envision today

Post-Mortem for NaviCane: Navigation-Assisting White Cane

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1. Introduction

According to a survey conducted by Statistics Canada in 2006, 31.9% of participants that were surveyed indicated they require the use of a white cane for mobility.[1] Currently, the visually impaired have several options for mobility aid: human guides, white canes, guide dogs, and electronic travel aids. Only white canes and electronic travel aids promote independence for the visually impaired.

The objective of the NaviCane: Navigation-Assisting White Cane is to enhance the safe travel of the visually impaired user. Our device allows the user to travel independently to unfamiliar places and sites. The device will receive an input from the user through our software application in order to determine the destinations that need to be reached. Our software application communicates with the NaviCane to determine the GPS coordinates of the desired destinations. In order to safely guide the user, multiple routes will be determined and added to the NaviCane. By simply following the routing data that the device contains, one can easily arrive at the desired destinations. Furthermore, the addition of ultrasonic sensors allow the NaviCane to detect obstacles ahead. This optimizes the time required for the user to prepare for such obstacles instead of sensing with a regular white cane. The device will provide feedback to the user to warn them of obstacles that may pose a threat.

The marketable advantage of our product does not pertain only to the visually impaired. In fact, other disabled individuals or the elderly may choose to use our product as well. For example, a simple modification in the structure of our design can turn our white cane into a regular stability cane. Although the necessity for detecting obstacles would be no longer needed, the GPS guidance system can still be useful. The GPS guidance system will prevent the user from becoming lost and provide an efficient method for the user to find their route again.

2. Current State of the System

2.1 Mechanical Design

The mechanical design of the NaviCane has gone through several revisions. It was decided that the product would act as an attachment to pre-existing white canes in order to eliminate the need for the user to get accustomed to a new cane. The current revision of the design relies on the hardware placed inside a box-like compartment that is connected to the handle of the cane. The user can then choose to either grasp onto the attachment as an handle or grasp onto the cane similarly to what they've been accustomed to.

As a prototype, the casing is currently made out of thin pieces of wood containing three sliding compartments for easy access of the USB port, battery, and development purposes. The physical cane is zip tied and taped onto the case while the hardware components are glued and taped down.

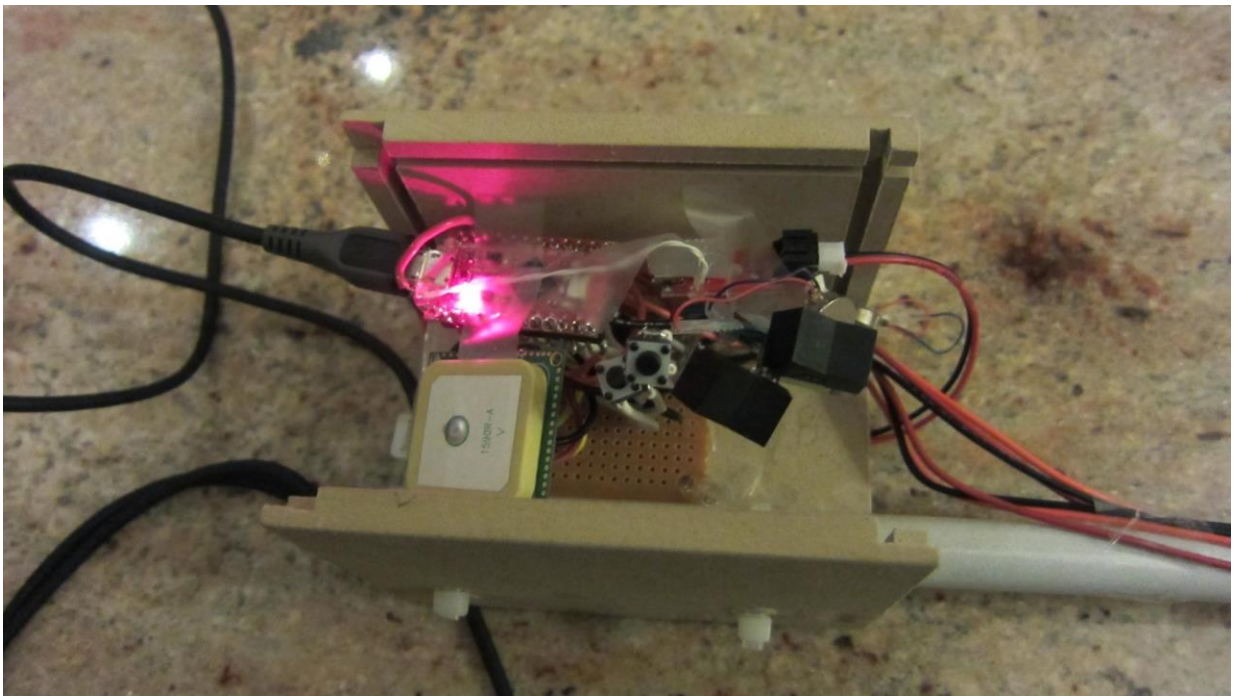

Figure 2-1: NaviCane's Mechanical Enclosure

2.2 Hardware Design

The current hardware design of the NaviCane primarily consists of a microcontroller connected to a GPS receiver, vibration motors, magnetometer, and ultrasonic range sensors. A QI wireless

inductive receiver is also connected to the system allowing the device to be charged either through a direct micro USB cable or wirelessly through a QI charger.

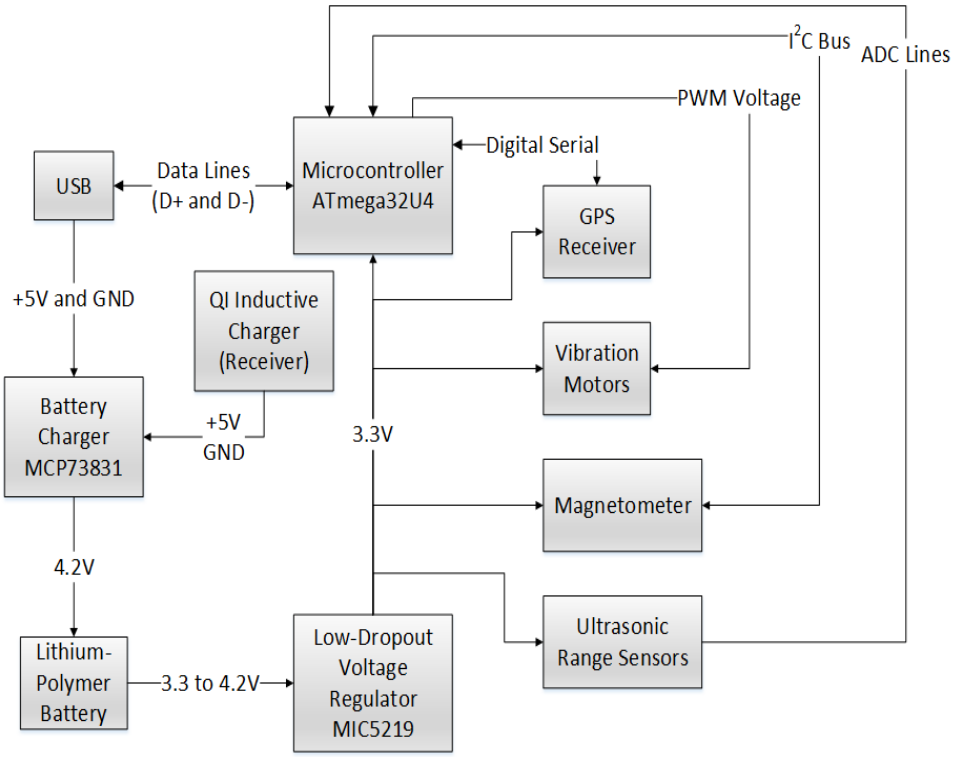

Figure 2-2: NaviCane's Hardware System

2.3 Embedded Software

The embedded software currently fulfills the main ambitions of our project in two major modules. The first module implements functions that guide a user through a predefined route sent by the client software using Compass and GPS functionality. The module allows the user to reverse the route at any moment to direct the user back to the starting destination. The module also allows the user to skip to the next node in the list if they so desire in the circumstance that the current node is not traversable (such as the case where there is construction blocking the node). When traversing the route, the current waypoint that the user is directed to will automatically switch to the next waypoint once the user reaches a distance of approximately 10 meters to the current navigated waypoint. As the user points the cane, they will experience force feedback proportional to the accuracy of the direction they are pointing the cane with regards to the direction of the current waypoint up to a deviation of 45 degrees in either direction. As the user reaches the final destination, the device sends a unique set of force feedback pulses to indicate to the user that the final destination has been reached. The second major module is implementation of ultrasonic sensors which alert the user to the presence of obstacles from the

ground to shoulder height within 6 inches of the user. When an obstacle comes within this range, a second force feedback motor sends pulses to the user, indicating that an obstacle has been encountered. Either of these modules can be disabled via separate switches.

2.4 Client Software Application

The client software takes in a user defined departure point, destination point and returns a map of the route and a written description of the route. The user can also denote whether or not the path is a walking path only or includes transit routes. The user can then import this route to the hardware device for use. These routes are queried from Google Maps API. To aid our target market, all aspects of the client software is screen readable by screen reader technology.

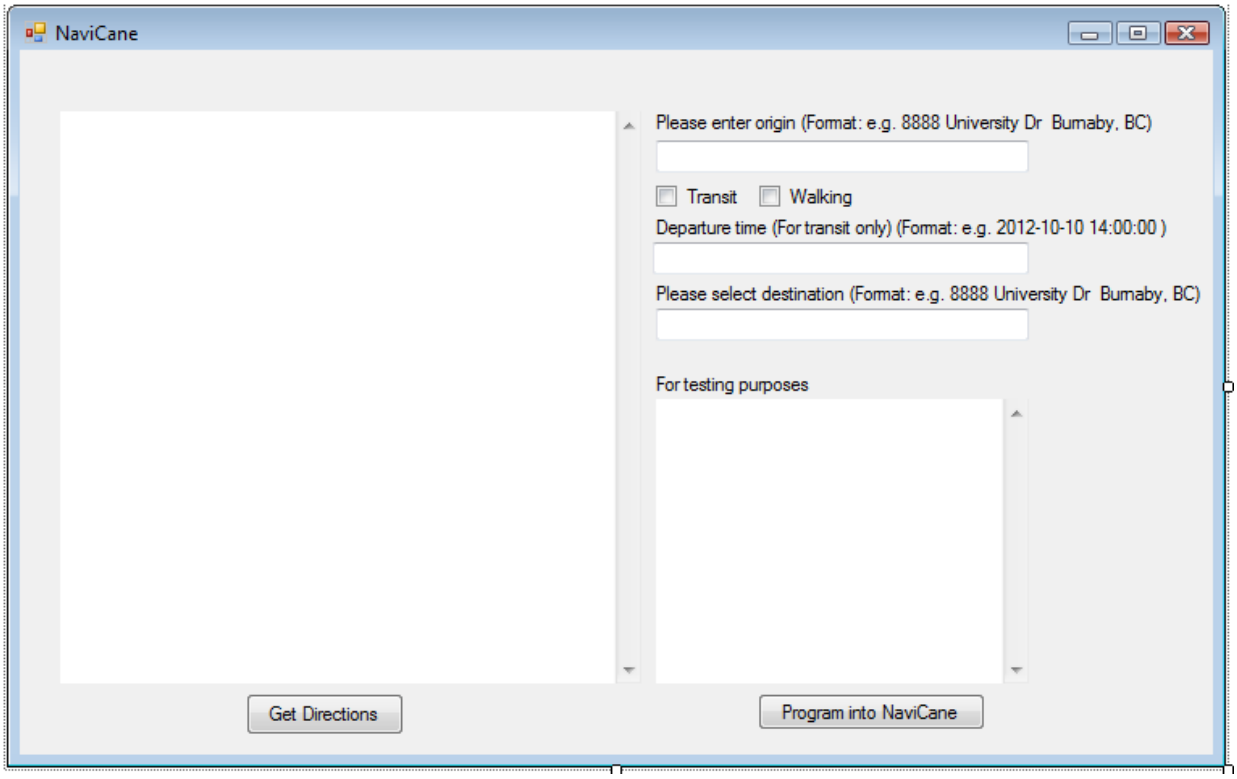

Figure 2-3: NaviCane's Software Application

3. Challenges and Deviations of the System

3.1 Mechanical Design

The current mechanical design has deviated slightly from our original desires and goals of having a slim, easily detachable, plastic handle. This unrealistic design proved to be detrimental for prototyping purposes and thus, we designed a much larger handle with sliding compartments in order to allow for easy access during NaviCane's development.

Another option we discussed involved using Lego pieces as the enclosure. Although this option is inexpensive, recyclable, and easy to work with, it resulted in a bulky and heavy design. Thus, it was decided to utilize a material made of either wood or plastic for the enclosure.

Our first version of the mechanical enclosure utilized a wooden enclosure much thinner than our current design. This thinness, however, resulted in cramped compartments which were not feasible from a development point of view.

3.2 Hardware Design

In terms of the hardware design, all of our initial goals of the project were met. The majority of the schematic design remains true to the original plan during the first month of development. Envision Today did not encounter any substantial issues that warranted major reworks.

However, one of our initial designs required a customized printed circuit board. Due to a limited budget and the development time required, it was possible to forgo the custom printed circuit board and instead, make the reworks on the existing boards with the addition of utilizing a protoboard. This decision was carried out during the beginning of the development cycle and did not adversely affect our overall design.

One late modification we made to the hardware system involved the addition of a QI wireless inductive receiver. This receiver allowed the NaviCane to be charged wirelessly when placed on a QI charging station. This modification was done in order to make the product more intuitive.

3.3 Embedded Software

Much of the challenges posed by the embedded software came in learning the limitations of the hardware devices within normal limitations of operating the Arduino. This includes things such as the rate of polling on both the compass and the gps which can account for some lag of the system and user feedback in general. The biggest challenge faced was the communications with the client software running on a PC. Synchronizing the two software platforms proved quite

tricky and many issues such as system lock ups and miscommunication was experienced and it became the primary reason for the push back of the overall schedule. Also, determining whether bugs and issues experienced were as a result of a hardware issue or software became an issue towards the end of testing.

The primary deviations from our original plans regarding the functionality of the embedded software is the implementation for alternate routes. Our current implementation is rather simple but a more complete solution regarding storing and generating a true alternate path would likely require much more work in the future. Other deviations include dropping various methods of user feedback and changing software interrupts into hardware interrupts on the device.

3.4 Client Software Application

The primary deviation from our original design with regards to the software client was the abandonment of the third party code base for querying and translating Google maps xml data for a completely in-house developed solution. At first, the first idea was to implement a working application that utilized Google Maps API. The idea in mind was to incorporate GMap.NET libraries with our existing application. However, the existing application was developed under Visual Basic as opposed to GMap.NET in C#.[2] The existing application was then redesigned under C#. After more research, an executive decision was made to discard using existing solutions. It was found that Google Maps API supported 3rd party developers immensely and provided the necessary introduction for us to proceed.

Some challenges that were faced with the client software were the numerous researching and intensive reading in order to understand how to create a proper client software. For example, online tutorials provided basic introduction towards creating a GUI. However, the GUI encountered many troubleshooting problems such as double clicking situations that were not aforementioned in these tutorials. Therefore, debugging and testing became a large consumption of time spent in order to resolve these issues. Another large issue faced was the implementation of USB communication with the Arduino microcontroller under Visual C#. Visual C# has no supported libraries for USB. A general workaround was using the serial port libraries from Visual C# or a 3rd party USB library. Again, troubleshooting with threading issues under the serial port were strenuous and exhausting, but resolvable with more time spent debugging. Although there are many threads and forums online providing references and information, they do not necessarily completely pertain to the bugs that we found. It provided some insight as to why bugs were happening, but a strong persistence for problem solving is the best solution. Following deadlines was another large challenge faced since the problems for existing bugs were sometimes unknown. Despite all the unknowns, sometimes bugs were resolved relatively quickly and deadlines were achieved. However, larger bugs were mostly intrinsic and required more time for deliberation. If a deadline was vastly approaching with no improvement on the debugging process, a backup plan was always proposed and discussed.

4. Future Plans

4.1 Mechanical Design

After the prototype stages, it is planned for the mechanical enclosure to drastically decrease in size and weight. Ideally, an ergonomic shape contouring to a person's natural grasp is desired. Along with replacing the current material with a thin and sturdy plastic, it is also necessary to add separate compartments for the hardware in order to allow the user to easily access the USB socket as well as the replaceable battery. Furthermore, the enclosure should allow the physical cane to easily attach and detach itself without the need for visual feedback.

4.2 Hardware Design

For the hardware design, there are several systems to improve upon in the future. As the nature of the product requires a very intuitive user interface, more development time is needed in order to incorporate features such as a buzzer/speaker (audio feedback) or touchscreen LCD interface. Discussions were made regarding the usage of voice controls in our current product design, but the cost and development time prohibited such endeavours. We also wish to incorporate a sophisticated fuel gauge for the battery in order to show the battery level intuitively to a visually impaired user.

It is also possible to further improve the overall functions of the product by adding connectivity features to the device, such as a 3G modem or even a bluetooth module for existing smartphones. These additions would allow the user to select and adjust navigation routes on the fly without requiring any software applications on a personal computer. However, such features would require considerable development time unsuitable for our current project.

With further changes to the software and overall product, it may also be necessary to expand the size of the memory by adding external memory storage (such as SD memory cards) or replacing the current microcontroller with one that contains a larger flash memory size and faster processing speeds.

4.3 Embedded Software

There are a few candidates for future work with respect to the embedded software side of things. Much work in general could be spent improving the efficiency of the code with regards to space. As the device is quite limited with regards to the flash (program space), improving this would allow for more room for additional functionality and potentially faster updates for the various subsystems (such as the compass and route detections). Along with this, a more robust system of storing waypoints would also help in this manner. Also, storing waypoints in EEPROM

instead of the more volatile SRAM would allow us to maintain a route even during power cycling but may require an expanded EEPROM as the existing size of EEPROM is not sufficient.

One of the major candidates for future works involves the implementation of a true alternate waypoints method akin to how many commercial GPS devices work. This would involve greatly expanding the EEPROM to allow for the storage of more waypoints as well as having a robust system of tracking and connecting the waypoints within the system. Related to this, more work can be done with regards to allowing the user to track multiple destinations and switch between them. The major obstacle to this implementation is the lack of simple feedback mechanisms that we have at our disposal to indicate to the user which route they are currently on. For this, we would likely have to look at giving sound feedback through headphones audibly indicating the path they are on. Sound feedback would also be useful in every other area that feedback is given such as indicating bus stops.

4.4 Client Software Application

Similar to the future work for the embedded software, the client software application has further development with regards to obtaining the routes and waypoints that can be used to generate alternate routes for the user should they wish to deviate their path or go to a new destination. Another source of future work could involve incorporating better walk routes as Google Maps API improves their design. Open source mapping softwares for walk or transit routes are also in consideration if the device allows for larger storage. Also, if the project continues, more bugs will seemingly show up from the client software. Reporting bugs to the developer will become an option and we will continue on resolving these technical issues.

5. Budget and Schedule

5.1 Budget

Table 5-1 below indicates the bill of materials for the NaviCane.

Table 5-1: NaviCane's Materials and Costs

List of Materials	Estimated Unit Cost	Actual Unit Cost
Arduino Pro Micro	$30	$25
Two Ultrasonic Sensors (LV-EZ0 and LV-EZ1)	$60	$54
Two Vibration Motors	$10	$10
GPS Module with Embedded Antenna (LS20031)	$60	$60
Magnetometer Breakout Board (LSM303DLMTR)	$15	$30
White Cane and Physical Case	$40	$35
Buzzer/Speaker	$5	N/A
Battery + Charging Circuit	$30	$27
Wireless Charging Circuit and Charger	N/A	$80
Printed Circuit Board	$150	N/A
Miscellaneous (Header pins, Electronic components, Protoboard, Cables)	$15	$15
Miscellaneous (Taxes, Shipping+Handling, Duties+Brokerage)	$70	$158
Total Cost	$470	$494

Overall, the estimated costs are similar to those of the actual costs. The main discrepancies involve the cost for expedited international shipping and the duties/brokerages attached to it when crossing the international border. Some of the more minor changes to our original bill of materials involve the removal of a custom printed circuit board and the addition of wireless

charging. The custom printed circuit board was removed in favour of doing reworks on the existing boards combined with a protoboard.

5.2 Schedule

Figure 5-2 below shows our proposed schedule in teal while any deviations that occurred are shown in red.

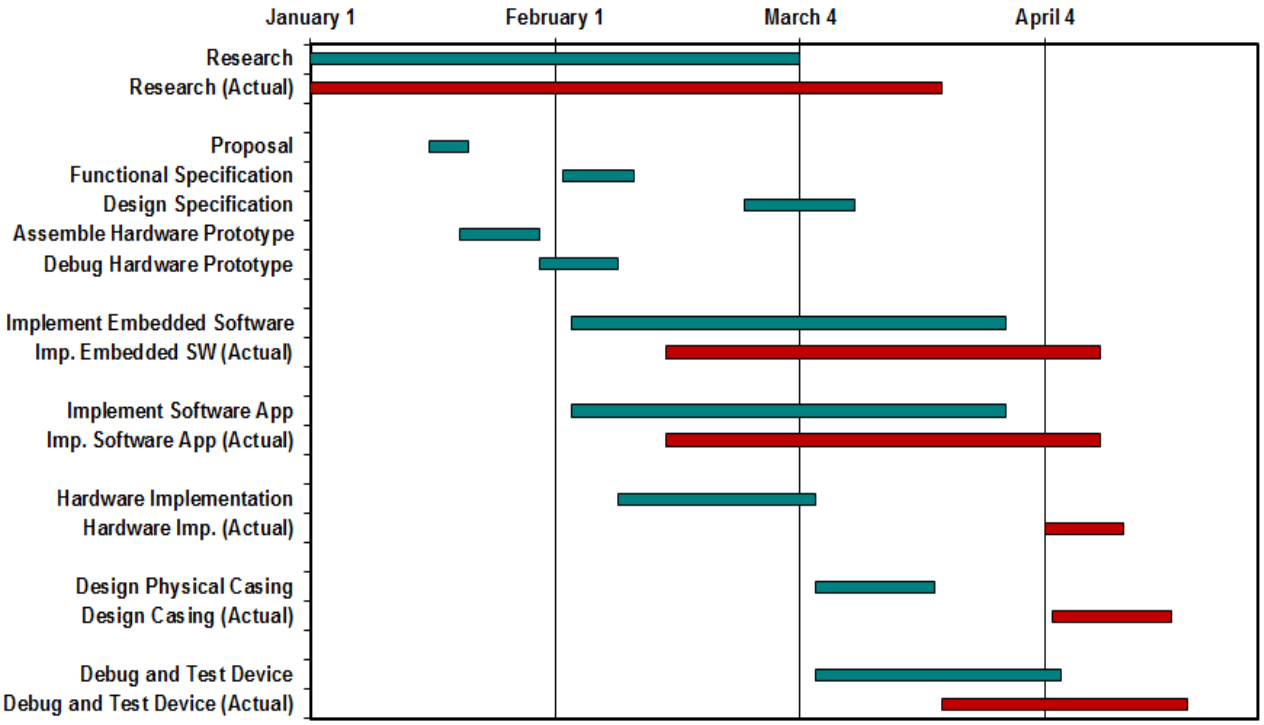

Figure 5-1: NaviCane's Schedule

One of the main causes for delays in our project was the amount of research necessary. This resulted in slight delays with the development of the embedded software and software application. The finalized hardware implementation was postponed until near the end of the software development because we decided to re-use components from our hardware prototype in order to assemble the final hardware implementation. The hardware prototype proved to be fully functional during the development of the software code. With the postponing of the hardware implementation, the mechanical casing was also delayed until after completion of the software. As a result, debugging and testing of the final device was slightly stalled until near the end of the development schedule.

6. Group Dynamics and Interpersonal Experiences

The group was primarily organized based on expertise. In this manner, Raymond Li was in charge of all hardware aspects of the project, Darren Tong was in charge of the client software application, Edwin Leong was in charge of the embedded software, and Vincent Guan was in charge of the mechanical design and certain aspects of the embedded code. All decisions were discussed by the entire group in a pseudo-democratic process and reasoned out. Any minor disagreements were discussed rationally and no major incidents occurred. Meetings were generally held once a week either in person or via online conferences.

Vincent Guan

Throughout the several months of tackling this project (many ups and downs) with my team members and balancing life was a good experience to say the least. We met as a group before the semester to come up with several good ideas that we believed will be successful. This group was ready from the beginning as each member has different skill sets that will ensure some level of success. With the approval of NaviCane by Dr. Andrew Rawicz, our little adventure began.

My responsibility on this team is basically to be as versatile and be able to fill in many roles where the team needs it. My roles include designing, testing, debugging, solving problems that the team encounters and doing the little things. The years at SFU have not been wasted as I am able to use my previous knowledge and experiences to help benefit the team. My writing skills are not as great compared to the rest of the team but I always give it 100%. I am grateful that this team can help cover my weakness and help expose my strengths even more. This is one reason why I believe we are successful together because we have a certain respect for one another and we rely on each other's strengths.

In my opinion, the team is most successful when we communicate our thought processes and ideas together while maintaining good time management. Even though we individually have our assigned parts in the project, we are able to work cohesively as a team because we all have a common goal. Not all members have similar time schedule, but we are able to accommodate each other when some are busier than others. I do not regret working with this team even though at times it can get frustrating. We all have different opinions and sometimes things get heated, but we are able to find a common ground on every decision. Sometimes it's best to listen and trust in their opinion even if the outcome is not as great.

I will say my biggest experience throughout this project is able to learn new tools and applying it. The first time use a program like AutoCAD was confusing and hard. The time it takes to learn how to create a decent and respectable mechanical design was challenging but rewarding. It was rewarding in the fact that my team members put their trust in my designs while it deviated away from the original. Learning to make 2D and 3D designs has slowly increased my technical skills. It was fun and exciting to design interesting things and with the feedback from my

colleagues, professors and teaching assistants, this was a confidence booster. I have learned to take criticisms and use it as motivation to continue to improve myself.

I believe the team can always do better comparing to the current state of the project. The time management plays a big factor as it always feels like we're behind. I feel that this project actually helped more in improving interpersonal skills than technical skills. Trying to balance this project, life and other school work has made me value time much more. Overall, this team's success isn't going to work without each other's talent and the communication and time management that goes along with it. Each member has experienced something new that they can apply in their future career.

Edwin Leong

This course was an excellent way to summarize all of the group work experience and individual technical expertise that I have learned during my years at SFU. The combination of real-world co-op experience and technical courses focused on the things that interested me about engineering helped to ensure that I was prepared and ready for the challenges involved in this course and bringing our ideas to fruition. The role that I took and responsibilities that I assumed were of organization (setting deadlines, scheduling meetings), project producer (keeping a view of the overall project, oversight), and lead embedded software designer.

My immediate impression of the group members, having known some the semester previous, was of that enthusiasm and passion that would ensure that our group as a whole would follow through and pursue any goal that we were set to. With this in mind, managing and working with the group proved quite simple and enjoyable. Maintaining deadlines, attending group meetings and staying in close communication were tasks I believe we, as whole, accomplished with little problem, perhaps to a fault. All group members accomplished their set goals quite autonomously, with little need for oversight and when interaction with the various components was needed, each group member stepped up to the plate quite readily to pull in the hours and effort needed to complete the task. Despite the ease of which our group worked together, my course and co-op experience working in tandem software programming teams helped tremendously, as well as the experience learning and working with the AGILE development ideology, which we utilized for this project to great success.

With regards to the embedded software design, I was very eager to tackle an aspect of the project that I have had little prior experience with. Luckily, as most programming is, the concepts were quite universal and easily understandable and I adapted quickly. The most interesting concepts I learned were utilization of the hardware, serial port communication, and all of the difficulties with dealing with analog readings and devices. I ensured that our coding practices followed industrial best practices such as modularization, simplicity, good documentation (code comments and descriptions), and consistent definitions and naming.

I feel as though I have earned a great deal of experience on the production side of things, as well. Keeping an eye on the main goals of the project while simultaneously expanding the scope to encompass useful features while narrowing the scope to eliminate extraneous features to ensure the meeting of deadlines while keeping the integrity of the project was an extremely useful experience to have.

Raymond Li

Over the past several months, I have had the pleasure of working alongside three talented engineering students who share as much passion for the field as I do. We began collaborating as a group early before the course began as we pitched ideas back and forth. The project formally started when I pitched an idea regarding a GPS-assisted navigation cane to my colleagues. With approval from Dr. Andrew Rawicz, who headed the program, Envision Today was born.

My main responsibilities in Envision Today revolved around the hardware design and prototyping as well as financial management. As the sole member with hardware expertise from past co-op experiences, I spearheaded the design of the hardware and ensured that all functionalities were met and tested. With monetary assistance from the Engineering Student Society Endowment Fund, I was able to coordinate and purchase the materials for my hardware design. The process of attaining finances and managing the budget proved to be a good learning experience as I needed to maintain organization to ensure success during the beginnings of Envision Today.

In addition to the responsibility of designing and prototyping the hardware design during the beginning stages of our project, I was also initially tasked with creating the scope of the project as well as coordinating our group's motives and goals. When dealing with any project, the single most important key to success is communication. This was one of the biggest issues that we had to overcome regarding the progress of our endeavor. Initially, we faced problems where the team had differing views on the extent of the project. We started off meeting at least once a week and these problems were quickly remedied as each of us proposed our suggestions, concerns, and rationales. With a strong joint effort and collaboration, we were able to continue development towards our goal.

While designing the hardware systems and components for the NaviCane, I believe that the most indispensable attribute I have acquired is an acute awareness of the importance of planning and time management. During the initial development stages of our project, I dedicated a great deal of time towards planning and researching datasheets as well as executing preliminary tests in order to ascertain that the subsystems were adequately designed to the utmost specifications. I believe that this helped ensure that there were no compatibility issues with the device overall. In the end, we did not encounter any major hardware issues. As such, the hardware prototype and implementation was carried out efficiently and thoroughly.

As each hardware subsystem was designed modularly, it allowed for easy management of the project in terms of implementation and time management. If an issue arose, it was possible to remove that modular subsystem in order to do additional tests and execute any possible remediation without disrupting the development of the overall device (such as the embedded software and software application). It is in my belief that this hardware modularity provided us with the ability to effectively tackle issues quickly and efficiently while retaining our composure.

Overall, I am very pleased with the success of our project and the team behind it. From the initial planning stages to a full-fledged prototype, it has been a pleasure to work with a group committed to bringing forth their skill sets. Personally, I feel that I have improved upon my hardware designs and my ability to work successfully in a team dynamic. I am confident that each and every member of Envision Today has acquired immeasurable experience and will excel at accomplishing any tasks set forth in the future.

Darren Tong

After five gruesome years spent learning material that were once thought to never be mentioned again, I came into the course with great expectations. A course with practically no restrictions, a place for creativity and a project that would illustrate the amount of effort the group has put in. After rumours of intensive work beneath sleepless nights and horrific stories that sparked the horrible memories of past projects, the semester began fairly pleasant. I had already worked with most of my group members many times before so the cooperation was nothing new. As the sole member of the group that was only taking ENSC 440 and ENSC 305, I had hoped that not all of the responsibilities would fall on me. To my surprise, all the group members contributed greatly and to the most of their abilities.

In my opinion, communication is one attribute of teamwork that can never be undermined. Although we might not have seen each other, I created a Skype group chat for everyone to insert their opinions and express their concerns. Verbally, group dynamics may cause group members to be shy and not offer much in conversation. Thus, I believed that online communication may have been more comfortable for everyone to disclose their own opinions without feeling repressed and judged. Although it wasn't used as often as I had hoped, I firmly believe that all groups will benefit from open communication.

After attending one of the guest lecture during Andrew's lecture, the guest speaker inspired me greatly for this project course. His lessons and learnings were a great help to allow myself to find a positive goal beyond university. As the software lead for project, I had hoped to research a ton of material in order to benefit our project. In addition, I also appointed myself to contact 3rd party organizations in order to conduct focus groups for the visually impaired. We all had many questions and ideas, but no answers. Much time was spent in attempts of acquiring helpful contacts; however, no one responded back with interest. It was a shame, as I really wanted to

create a product that could one day hit the market. Although not much came out of it, I do realize that I'm not the center of the universe and everybody else has their own lives and problems.

After the vast amount of time spent in the software client application, I do not regret it one bit as I feel like I have learned more than all the years spent in the program. When faced with errors and bugs, there is no greater feeling than that of you being able to resolve them. From having no knowledge of creating a GUI, no experience with dealing with APIs, and a clueless approach to USB communication, I can safely say that I can now develop and troubleshoot all the three aforementioned issues as it pertained to me. Always intrigued as being a problem solver, I now know why I haven't dropped out of engineering. Although there are many threads and forums online that may help with resolving software issues, it is rare to find one that deals specifically with your problem. This is an area that I believe I can excel at because it requires great effort to understand and resolve. I shown myself this semester that I am capable of doing this.

In regards to the project, I firmly believe that it is definitely viable. If possible, I would like to continue it. Although there are always protesters to change, this device may one day allow many visually impaired users to travel independently and expand their horizons. Regardless of whether this particular device impacts society or not, I can see that this path of engineering products may be a strong calling for someone such as myself.

7. Conclusion

We at Envision Today are proud of the work and results that we have achieved in these last four months. We believe in the potential for our product to improve the lives of our target market and are grateful for the skills and technical expertise that partaking in this endeavour has given our team. The next major step lies in consulting focus groups and exploring the concerns and attitudes of our target market. Our initial probing has come up inconclusive with regards to how our product may be received and we must attempt to determine the demand for our product in the marketplace and whether or not there are features or other advances we can make to further appeal to our target audience. There still remain many improvements that can be made with our product and as such we believe there is much growth that our product and team can undergo. Overall, we believe that our efforts have been a success and that whether it is the personal growth of our staff or the success of the product that we all helped build, that we have all benefitted as a result. We thank everyone who has been involved in the project, whether they be team members, investors, professors or mentors for having helped shape and guide our ideas into the prototype that we have developed today.

8. References

[1] Canadian Government. (2009, Feb. 26). *Table 2 Aids and assistive devices used by people with severe seeing limitation, 2006*. [Online]. Available: http://www.statcan.gc.ca/pub/89-628-x/2009013/tab/tab2-eng.htm

[2] “Radioman.lt”.(2011, Nov 20). *GMap.NET - Great Maps for Windows Forms & Presentation.* [Online]. Available: http://www.codeproject.com/Catalogs/2689/GMap-NET-Great-Maps-for-Windows-Forms-Presentation.aspx

Appendix

Envision Today Ltd.

AGENDA

January 12, 2013
8:00pm-9:00pm

Skype Meeting

Purpose of Meeting: To discuss the initial startup, exploration and basic design principles

Items for Discussion:

- Discussion on Company Name
- Results of discussion with CNIB
- Discussion of the ESSS funding request and funding exploratory findings
- Discussion of results of exploratory Google Maps API findings

Envision Today Ltd.

MINUTES

January 12, 2013
8:00pm-9:30pm

Skype Meeting

Present: Edwin Leong, Vincent Guan, Raymond Li, Darren Tong

Purpose of Meeting: **T**o discuss the initial startup, exploration and basic design principles

Minutes:

Edwin Leong called the meeting to order at 8:00.

A. Discussion of name of company

Discussion: Discussed various names. Envision Today decided upon. Vincent volunteers to develop the logo.

B. Discussion of results with CNIB (Andrea Gronfeldt, Assistant Director of Services and Operations 604-431-2116)

Discussion: Darren did not manage to get in contact with CNIB due to scheduling conflicts. Andrea Gronfeldt is only present in the morning.

Action: D will contact Andrea Gronfeldt again Monday morning. Questions need to be compiled for an initial exploratory meeting by Tuesday.

C. Discussion on the results of the funding exploratory findings and Google Maps API

Discussion: Some rough figures were established. Google maps API discussed.

Action: Raymond is creating and distributing a spreadsheet with the rough figures.

D. Discussion on handing in funding request to the ESSS

Action: Edwin will print and hand in the request. Others will create digital signatures.

E. Other Business

Engineering Notebooks to be obtained
Proposal to be done through Google docs

Meeting was adjourned at 9:30pm.

Envision Today Ltd.

AGENDA

January 15, 2013
3:00pm-5:00pm

Skype Meeting

Purpose of Meeting: To discuss the presentation for the ESSEF
Items for Discussion:

- Development and discussion of the presentation

Envision Today Ltd.

MINUTES

January 15, 2013
3:00pm-5:00pm

Skype Meeting

Present: Edwin Leong, Vincent Guan, Raymond Li, Darren Tong

Purpose of Meeting: To discuss the presentation for the ESSEF
Minutes:

Raymond Li called the meeting to order at 3:20.

A. Development of the Presentation

Discussion: Re-discussed the costs involved for the presentation. Discussed roles and talking points.

Meeting was adjourned at 9:30pm.

Envision Today Ltd.

AGENDA

January 17, 2013
1:30pm-2:30pm

Lab 1 Meeting

Purpose of Meeting: To discuss details of the functionality and achievable specifications
Items for Discussion:

- Re-routing
- Focus group
- Prototype functionality
- Storage Space for Materials

Envision Today Ltd.

MINUTES

January 17, 2013
1:30pm-2:30pm

Lab 1 Meeting

Present: Edwin Leong, Vincent Guan, Raymond Li, Darren Tong

Purpose of Meeting: To discuss details of the functionality and achievable specifications
Minutes:

Raymond Li called the meeting to order at 1:30.

A. Re-routing algorithm

Discussion: Discussed the need for sorting and searching for new nodes and paths

Action: Re-routing and pathing to be set aside until initial prototype has been finished. Open source mapping to be researched (Wikipedia sourced)

B. Focus Group

Discussion: Discussed the need for a focus group

Action: New contact for Eye of the Dragon to be contacted. Questions to be forwarded to Darren.

C. Initial Functionality

Discussion: Prototype initial functionality to be kept minimal

D. Storage Space

Discussion: Discussed the ability to obtain a locker in Lab1

Action: Another e-mail to be sent to Fred Heep by Vincent

Meeting was adjourned at 2:30pm.

Envision Today Ltd.

AGENDA

January 28, 2013
9:00pm-10:00pm

Skype Meeting

Purpose of Meeting: To discuss details of the of the coding process and the hardware specifications
Items for Discussion:

- Locker
- Visual Basic and the Google Maps API
- Hardware specifications
- Software Specifications

Envision Today Ltd.

MINUTES

January 28, 2013
9:00pm-10:00pm

Skype Meeting

Present: Edwin Leong, Vincent Guan, Raymond Li, Darren Tong

Purpose of Meeting: To discuss details of the of the coding process and the hardware specifications
Minutes:

Raymond Li called the meeting to order at 9:30.

A. Locker

Discussion: Raymond has obtained a locker for our use

B. GPM module

Discussion: Vincent and Darren discussed the need for GPM using a sim card or a phone

Action: Will be considered after core functionality is finished

C. Hardware specifications

Discussion: Hardware has been finalized

Action: Hardware has been run through with team and will be ordered ASAP by Raymond

D. Client Software

Discussion: Software to be used to obtain coordinates considered

Action: Current candidate is Visual Basic, secondary Flash (Actionscript)

Meeting was adjourned at 11:30pm.

Envision Today Ltd.

AGENDA

February 13, 2013
6:00pm-8:00pm

Lab Meeting

Purpose of Meeting: To discuss implementation and issues with hardware and software
Items for Discussion:

- GPS Serial Communication
- UI Interface

Envision Today Ltd.

MINUTES

February 13, 2013
6:00pm-8:00pm

Lab Meeting

Present: Edwin Leong, Vincent Guan, Raymond Li, Darren Tong

Purpose of Meeting: To discuss implementation and issues with hardware and software
Minutes:

Raymond Li called the meeting to order at 6:00.

A. UI Interface

Discussion: Gmap.net is coded in c#
Action: Will need to switch code from visual basic to c# to utilize existing libraries that hook into gmap.net

B. GPS module

Discussion: GPS Module does not appear to be sending information on the serial communications port. Potentially due to baud rate of the current arduino.

Action: Will have to either find another solution online or discuss switching microcontrollers next week

Meeting was adjourned at 8:00pm.

Envision Today Ltd.

AGENDA

February 19, 2013
1:30pm-4:00pm

Lab Meeting

Purpose of Meeting: To discuss and resolve implementation and issues with hardware and discuss the oral presentation

Items for Discussion:

- Continuing GPS Issues
- Oral Presentation

Envision Today Ltd.

MINUTES

February 19, 2013
1:30pm-4:00pm

Lab Meeting

Present: Edwin Leong, Vincent Guan, Raymond Li, Darren Tong

Purpose of Meeting: To discuss and resolve implementation and issues with hardware and discuss the oral presentation
Minutes:

Raymond Li called the meeting to order at 1:30.

A. GPS module

Discussion: GPS Module does not work on the serial port

Action: Trying to switch to the software serial instead and change baud rate

B. Oral Presentation

Discussion: General talking points need to be assigned

Action: Roles assigned, skype meeting scheduled tomorrow

Meeting was adjourned at 4:40pm.

Envision Today Ltd.

AGENDA

March 4, 2013
9:00pm-11:00pm

Skype Meeting

Purpose of Meeting:
Items for Discussion:

- GPS Solution
- USB connection is torn
- Communication from client to hardware
- Open Communication

Envision Today Ltd.

MINUTES

March 4, 2013
9:00pm-11:00pm

Skype Meeting

Present: Edwin Leong, Vincent Guan, Raymond Li, Darren Tong

Purpose of Meeting: To discuss and resolve implementation and issues with hardware and discuss the oral presentation
Minutes:

Edwin Leong called the meeting to order at 9:10.

A. GPS Solution

Discussion: GPS communication has been solved
Action: Testing of GPS Code will commence
Action: Testing the setup of gps to make sure baud rate setting doesn't need to be changed every power cycle

B. USB Connection torn

Discussion: USB connection is hanging by a thread from damage

Action: Raymond is going to superglue the connection from the USB to the board

C. Client Communications Protocol

Discussion: Need to create the protocol for the communications

Action: Assigning protocol, could communicate back for acknowledgement

D. Open Discussion

Discussion: GPS Distances are to 4 sig figs, full hardware implementation date, starting work on the design specs, alternate routes, not using GMap.net, rough schedule

Action: testing and debugging past the 15th
Action: design specs started
Action: Darren looking into alternate routes
Meeting was adjourned at 4:40pm.

Envision Today Ltd.

AGENDA

March 28, 2013
9:00pm-11:00pm

Skype Meeting

Purpose of Meeting:
Items for Discussion:

- Current Progress
- Alternate Routing
- Communications
- Interrupts
- Progress Report

Envision Today Ltd.

MINUTES

March 28, 2013
8:00pm-11:00pm

Skype Meeting

Present: Edwin Leong, Vincent Guan, Raymond Li, Darren Tong

Purpose of Meeting: To discuss current progress and resolve communication issues with hardware and discuss the progress report
Minutes:

Edwin Leong called the meeting to order at 8:30.

A. Current Progress

Discussion: Everyone's current progress. Status of GUI. Status of Microcontroller code. Status of Hardware.
Action: Testing and Debugging of Communications and current completed architecture (considered core functionality)

B. Alternative Routing

Discussion: Alternative Routing should be considered as a priority

Action: Alternative Routing has priority after Core Functionality and Reverse Routes

C. Communications

Discussion: Communications must be set and completed

Action: Darren and Edwin to work till the Sunday to complete to prepare for full functionality debugging. Sunday will be collaboration day

D. Interrupts

Discussion: Interrupts need to be created but for which switches

Action: Interrupt to be create for route reversing, Vince will be in charge

E. Progress Report

Discussion: Progress Report coming up due on Monday, Need to discuss sections and availability.

Action: Vincent and Raymond will finish their sections (Financial, Scheduling, parts of progress, conclusion) before the Sunday, Edwin and Darren will finish the rest of the report on the Monday

Meeting was adjourned at 11:00pm.

Envision Today Ltd.

AGENDA

April 10, 2013
1:300pm-2:30pm

Lab 1 Meeting

Purpose of Meeting:
Items for Discussion:

- Additional parts shipment
- Communications Issue
- Interrupts
- Alternative Routing
- Reverse Routes
- Testing

Envision Today Ltd.

MINUTES

April 10, 2013
1:300pm-2:30pm

Skype Meeting

Present: Edwin Leong, Vincent Guan, Raymond Li, Darren Tong

Purpose of Meeting: To discuss current progress with overall hardware to prepare for demo
Minutes:

Edwin Leong called the meeting to order at 9:30.

A. Additional Parts Shipment

Discussion: Finally obtained the final batch of parts from Fred Heep.
Action: Complete hardware assembly to be completed by Raymond, another ultrasonic sensor has been added for immediate testing

B. Communications Issue

Discussion: Communications continues to be an issue, we cannot see messages from the arduino on the client side

Action: Possibly ditch arduino side confirmation, blind client sending communications protocol? Darren to continue working on the issue and report back within a week with final implementation measures.

C. Interrupts

Discussion: Buttons need to be tested and functions need to be implemented for buttons and functionality.

Action: Interrupts to be implemented by Vincent in the next week

D. Alternative Routing

Discussion: Edwin confirmed there is enough space for a nominal alternative routing procedure and waypoints.

Action: Alternative routing must still be pushed back until primary functionality has been completed, it will be the next priority afterwards.

E. Reverse Routing

Discussion: Edwin has completed reverse routing implementation.

Action: Interrupts to complete reverse routing full workflow by Vincent

E. Testing

Discussion: Testing of full workflow must be started on the hardware

Action: Vincent now has the hardware, shall begin testing

Meeting was adjourned at 2:30pm.

Envision Today Ltd.

AGENDA

April 14, 2013
9:30pm-10:30pm

Skype Meeting

Purpose of Meeting:
Items for Discussion:

- Merging Code
- Interrupts
- Battery Circuit
- **Demo Plan**
- Alternative Routes

Envision Today Ltd.

MINUTES

April 14, 2013
9:30pm-10:30pm

Skype Meeting

Present: Edwin Leong, Vincent Guan, Raymond Li, Darren Tong

Purpose of Meeting: To discuss current progress and resolve communication issues with hardware to prepare for demo
Minutes:

Edwin Leong called the meeting to order at 1:30.

A. Merging Code

Discussion: Vincents code fragments must be merged with the main code
Action: Vincent to send code fragments to Edwin and Edwin will merge the code

B. Interrupts

Discussion: Interrupts must be created for potential alternative routing measures

Action: Vincent to create and send to Edwin for merging

C. Battery Circuit

Discussion: Circuit is complete and ready to be combined with the primary device

Action: Raymond to combine on the 17th of April.

D. Demo Plan

Discussion: Demo must be prepared for.

Action: Darren to work on initial demo and presentation materials until the 17th of April. Rest of team will begin working on the demo after the 17th.

E. Alternative Routing

Discussion: Potential crude solution for alternative routing found.

Action: Edwin to investigate the proposed method and potentially implement

Meeting was adjourned at 10:30pm.

