital aspects of this project such as microcontroller programming. With my past experience in hardware and software development, I will make sure that every product of Weiibo Inc. is technologically innovative and environmentally sustainable.

Diwaker Malla – CFO and VP of Marketing

I am a fourth year undergraduate student of electronics engineering at the Simon Fraser University. I will work towards overseeing the funding, budgeting, and financing of Weiibo Inc. In addition to engineering science courses, I have taken the following courses that will help me successfully manage the company's finance: Financial Accounting, Microeconomics, and Introductory to Finance. I also have extensive experience in writing business plans from winning the Ken Spencer Entrepreneurial Competition, and participating in the Enterprise and the Queen's Entrepreneurial Competition. Also, I will be involved in the R&D of the prototype of this project.

Karl Simard – VP of Technology

I am a fourth year engineering student and I am excited about this project. Until now, I have had the opportunity to develop firmware using many operating systems such as Linux, Windows, eCos and other OS's specific to the development of chip design. I am strongly interested in wireless communication as well as hardware development. Thus, my contribution to the team will be focused in the area of wireless communication.

10. Conclusion

Weiibo Inc. is a company dedicated to producing innovative wireless solutions that will add to the convenience of the public. Our wireless parked car finding system will allow people to have a peace of mind in locating their cars at parking lots. This product can also be integrated into other forms of vehicles such as motorcycles, bicycles, etc. Furthermore, this product can be used to find similar mobile objects such as pets.

We have investigated many alternatives to our product that could be used as a substitute for our wireless parked car finding system and we have found that other such products are less cost effective and really not designed for such a purpose. Also, in order to help the user find a car in a parking lot, other devices must be used contrary to their main purpose. Our wireless parked car

finding system will be specifically designed to have a longer operating range than the similar products.

We have also included a schedule where we estimate the time we will need to complete the project. We are confident this project will be completed by April 2008 and that by then a fully operational prototype will be available for testing with potential end users. We have clearly stated what our goals are and included sections outlining our projected costs, sources of funding, sources of information and other relevant information giving details as to how we are going to accomplish these goals.

11. Sources

- Active Electronics (Kingsway, Burnaby, BC)
- RP Electronics (Richmond)
- Digi-Key (www.digikey.ca)
- Linx Technologies (www.linxtechnologies.com)

12. References

[1] CTV News staff, "Vancouver considering noisy car alarm ban," *ctv.ca*, para. 7, Jan. 14, 2004. [Online]. Available: http://www.ctv.ca/servlet/ArticleNews/story/CTVNews/1074045491889_69454691/?hub=CTVNewsAt11. [Accessed Jan. 17, 2008]

[2] ICBC news staff, "Anti-theft" *icbc.com*, para 5, Available: http://www.icbc.com/library/research_papers/anti-theft/anti-theft.asp. [Accessed Jan. 17, 2008]