WhereTo

Post Mortem for an

Indoor Direction Finder for the Visually Impaired

Project Team

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Submitted to

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Introduction

The **Envied Solutions WhereTo** indoor direction finder is intended to allow the visually impaired successfully navigate unfamiliar buildings with no outside assistance. The intention is that public and commercial buildings will install this system to provide assistance to those traversing these buildings with various levels of visual impairment. The **WhereTo** handheld device can then be controlled entirely by voice, with the user speaking to the WhereTo and the WhereTo in return giving the user verbal directions.

After four months of work, the system still requires further development. Progress has been made but the prototype needs additional work to implement all of the core requirements identified in the project functional specification.

This document is intended to describe the current state of the project and what work and circumstances produced this outcome, to provide a comparison between projected and actual budget and schedule, and to illustrate how all these factors came together.

Current State of the System

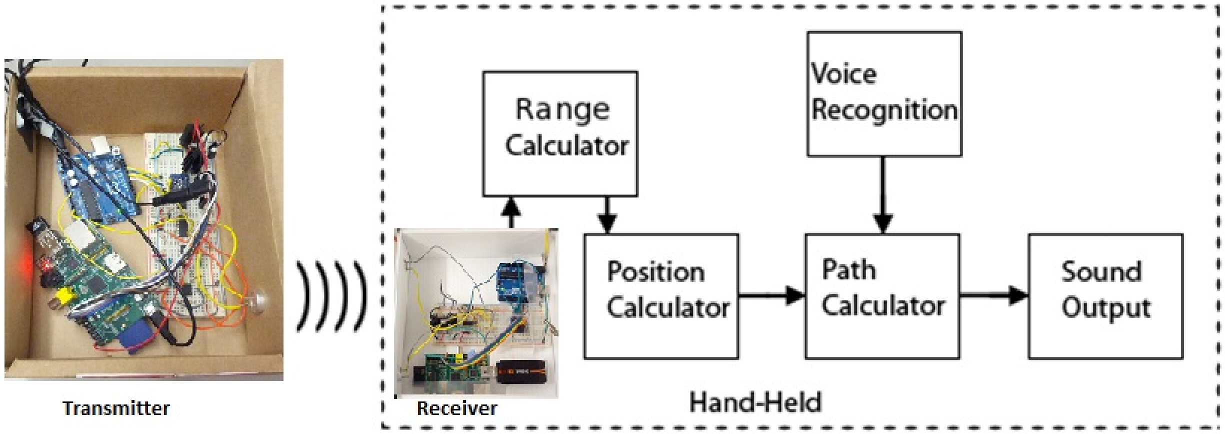

Figure 1: System Diagram

Hardware Design (Transmitter & Receiver)

The transmitter and receiver are shown in **Figure 1**. Once the decision to use ultrasonic waves as a transmission medium was made, the development of the required hardware progressed at a steady pace. Initially, we built proof of concept circuits using components we had readily available from previous project classes. After experimentation, we started laying down our requirements and circuit designs and began buying components. At this stage, we purchased items such as op-amps, transistors and ultrasonic transducers.

At this stage, we designed a simple bandpass amplifier for the receiver circuit. We also came across references in our research that indicated the amplitude-modulation presented severe difficulties when combined with ultrasonic transmissions. We therefore decided to use binary-frequency-shift-keying. This required some way to transmit at least two distinct frequencies. To accomplish this we made the choice to use a voltage-controlled-oscillator (VCO) digital-to-analog converter (DAC) as the voltage input. This meant that the output frequencies could be set in software instead of being fixed in hardware.

We also purchased a Raspberry Pi and an Arduino UNO to explore using them as basis for our software. We found that the Arduino was a good system for capturing a series of samples for use in frequency analysis; however, it did not have the speed to do the processing itself. Thus, we set up a system to transfer the data to the Raspberry Pi where the data was analysed via a fast Fourier transform (FFT) algorithm. To interface the Raspberry Pi to the Arduino, we purchased level shifters to change the Arduino's 5 volt signals to the 3.3 volts the Raspberry Pi was capable of handling.

When tested, the first batch of the ultrasonic transducers we ordered were extremely insensitive as both transmitters and receivers to the point where we decided to incur the expense and delay of ordering a second batch of transducers.

The rest of the parts proved satisfactory and we were able to build a test setup consisting of a VCO controlled by a Raspberry Pi directly wired to a receiver consisting of an Arduino and a Raspberry Pi. This setup was able to send information using up to eight different frequencies simulating four beacons using two frequencies each.

When the second batch of ultrasonic transducers arrived, we substituted them into the test setup but quickly realized we had overlooked an important detail. The new transducers had a bandwidth of only 2 KHz with a centre frequency of 40 KHz. To fit eight frequencies into a 2 KHz bandwidth required increasing the resolution of the FFT, which in turn required increasing the number of samples, which finally required increasing the time needed to collect a complete set of samples. We came to the realization that the increased time to collect a sample would reduce the time precision determining when a transmission began to such a degree that we would be unable accurately determine distances. The small frequency bands also caused problems with signals bleeding across multiple adjoining bands. The transducers were also very directional (approximately 30° of sensitivity) which made getting a signal across longer distances more difficult. If the aim was off the receiver would not pick up the transmitted signal strongly enough to be registered.

As we were late in the project timeline and these limits were inherent in the hardware we had available, the decision was made to demonstrate a single transmitter and receiver. By reducing the system to two frequencies, we were able to reliably transmit from short distances. The data rate still left a lot to be desired. Technical issues with the Raspberry Pi-Arduino interface resulted in a data rate of 71 bits/second. However, we were able to reliably transmit signals at some distance. We tested up to half a metre with a low error rate, the main difficulty being aiming the transducers so that the signal was strong enough.

User Interface Software

The software, user-interface, end of our product is the voice-controlled direction provision system. The system begins with the user selecting a marked location on the built-in pre-defined map of the area. This may be accomplished by the navigating the menu layers by speech input.

Once a destination is set, the system is ready to start calculating a path. The system can take in signal strengths of each beacon within range to run a trilateration algorithm to determine the user's current location on the pre-defined map of the area. These sensor inputs are currently unavailable so a mock-up of how it works is in place. This coordinate on the map goes into the A-star search algorithm to generate the optimum path to the selected destination. The initial direction to take this path is output to the user. Another feature we have yet to implement is using the magnetometer we have acquired to retrieve the device's current orientation. This additional information can allow for more intuitive directions which are relative to the user such as turn left, turn right as opposed to absolute directions such as go north, or go south, which forces the user track or their own orientation.

Problems & Challenges

Hardware:

One of the largest hurdles was finding satisfactory ultrasonic transducers. In the end, we purchased three different batches in pursuit of good transducers. Including shipping time, this delayed our entire design for at least three weeks. Receiver design took some trial and error to determine how powerful the amplifier needed to be. Originally, we tried a gain of 10 V/V on the receiver side. However, the signal we received was too small so that even after amplification the rest of the receiver could not reliably recognize a signal. When we used a gain of 1000 V/V, the amplifier finally gave us enough signal strength for use by the receiver side. Even still the effective range is still low and this is one component that could benefit from additional attention.

Our initial design of the voltage controlled oscillator worked quite well. While making some changes to get the VCO's operating frequency range where it was needed we did encounter poor and inconsistent performance. This was finally tracked down to a bad wire and we have very few problems with this circuit since fixing that connection.

The battery holders had issues with power leads that became detached very easily. In the end, we had to solder directly onto the battery holder contacts so that it will not come loose easily.

Due to time constraints, there are still some problems that are known, but we do not have time to resolve. First, on the transmitter side, we planned to use a single power supply cord to power up all our devices, including the Raspberry Pi, the Arduino, and our own circuitry. We have tried a few solutions. These attempted solutions have been unsatisfactory in how steady the voltage levels are or how much current can be supplied. It is still under investigation right now. We may need some additional components to resolve this. Secondly, we did not have enough time to build a good PCB version of the circuits since the hardware design was only finalised in the second week of April. A PCB version of the receiver was constructed but the rush job was of poor quality and this circuit failed when we were putting it into a wooden case.

Software:

On the software side, we have kept to our original design quite faithfully. The core aspects: voice recognition, path-finding, and audio output are all using the same proposed methods from our design specifications.

The Raspberry Pi used in our prototype also struggled with recording and outputting good quality audio. Its in-built audio chip does not suffice for pleasant and clear listening. Our makeshift solution is to use an external USB sound card.

Voice recognition is very finicky by nature. Sound models need training with a wide variety of samples to ensure maximum accuracy and match-rate with different accents, tones, and speeds. It also requires a great deal of fine-tuning with the actual recording hardware to ensure reliable results.

Due to the limitations in our hardware design, a proper set of signal strengths were not available to determine actual user position in real time. As such, we are only able to highlight the functionality of voice recognition, path finding, and direction provision in a theoretical sense.

Furthermore, due to the overambitious scope of our project, we have left out the implementation of the magnetometer (digital compass) in our prototype in favour of refining other features. This perplexes the direction output, as we are only able to provide them in the form of North (N), East (E), South (S), West (W), and their in-between directions.

Future Work

Hardware:

Resolving the power supply issues on the beacon will require stepping back and analyzing all the bias points but should be ultimately a solvable problem.

The extremely low bit rate of the ultrasonic rate presents a few lines of investigation. The primary bottleneck is between the Arduino pre-processor and the Raspberry Pi main processor. Getting a faster pre-processor would improve this bottleneck. A faster pre-processor would also allow doing the frequency analysis there instead of on the main processor and open up the possibility of doing a progressive form of the Goertzel algorithm on the pre-processor giving the system better time resolution.

With improvement in the bit rate it should easy to implement the message protocol we discussed in our design specification. Building the rest of the range calculation system is possible in principle. As intended we were going to synchronise beacon clocks with the Precision Time Protocol but this is something we never had time to work on so it may not prove suitable. More specialized time synchronization systems exist but may be much more expensive.

Since the ultrasonic transducers can only transmit and receive signals at short range, one avenue we could explore is having the system switch to a radio system at longer ranges with a possible drop in precision. For example, if the signal is out of range for ultrasonic communication, the RF subsystem could just notice that there are beacons outside of the ultrasonic range. When you walk close to the ultrasonic data transmit range, the device can switch into ultrasonic mode, which would provide better accuracy.

Alternatively, if we were able to build a radio based positioning system that offered enough accuracy we could convert the whole system to that and drop the ultrasonic component completely. This would have the advantage to increased range and less need for direct line of sight. The primary challenge would be the need for more accurate clock synchronization as the speed of radio waves is much faster than the speed of sound waves.

Condensing the handheld unit size would involve redesigning the system to use micro-controller(s) mounted directly on a single board with the rest of the circuit instead of the separate Raspberry Pi and Arduino we used in the prototype. This would easily condense the board the approximately the same size as in a modern cellphone. However our current version is too big for handheld and it is not a professional design.

Software:

Much of the software needs rewriting for efficiency. In order for the user-interface to be responsive and reliable, the software needs to have proper scheduling or perform some multi-threading to simultaneously accept hardware key as well as voice inputs. The Raspberry Pi board we are using to prototype is also a limiting factor. For a production-ready version of our product, we need to look into dedicated processing systems to run our specialized code.

Another area to be refined is voice recognition. The current system has great troubles with distinguishing short keywords. Words with three or more syllables are easier to resolve while crucial keywords such as Yes and No are near indistinguishable. It is worth consideration to license proprietary voice-recognition software or just their sound models to improve keyword match-rate.

Financial Details

As of January 21st, 2013, the estimate budget is summarize as below,

Component	Estimated Budget
Wi-Fi Receiver	$30
Wi-Fi Transceiver	$40 x 4
Audio	$50
Battery (rechargeable)	$20
Microcontroller	$50
Sensor	$40
Handle	$40
Magnetometer/Accelerometers	$30
PCB Board	$50 x 4
20% Contingencies	$120
Total	$740

Table 1: Tentative Budget

In the beginning, we planned to use Wi-Fi as a communication medium between the handheld and beacons. The majority cost would have been the Wi-Fi devices and we would have needed to buy some audio components to get better quality voice outputs.

The table below lists the final cost for our project.

Component	Actual Expense
4 *Raspberry Pi (Model B)	$156.80
3 * Arduino Uno	$94.91
Battery (inc. charger)	$36.90
Ultrasonic Transducers	$28.83
IC Chips	$60.12
Wi-Fi adapter	$14.55
Miscellaneous	$366.66
Total	$758.77

Table 2: Actual Expense

According to **Table 2**, there are large deviations between our initial budget and the actual spending. The major difference is that we have changed our entire design from Wi-Fi signal to ultrasonic signal. Additionally, we have purchased more microcontrollers than what we expected to in the beginning. In the beginning, we thought that only the handheld device would have a full-fledged microcontroller. However as the design evolved, we used them in both handheld and beacons. Another thing is that we underestimated the contingencies expenses. The miscellaneous items cover shipping and handling, connectors, some IC chips, cables, and supplies. Also noteworthy, is that we preferred buying several spares for each component so that if the one broke down, we could replace it with no delay.

Schedule Deviation

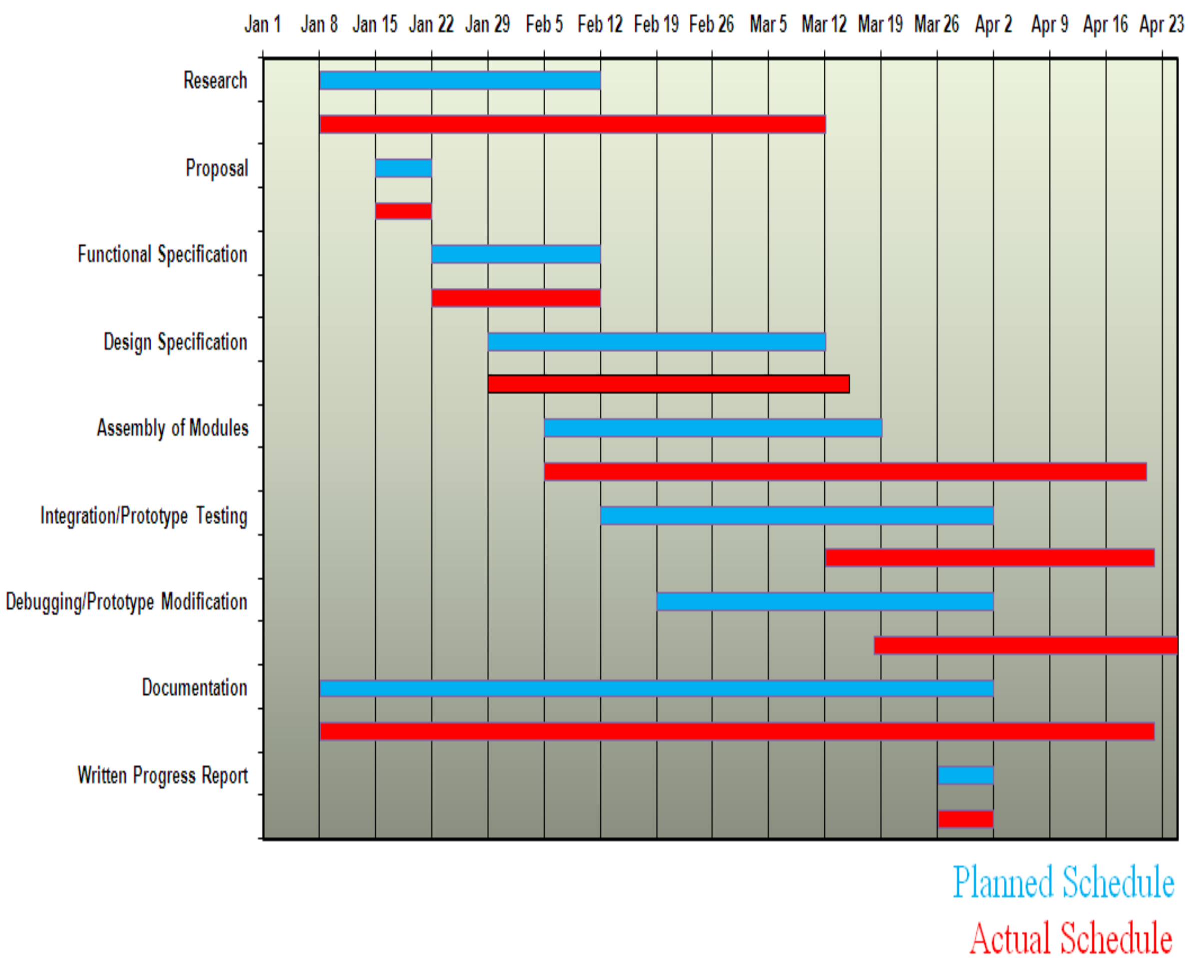

Figure 2: Schedule Deviation

Due to troubles with finding a set of well-performing ultrasonic transducers, the tasks that relates to building the prototype delayed by over two weeks.

Group Dynamics

Envied Solutions began as a three-manned team with the electronics expert Alan, the software-inclined Wilson, and the balanced, Linux/Raspberry-Pi guru, Phillip. Shaham later joined the team as we were voting on the project topic.

Because the nature of our product requires extensive research and testing with hardware, Phillip worked closely with Alan in designing and building the transmitter and receiver circuits. Wilson worked on the high-level software algorithms and consulted with Phillip over various details in how to ensure compatibility with the hardware and how the Raspberry Pi differed from typical desktop systems. Meanwhile, Shaham, being less experienced in both hardware and software, aided with research. He later took charge of the construction of the physical cases for our circuits.

The three original members got along very well. There was some conflict with the incoming member which was not properly addressed for some time. While attempts to set group wide expectations were made at various times they were half hearted and not well enforced which contributed to an ongoing negative group dynamic. Eventually we did attempt to deal with it. We let Shaham know that it was an issue so he would attend crucial team-direction meetings more frequently. In a sense, the issue was resolved; Shaham did make himself available and we found some new tasks for him to work on such as document outlines.

Individual Reflections

Wilson's Reflections

Undertaking ENSC 305/440 without a foolproof project topic before the beginning of the courses was the first mistake I made this semester. I have learned that while it is great fun to throw ideas around in our team and discover that some of them show promise, it is also equally hurting to the time we have in actually getting that ambitious project done.

It was well into the second week of classes before we have decided to pick the route of our direction-finding system and started research of the possible implementations. At this point, I also felt very honoured because I was the one who pitched the initial idea – which seemed plausible to everybody. I was overjoyed when I became CEO (on paper) for this team and that we use the company (**Envied Solutions**) and product names (**WhereTo**) that I suggested. That was the last moment I felt comfortable with our project.

Having my initial assumption that Wi-Fi access points would suffice as signal beacons shot down because of their precision limits and shifting to use ultrasonic transducers only led to more troubles. Good performing ultrasonic transducers do not come cheap. We learned the hard way that we should not trust low-cost unknown origin electronic parts to work as advertised. We have purchased and experimented with a plethora of them and eventually settled with mediocre ones just before the jump in price to about $60 apiece of which we need at least five. This was the first hardware challenge and mistake and it is the largest one that would stick to the end.

On the software user-interface end, we were lucky to have found well-documented research and guides on most of our modules. I discovered the many ways of which people have tried to perform voice recognition – and how to do a fair job of it on a resource-limited system. I was responsible for the high-level software subsystem of which I designed and assembled while Alan and Phillip worked in tandem on the ever-puzzling hardware as well as the hardware-software interface respectively. By the way, watching them work was a great learning experience on what defines impeccable work ethics. They were the most knowledgeable in the fields they assumed responsibility over and they have put in far more hours than I expected out of them to get things working as intended. While it is unfortunate that we could not transmit reliable location information from sensor-received signals to the software front-end, I was able to transform the software to a game-like mock-up of a fully functioning system to highlight how it would have worked if the hardware signals came through properly. While it is nice that some things work, what I wrote earlier still stands, I was not comfortable with the state of our project.

What I believe is the cause to our semi-functioning product is that nobody noticed or raised their concern that we simply cannot do this in 3 months. No. It was not possible. Not without a solid plan before the term began instead of having to learn and plan as we go. Perhaps, if we started two months earlier, we may be able to implement the features we have forsaken and iron out the inefficiencies.

Aside from the technical ups and downs, I have learned a great deal in how and how not to motivate a team to get work done. Requirements, expectations, deadlines, meetings, and the like required agreement from everybody before I can expect them to be uphold. After offering options on the project and hearing everyone's opinions, someone (often myself) must state the direction we take or the matter would be forgotten. Scheduling meetings and trying to find things for people to do is also something I have picked up as we progressed (I am still not great at it but I had to get better in order to get things done). Keeping track of progress and having a space to collaborate is what I found most crucial in our brief four months together. To accomplish this, we made extensive use of the Sakai (sakai.sfu.ca) tool mentioned on the course website. Its Wiki and Dropbox proved invaluable in assembling all our documentation.

Overall, the greatest lesson that I have learned (again, the hard way) is that everyone has to contribute to their utmost ability to have a chance at succeeding in a capstone project. However, despite the harrowing process, I loved every moment of seeing a simple concept growing into a demonstrably plausible product.

Phillip's Reflections

This was a challenging project with several hurdles to overcome. Despite the difficulties we encountered and our inability to deliver the final product the project was well worth the attempt.

During the project I gravitated towards two roles. First, I did the research for several approaches and techniques for solving the problems presented by our project. Some of these were useful while others were dead ends. I then passed off that information, possibly with an algorithm or sample program to other team members to work on. Second, I took the role of integrating the hardware components with the software.

The most technically challenging and rewarding sub-system which I worked on implementing was the ultrasonic transmitter-receiver. I worked closely with Alan Fang to design and build this component: Alan worked primarily on the analog hardware whereas my focus was on the analog-digital interfaces and software. Working together we were able create a system capable of transmitting information reliably across distance of half a metre.

Despite this success there were two areas where the sub-system's performance fell short. The ultrasonic sensors were too directional making use at range more difficult and the speed of the link was about an order of magnitude too low. Both these problems stemmed from the characteristics or our ultrasonic components, and limitations of the Arduino microcontroller we used to preprocess our input. These limits could have been predicted from the outset but I failed to perform the calculations which would have revealed the issues during the design stage; only realizing the problem with the data-rate during implementation.

Working on this project, particularly the difficulties with the ultrasonic link taught me several lessons and reinforced some others. I had the opportunity to practise modifying standard circuits to fit a different set of specifications and constraints. One of the hard lessons learned was that I was not careful enough during the design phase determining how different parts of the system constrained other parts negatively. However, while adversely affecting this project, I did come to understand frequency analysis much better while figuring out my initial errors.

Overall I feel this course and the project I took part in were time well spent. The experience of trying to build such a complicated system taught me many things both specific to the **WhereTo** design and project management in general. I look forward to future endeavours on this scale with confidence.

Alan's Reflections

Four months has passed, time flies. That is the feeling I get when I see that the deadline is only hours away. These four months has been the most memorable and the most challenging experience in my university life. As the CFO, I am responsible for the team's cash flow, financial statements, and purchasing most of the components to minimize our expenses.

Aside from financial management, I worked as the hardware developer for our devices by designing circuitry and power systems for our transmitters and receiver. Since the beginning, I knew that we had chosen a challenging topic. After working on the project, I realized that the topic is even harder than what I have estimated it to be. It is so hard to find a decent transducer at a low price. Most websites that sell ultrasonic transducers did not show their data sheets and then there was the long wait for them to get delivered so I can finally start testing them to see if we can make use of them. Unfortunately, the first batch I bought was very bad. Not only did the transducer not receive signals well, they used RCA cables, and had a resistance too high to use with our existing circuitry. After this experience, our group decided to invest in a second set of transducers, which, according to the data sheet, has a longer effective range. However, after we received them and ran some tests, we discovered that they have an extremely narrow transmit and receive frequency band. Finding these half-usable transducers and waiting for them to arrive delayed our project for at least three weeks.

Compared with any other academic course I've taken at SFU, I've learned much more on my own through this project. This includes discovering how to transmit and receive signals in the ultrasonic range. Moreover, I've developed a better understanding on analog to digital, digital to analog, and how communication systems work in the real life. Through these four months, I also learned how function as a team, how to solve problems as they arise, and how to maintain good communication. This project was also a great opportunity for me to refresh on some concepts I've learned at SFU but have forgotten over the years. Although we cannot accomplish our ultimate goal, I am still satisfied with the amount of work we have done and the effort we have put into the project.

Shaham's Reflections

I am currently a fourth year systems engineering student at Simon Fraser University. When I was first put in this group the project idea was picked already and I had no clue how we were going to be implementing this idea, theoretically and finally making a prototype of it. This seemed like an impossible task especially since I had no previous co op or any kind of working experience in the field yet. Once I started working with Phillip, Alan and Wilson though, they were very welcoming and encouraging and we just kind of took it step by step and the team seemed pretty balanced. Phillip and Wilson were the software experts; Alan and I were the hardware and business brains of operation. Slowly things seemed to fall in place and we were following our schedule to the best of our ability until about half way when naturally we started to run into problems and the stress factor also kicked in. But with our great team dynamics we were able to think fast on our feet and solve problems as efficiently as possible and just playing with the cards we were dealt. We had regular meetings and everyone kept each other up to date with their progress and problems. In the case that we ran into problems we would quickly brainstorm as a group and solve the problem or at least come up with possible solutions to try. Even though most of us had heavy course load we managed to keep up the team dynamics during the past few months. During this period I improved on a lot of technical and non-technical skills. I learned more about circuitry; how to neatly make a circuit and test. I got firsthand experience with Raspberry Pi. I used Linux for the first time and learned a lot of useful feature that will also be helpful in the future. I also improved my machine shop skills such as cutting, drilling, grinding, sanding, soldering and etc while making the user interface and the first prototype. I improved my documentation skills such as progress reports and journal. Despite recommendations from previous professors I didn't have experience with journals before but I found it very useful during this project and am going to continue using it. To sum up this course has been the most challenging course I have taken at SFU, as I'm sure most students would too. It has been a ton of work and very time consuming specially considering I was taking 4 courses this semester but I have loved every second and every challenge of it and it has been a great experience to take with me into the future projects and life ahead.

Conclusion

While we failed to build a prototype which met our core functional requirements, the **Envied Solutions** team did put a great deal of effort into this project. However, we fell short in properly analyzing our proposed solution in the early stages of design and how different design decisions would affect each other. We also did not deal with negative dynamics within our group effectively at an early stage. This reduced productivity across the team and contributed to schedule slippages that ultimately led to not completing the project goals within the four month timeframe.

Given the opportunity to do the project over again there are things that we would do differently. We would especially have benefited from consulting with more knowledgeable people regarding the approach we were taking. This would have likely bypassed many issues we encountered. Additionally, we would work on setting expectations for all members and measuring their performance against those expectations so that there would be fewer disputes about whether the workload was being shared equally.

In spite of the difficulties the team as a whole gained experience with several aspects of technical design and developed our soft project skills. The time spent was ultimately a positive learning experience.

Appendix (Meeting Requests/Agendas)

SFU Connect **ffa3@sfu.ca**

Meetup tomorrow at 2:30, Lab1, to start on proposal

From :	Wilson Chen <wilson_chen@sfu.ca>	Tue, Jan 15, 2013 10:21 PM
Subject :	Meetup tomorrow at 2:30, Lab1, to start on proposal	
To :	Fu-Tsung Fang <ffa3@sfu.ca>, Phillip Peach <pjp2@sfu.ca>, Shaham Shafiei <ssa96@sfu.ca>	

As the subject reads, let's meet up tomorrow and get started on the proposal. I have class until 2:30 but you can all meet up earlier if you want.

SFU Connect **ffa3@sfu.ca**

Project Proposal Progress?

From :	Wilson Chen <wilson_chen@sfu.ca>	Sun, Jan 20, 2013 09:05 PM
Subject :	Project Proposal Progress?	
To :	Fu-Tsung Fang <ffa3@sfu.ca>, Phillip Peach <pjp2@sfu.ca>, Shaham Shafiei <ssa96@sfu.ca>	

We still need to put together a lot of the content and make sure we've covered everything. After we finish up all the parts we agreed on doing send it all to Alan to put them together. After that, there are still the letter of transmittal, executive summary, and team/company details (company name, product name, logo, members) left to write up. We also need to spare some time to proofread for persuasion, grammar, and style before submitting.

What Shaham wrote looks more like an executive summary than design solutions. So as of yet, we don't have many details about how the product will work. We need an intro, a scope/benefits/risks analysis, and a conclusion.

Don't forget to record all sources of information if you're getting statistics or technical info from places for the references.

===============>
Let's meet up TOMORROW afternoon at 2:30, Lab 1 to go over what's remaining.
===============>

For the team details, write up a brief intro of yourself like Alan did (and also your preferred title or I'll assign one) and send it to me so I can put it together TONIGHT. I will also write up the letter of transmittal while I'm at it.

For the names and logo, can everyone give it some thought and bring whatever you have when we meet up tomorrow. Otherwise, we'll just go with whatever we have so far.

I'll see you all tomorrow,
Wilson

SFU Connect **ffa3@sfu.ca**

305/440 Meeting today at 2:30 Lab 1

From :	Wilson Chen <wilson_chen@sfu.ca>	Wed, Jan 30, 2013 05:48 AM
Subject :	305/440 Meeting today at 2:30 Lab 1	
To :	Fu-Tsung Fang <ffa3@sfu.ca>, Phillip Peach <pjp2@sfu.ca>, Shaham Shafiei <ssa96@sfu.ca>	

Hello everyone,

This is a reminder that we've agreed to meet up at the usual spot in lab 1 at 2:30 today.

My ENSC 474 image processing assignment is taking many tens more hours than I thought it would - so I'm giving an outline of what we will discuss in order to hold a quick meeting and I can quickly get back to that C++ mess.

Similar to how we did the proposal, I've drafted up a division of tasks which I'll show you all.

This time, everyone should collaborate on the main content worth 65% using Sakai or other tools if people have suggestions. Then there are a few small tasks left to delegate. We should come up with a list of required/desired functions within the next few days so we can start researching, justifying, and fine-tuning them. If you haven't already, read through a few example functional specification documents to see what they expect and also get familiar with Sakai's dropbox and wiki for collaboration.

Wilson

SFU Connect **ffa3@sfu.ca**

305/440 Functional Spec:

From :	Wilson Chen <wilson_chen@sfu.ca>	Sat, Feb 02, 2013 08:54 PM
Subject :	305/440 Functional Spec:	

Hello everybody,

This is a reminder that the current plan is for Alan, Phillip, and I to work on the Handheld, User Interface, and Beacon sections respectively and Shaham can start filling in bits and pieces for the System Requirements. These are all to be done in our Wiki pages of sakai.sfu.ca. Also, if you have anything to add onto other sections, just add it and leave a note.

We'll meet up on Tuesday at 1PM (during normal lecture hours) to see where everybody is at. If you cannot make it, please let everyone know in advance so we can accomodate for it. I hope that we can finish writing up the content before the day it is due this time.

Enjoy the rest of your weekend!

Wilson

SFU Connect **ffa3@sfu.ca**

ENSC 305/440 Meetup after lecture tomorrow

From :	Wilson Chen <wilson_chen@sfu.ca>	Mon, Feb 18, 2013 11:29 AM
Subject :	ENSC 305/440 Meetup after lecture tomorrow	
To :	Fu-Tsung Fang <ffa3@sfu.ca>, Phillip Peach <pjp2@sfu.ca>, Shaham Shafiei <ssa96@sfu.ca>	

Hello everybody,

I hope that you all had a nice relaxing reading break. Tomorrow, we have a mandatory 1-hour lecture for 305 so let's meet up for 1 hour afterwards to see how far we've gotten in deciding the technology so we can start prototyping.

Please reply to everybody if you cannot make it.

Wilson

SFU Connect **ffa3@sfu.ca**

Meetup tomorrow at 1PM in Lab 4

From :	Wilson Chen <wilson_chen@sfu.ca>	Wed, Feb 20, 2013 04:58 PM
Subject :	Meetup tomorrow at 1PM in Lab 4	
To :	Fu-Tsung Fang <ffa3@sfu.ca>, Shaham Shafiei <ssa96@sfu.ca>, Phillip Peach <pjp2@sfu.ca>	

We'll meet up prior to the oral progress report to go over what we'll talk about.

Lab 4 @ 1PM!

SFU Connect **ffa3@sfu.ca**

ENSC 440 Design spec & progress

From :	Wilson Chen <wilson_chen@sfu.ca>	Tue, Feb 26, 2013 01:28 AM
Subject :	ENSC 440 Design spec & progress	
To :	Fu-Tsung Fang <ffa3@sfu.ca>, Phillip Peach <pjp2@sfu.ca>, Shaham Shafiei <ssa96@sfu.ca>	

Hello everybody,

I'm thinking we should meet up and go over our progress in the project on Wednesday (it may be too short of notice for Tuesday). The design spec is due in less than 2 weeks and we should get started early because it will very likely be the hardest document to write up.

Alan has ordered some parts and we're waiting for it to arrive. They probably won't arrive until next week but we should still go over our plans. I've started on drafting up a basic path finding & feedback algorithm that assumes I have the exact distances figured out and I know the layout of beacons the building. We can share whatever else we have seen or thought.

The biggest challenge will be to figure out how to separate the encoded signals and determine their strengths - the bridge from hardware to high level software.

So how is Wednesday the 27th at 2:35PM for everyone? (I need a few minutes to talk to my ENSC 474 prof about another project after my class)
I've scheduled a meeting with the SFU calendar and you should all have seen the invite/response request.

I'll update sakai.sfu.ca with what we need to do later today.

Wilson

SFU Connect **ffa3@sfu.ca**

ENSC 305/440 Design Spec Progress

From :	Wilson Chen <wilson_chen@sfu.ca>	Tue, Mar 05, 2013 07:19 PM
Subject :	ENSC 305/440 Design Spec Progress	
To :	Fu-Tsung Fang <ffa3@sfu.ca>, Phillip Peach <pjp2@sfu.ca>, Shaham Shafiei <ssa96@sfu.ca>	

Hello everybody,

We haven't really gone over what to do about the design spec yet. It's due on Monday and should be quite similar to the functional spec except that now we explain how we implement each component of the system and justify why we choose that approach.

I've been writing up parts for the handheld in how it takes location info and translate it into audio cues. I plan to get the sensor-signal to location info design drafted up by Thursday so we can refine it. I also received my order of a Raspberry Pi as well as a new Arduino Uno for us to experiment with. If we don't need to use them in our project, I can just keep them for myself.

If it works for everybody, we can meet up briefly tomorrow, Wednesday, at around 1:30 to delegate the work and see where we're at. If not, we'll need to continue to pick parts of the design spec to work on (let me know what, so I can figure out what we're missing). I assume Alan and/or Phillip will take care of explaining what kind of circuitry will be used to combine everything. As a general note, we need to work towards quantifying things so that we can be specific in our test plan. Whenever possible, use tables, graphs, and figures.

By Friday, we should have a good start into our parts so we can finish and revise them over the weekend. So on that day, update us on your progress and let us know when you plan to finish your parts by.

Anyways, let me know if you are available tomorrow, Wednesday, at 1:30ish to meet up.

It'll be a tough week... good luck.

Wilson

SFU Connect **ffa3@sfu.ca**

ENSC 305/440 Meet up Monday

From :	Wilson Chen <wilson_chen@sfu.ca>	Fri, Mar 22, 2013 11:56 AM
Subject :	ENSC 305/440 Meet up Monday	
To :	Fu-Tsung Fang <ffa3@sfu.ca>, Phillip Peach <pjp2@sfu.ca>, Shaham Shafiei <ssa96@sfu.ca>	

Hello everybody,

Does Monday afternoon at 2:30PM work for all you? I hope that everybody has rested enough from our design spec session to work hard on the project again. It's about time we met up and spend an hour or two to go over where we're at, what needs to be worked on, and who's working on what.

Thanks,

Wilson

SFU Connect **ffa3@sfu.ca**

ENSC 305/440 Meeting Monday

From :	Wilson Chen <wilson_chen@sfu.ca>	Thu, Apr 04, 2013 11:16 PM
Subject :	ENSC 305/440 Meeting Monday	
To :	Phillip Peach <pjp2@sfu.ca>, Fu-Tsung Fang <ffa3@sfu.ca>, Shaham Shafiei <ssa96@sfu.ca>	

Hello everybody,

Is Monday at noon a time for everyone to meet up and integrate what we have ready to get a better picture of what's working and what needs improvement?

I'm still trying to get the A* pathfinding algorithm done (I'm trying to follow as close as possible to the guides and demos that I've found) and what I've noticed so far is that I need a way to periodically obtain the current location - and that's something we don't have yet.

Let me know if Monday is good or not so we can work out a time that's good for everyone.

Wilson

SFU Connect **ffa3@sfu.ca**

ENSC 305/440 Meeting at 11:30 AM before Class

From :	Wilson Chen <wilson_chen@sfu.ca>	Mon, Apr 08, 2013 01:50 PM
Subject :	ENSC 305/440 Meeting at 11:30 AM before Class	
To :	Fu-Tsung Fang <ffa3@sfu.ca>, Shaham Shafiei <ssa96@sfu.ca>, Phillip Peach <pjp2@sfu.ca>	

Ok, so it seems that it works best that we meet up before class at 11:30 to go over what we have ready and what's in progress or needs to be worked on.

After the lecture, we can start putting things together and go over more detailed plans and schedules (if we don't have enough time before class).
