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Post-Mortem for the

VIA: Visually Impaired Assistant



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1. Introduction

The VIA, or Visually Impaired Assistant, is a navigational tool for the visually impaired to use in their everyday life. It is difficult to find a solid solution to navigating in such a fast paced world without the use of all five senses, but our goal was to change that idea. Our motivation in this project came from our curiosity around tools that help us navigate through an unfamiliar environment. From there we developed an idea of helping people who truly struggle with an easy navigation, the visually impaired. Our drive shone through at this point and we had a great desire to create a truly great project.

Our device, the VIA, was meant to produce a better alternative to the current systems available on the market. That includes the very common white cane used by many, and the guide dog as well. Our device operates very similar to the white cane, but allows for greater distance, which provides a better feel for the area around them. Our system uses ultrasonic sensors as a way to detect up to 7 meters away. In addition, it uses audio feedback to provide certain object distinction and distance of the object detected.

The VIA aims to give users a greater sense of their surroundings, and hopefully a better life through our device. It was our hope that many users would have the feel of more freedom from our device and a stronger level of comfort in any environment. Our team of engineers has been working tirelessly in hopes of producing a quality device that truly could improve someone's life. This post-mortem document will discuss our project, the problems we faced, and what we have learned as a result of the development of the Visually Impaired Assistant.

2. Current Device Progress

2.1 System Overview

The functionality of the VIA is highly dependent on the simultaneous performance of many components. Two main subsystems coexist within the VIA that help it achieve its functionality. The first of these subsystems is meant to detect obstacles. The main components used to detect obstacles are 3 ultrasonic range finders, and the 9 degree of freedom chip (9DoF). The second subsystem is used to send audio feedback to the user. This is done by pairing the users phone with the BlueSMiRF Silver - Bluetooth modem and playing audio clips via the android app.

2.2 Ultrasonic Sensors

To accurately range distances, we used three I2CXL-MaxSonar-WR Ultrasonic Range Finders mounted at 15 degree increments from each other. These range finders are



intended for outdoor use and provide a maximum ranging distance of 7 meters. Also they have a 1 cm resolution which was enough for our intended use. These sensors use i2C protocol to trigger and store range readings. The first iteration of our product used three MB1010 LV-MaxSonar-EZ1 range finders by MaxBotix instead. The reason they did not work correctly was because of interference caused by the width of the sensor beam.

2.3 Absolute Orientation Detection

We decided to use MinIMU v3 Gyroscope, Accelerometer, and Compass for the VIA. Modifying the available libraries, we were able to implement the 9DoF chip with full/expected functionalities. As with the ultrasonic sensors mentioned above, the 9DoF chip also uses the i2C protocol. A combination of the absolute orientation of the device found by the 9DoF chip, and the range reading found by the ultrasonic sensors was used to accurately detect obstacles and their distance from the user.

2.4 Audio Feedback System

Audio feedback is done through an Android phone application. The device is paired with the user's Android phone via the Bluetooth modem. As of right now, the phone application isn't visually impaired friendly; allowing the application to automatically pair with the device, as well as integrating text-to-speech functionality would improve this issue dramatically.



3. Materials and Cost

Unit	Cost per Unit	Quantity	Total Unit Cost
Electronics			
Arduino Uno	33.00	2	66.00
Pro Trinket 3v	16.00	3	48.00
MB1010 LV-MaxSonar-EZ1	30.00	8	240.00
I2CXL-MaxSonar -WR Ultrasonic Range Finder	161.64	3	484.91(Tax Included)
3 axis Gyroscope	22.00	1	22.00
MinIMU-9 v3 Gyro, Accel, and Comp	49.53	1	49.53 (Tax included)
SD Card Shield	16.90	1	16.90
SD Card	15.80	1	15.80
VS1053 Code + MicroSD Breakout(Audio Module)	24.95	1	24.95(Tax Included)
1 MB SPI Flash	1.95	5	9.75(Tax Included)
BlueSMiRF Silver(Bluetooth Module)	42.50	1	42.50
Electronics Subtotal			1020.34
Electronics Taxable Total			451.20
IC's			
74HC08	0.70	1	0.70
74HC11	0.60	1	0.60
74HC125	1.60	2	3.20
74HC126	1.60	2	3.20
74HC138	0.80	1	0.80
74HC238	0.90	1	0.90
IC Subtotal			9.40
IC Taxable Total			9.40

Components			
Rocker Switch	0.80	1	0.80
Mini Rocker Switch	1.50	2	3.00
Speaker	1.00	2	2.00
Speaker	2.50	1	2.50
Amplifier	6.50	1	6.50
Buzzer	1.50	3	4.50
Speaker	3.00	1	3.00
Headphone Jack	10.00	1	10.00
LED 5mm	1.00	3	3.00
LED 3 Watts	6.00	2	12.00
PCB	5.50	2	11.00
PCB 170	1.50	3	4.50
PCB 276	1.70	1	1.70
Headers	0.80	5	4.00
Headers	1.00	4	4.00
Headers	1.50	2	3.00
Connectors	0.90	3	2.70
Jumper Connectors	1.50	2	3.00
Jumper Wires (Lee's)	5.25	1	5.25
40 Pcs M-M Jumper Wires (RP)	9.70	1	9.70
40 Pcs M-M Jumper Wires (RP)(Price Increase)	10.80	1	10.80
DC Plug	0.75	2	1.50
9V Clip	0.30	2	0.60
9V Holder(Different Variations)	1.50	7	10.50
AA Holder	1.10	1	1.10
Component Subtotal			120.65



Components Taxable Total			120.65
Others			
USB A to B	3.05	3	9.15
3D Printed Casing	131.54	1	131.54(Tax Included)
Xacto Knife	3.59	1	3.59
Knife Blades	3.60	1	3.60
Mini Breadboard	3.50	3	10.50
Desoldering Pump	7.90	1	7.90
ShoeGoo	8.79	1	8.79
Electrical Tape	4.28	1	4.28
Plexiglass	4.99	1	4.99
Plexiglass	9.97	1	9.97
Glazing Paint	6.50	1	6.50
9V Battery	6.99	1	6.99
Shipping + Import Fees	120.43	1	120.43(Tax Included)
Others Subtotal			328.23
Others Taxable Total			76.26
Subtotal			1465.62
Taxable Total			657.51
Tax Total(12%)			78.90
Total			1544.52
ESSEF Funding			475.00
Withstanding Total			1069.52

4. Schedule

Shown below is the initial schedule we set for our project as part of our proposal document.

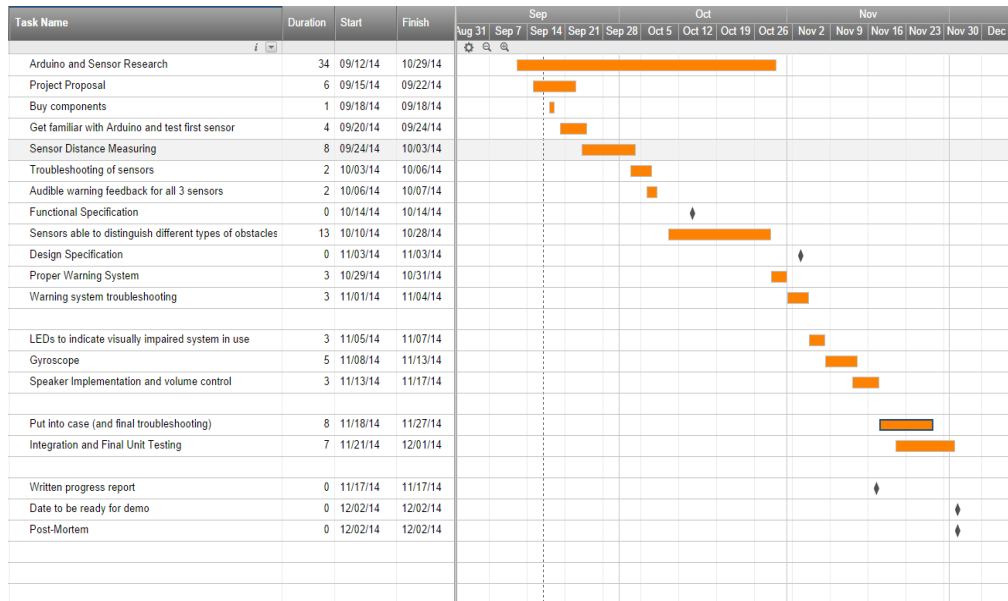


Figure 1: Initial VIA Project Schedule

Unfortunately, our schedule deviated quite a bit from what we had initially planned. A large difference in our schedule actually arose when our demo, set for the 15th of December, extended our finishing date for the project by almost two weeks. However, with little account taken by us for how much time documentation would take, our schedule ended up very different than we expected.

A number of errors occurred, with our sensors finished early on, only to stop working later in the term, as well as the case taking longer than expected. A large roadblock came in the form of each part taking longer to implement than intended, and integration being extremely delayed because of sensors issues. We learned quite a bit about scheduling and how much there truly is to take into account when a large-scale project is concerned.

5. Problems and Challenges

We had many technical challenges, most of which were rooted from the same issue, the original set of ultrasonic sensors. These sensors were a constant problem during our



development cycle. Individually, the sensors seemed to operate consistently and to a good degree of accuracy. However, when we began integrating the 3 ultrasonic sensors together, they no longer functioned correctly. There would always be at least 1 sensor getting incorrect range values. This was obvious because we would aim all the sensors at an object a given distance away, and at least 1 of the 3 sensors would incorrectly read the max or min possible range reading. We continued working with these sensors under the impression that we would be able to find a way to make them work. Some methods we used to try and solve this problem include adding a longer delay between ranging, going through a troubleshooting tutorial available on the sensor manufacturer website, and even buying a new sensor with the hope that the ones we were using were faulty. Unfortunately, none of these solutions worked. The time spent trying to make the original set of ultrasonic sensors ended up hindered our progress in other areas of our project. It seems all of our range reading problems were solved once we decided on buying an entirely new model of ultrasonic sensors.

Our next biggest challenge after that was getting our detection algorithm to work correctly. We spent a fair amount of time first coming up with the algorithm, then writing it out in code, only to realize it didn't actually work as intended. Fortunately, this was purely a software problem and we believed we had ample time to solve it. Right up until the demo day, we were iteratively improving our algorithm. This was done by testing our algorithm in different situations and thoroughly going through our output log files.

Overall, while we did have some major challenges during the development of our product, we were able to overcome them.

6. Group Dynamics

The VIA team was able to find time in our busy course schedules to meet on a regular basis. In the beginning, we likely should have met more regularly, but we were meeting many times a week as the deadline approached. We spent quite a few meetings and hours together. Close to the deadline (in the Fall), there was some heightened anxiety and a bit of tension developed. However, overall, we were able to stick it out and there is no animosity towards each other. We would still call each other friends after the project, which is not easy when in such a small group.

Our team came together because our personalities worked well together, and that has not changed. We all had a good team experience, and that was the most important part of group dynamics.

7. Workload Distribution - Second Iteration

The table below illustrates the workload and responsibility distribution during our project. “**XX**” denotes primary responsibility and “**X**” the secondary. This is the workload distribution during the second iteration of the VIA - during Jessica’s Co-op term in California.

Task	Ahmad Ibrahim	Robert Sanchez
Solidworks Design	XX	
Range Finder Programming	X	X
9DoF Programming	X	X
Bluetooth Module Programming		XX
Component Integration	XX	XX
Detection Algorithm Development	XX	
Android App Development		XX
Testing	X	X
Parts Acquisition	X	X
Administrative	X	X
Documentation	X	X

8. Individual Reflections

Ahmad Ibrahim

From the start, I knew this project was an ambitious one, especially for a group of three, but I never quite expected it to be as difficult and time consuming as it ended up being. The positive of this is that it was the most difficult portions of the project that gave me the most valuable experiences.



As alluded to above, my partners and I encountered many problems while actualizing the VIA. In my opinion, the largest of these was that there was always at least 1 ultrasonic sensor not working due to interference. This was caused by the angle between each sensor being too small and the beam width being very wide. According to the datasheet, the angle between sensors that we provided should have sufficed. From this I learned not to believe everything listed in a component's datasheet. So I decided to spend some time researching the cause of this interference and eventually found an ultrasonic sensor with specs that are much greater than what we should need. Just like that, ultrasonic sensor reading issues were fixed. In hindsight, as a group we should have moved onto new ultrasonic sensors earlier on when we hit that issue. Instead we wasted a lot of time trying to solve a problem that couldn't realistically be solved.

A smaller problem encountered revolved around the 3D printing of the VIA encasement. In an attempt to save costs, I ordered the printing from a small, relatively unknown, and much more inexpensive hub. Of course, you get what you pay for. The case was shipped 2 weeks late and didn't even print properly. We should have ordered from a more expensive and reputable 3D hub instead of trying to cut costs. Next time I ordered a print for our redesigned case, I went with a well known hub. Although it was much more expensive, the case came in on time and looked great.

In terms of technical skills and experiences gained from this project, I have a newfound appreciation for the physics that goes into ultrasonic sensors. This is amplified by our first set of sensors not behaving as advertised and the need to research what caused the problem. Also, before working on this product, I had no experience using i2C protocol. So the fact that all the rangefinders and the 9DoF chip use i2C helped me learn a lot about something that I will likely encounter in my career. Furthermore, I also had minimal experience programming for the Arduino microcontroller. We decided to use the Arduino as a master to dictate which of the slave sensor components gets to use the SDA and SCL data lines. I also got to develop the detection algorithm and then write the code for it on the Arduino. All of this allowed me to not just become comfortable using the Arduino, but to become confident in my Arduino programming abilities. Finally, because I had a little bit of experience designing in Solidworks, I took the opportunity to design both iterations of the VIA encasement. This allowed me to hone my 3D design skills. Comparing the final case and the first version, the difference in quality is noticeable.

Being completely honest, Robert and I worked on this project for longer than we initially wanted to. But in hindsight, I'm really happy we had the opportunity to complete this project the way we originally envisioned it. Every road block and hiccup we ran into served as a new lesson learned. Also, having great partners made this project extremely enjoyable. We had ups and down throughout, but as a group we were able to persevere and complete this project. For that, I'm proud of myself and my partners.



Robert Sanchez

What I learned the most from this project is to never wholeheartedly trust the datasheet or specifications given; they're usually best case values used to sell the product. This showed how naive the group was, specifically myself - which proved to be costly.

The unfortunate failure of our initial product hinged on the capabilities of the Max Sonar EZ1 ultrasonic sensors. It was almost heartbreaking that the sole reason for our product not working was due to the sensors; though based on their specifications, the sensors should have sufficed.

From this, we learned that instead of trying to set tough goals for ourselves from the beginning, we should create a working product which fall short of our goals then work our way up. This showed the importance of working prototypes or proof-of-concepts that we readily brushed off earlier in our design phase.

During our second iteration of the VIA, we've already had our lofty goals set for us, with added challenge of having essentially a group of two instead of three. With all the work we put in to reach our highly set goals, I've grown to appreciate what startups have to go through just to get going; their lives depend on the success of their product, while for us, it was only our grades. This has made me realize that creating a startup isn't for me, at least not for the time being.

Though we did not create the product we initially envisioned, I am extremely happy with the product we finished with. And as much as I'd hate to admit it, I'm actually glad that our first iteration failed and we had a second chance to work on the VIA. I feel that all the issues and pitfalls we encountered along the way will only help us in the future, and make us better engineers. I believe that the VIA would not have come to fruition if it weren't for my group members, and I'm extremely grateful that I had the opportunity to work with Jessica and Ahmad on this project.

Jessica Zanewich

Four months ago, I had the pleasure of working with two talented engineers to try and achieve a great project. Although we were not initially successful, and I unfortunately had to move away for work, I am very proud of my two partners for pushing on and continuing to persevere on the VIA.

I learned quite a bit while working in ENSC 440. With regards to technology, I was able to learn about Arduinos and how to utilize them in many ways. This was a large part of the work I did on the VIA. The main component I worked on was the audio, and I feel I have a much better understanding of using speakers and changing volume of the speakers through circuits. I also spent much of my time working on the content of documents



(which I shared with my team members) and editing any time I could. I do think I learned a lot over the course of my term in ENSC 440, on the technical side.

Not only did I learn about technical information, I was also able to get to know more about project and time management, and group dynamics. I actually learned a great deal about project management, and I believe we could have done better over my time in the Fall. We underestimated the time it would take for our project to be finished, and we learned from it. I have a much better understanding of how to really break down a project and quantify the work that needs to be done and how much we must accommodate for errors and issues that may arise. I also learned good practices for keeping our work progressing, such as having regular group meetings and, for next time, having a dedicated scheduling software to keep better track of what is happening. Finally, I learned that working in a small group can be difficult, but we were able to push on and stay focused as a team in the end.

Overall, I am proud of my team members for continuing on after I left and getting through the work that needed to be done. I appreciate them letting me know what was next to be done. I would be completely happy to work with them again, and I hope the same can be said about me. They worked tirelessly and I thank them immensely for everything they have done.

9. Conclusion

Sensible Solutions is well on its way to developing the VIA, or Visually Impaired Assistant; a device that will help the visually impaired navigate safely and confidently in their surrounding environment. This will be done using 3 ultrasonic sensors, a 9DoF chip, an audio feedback system composed of a BlueSmiRF Silver Bluetooth Module and the users Android device, and an Arduino microcontroller. This design specification is written to allow the members of Sensible Solutions to create a product that accomplishes all of the goals outlined in the functional specification document. This includes how each of the features will be developed, and then tested. The test plan will allow us to find any unnoticed design flaws as soon as possible, giving us ample time to rectify the issues. Ultimately, the design specification allows us to streamline the development of the VIA into a truly marketable product that that will greatly improve the lives of anybody that is visually impaired.



10. Appendix

Sensible Solutions

AGENDA

September 2, 2014

10:30-11:00

Applied Sciences Building

Purpose of Meeting: To establish project ideas and solidify our possible goals

Items for Discussion:

- Outline a final goal for the cast
- Determine what goal we will work towards next



Sensible Solutions

MINUTES

September 2, 2014

10:30-11:00

Applied Sciences Building

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: To establish project ideas and solidify our possible goals

Minutes:

Robert Sanchez called the meeting to order at 10:30.

A. Determine final project goal of cast

- Want the cast to be split into sections
 - Want sections to fill in using some sort of electronic pump system
 - Implement buttons for each section to fill each individually
- Add more to make it a little more complicated?
- Sensing of pressure within the cast
 - Would like to somehow make the cast able to determine that there should be more pressure where the broken bone is
- Many milestones determined to work towards, not a single large goal

B. Figure out what we as a group must work towards next

- Each group member should be looking at previous project proposals
- Come up with possible company name

C. Next Meeting Date

The next meeting will be held on September 5, 2014 at 16:30-17:00 in the Applied Sciences Building



Sensible Solutions

AGENDA

September 5, 2014

16:30-17:00

Applied Sciences Building

Purpose of Meeting: To establish project ideas and solidify our possible goals

Items for Discussion:

- Discuss the marketability of our product
- Add innovative ideas or progress to
- Determine what goal we will work towards next



Sensible Solutions

MINUTES

September 5, 2014

16:30-17:00

Applied Sciences Building

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: To establish project ideas and solidify our possible goals

Minutes:

Group called the meeting to order at 16:30.

A. Determine final project goal of cast

- Want the cast to be split into sections
- Want sections to fill in using some sort of electronic pump system
- Implement buttons for each section to fill each individually

Add more to make it a little more complicated?

- Sensing of pressure within the cast
- Would like to somehow make the cast able to determine that there should be more pressure where the broken bone is
- Should it even be used on broken bones? Or is it more for sprains and slight fractures?

Many milestones determined to work towards, not a single large goal

B. Figure out what we as a group must work towards next

- Each group member should be looking at previous project proposals
- Come up with possible company name

C. Next Meeting Date

The next meeting will be held on September 9, 2014 at 10:30-12:00 in the Applied Sciences Building



Sensible Solutions

AGENDA

September 9, 2014

10:30-12:00

Applied Sciences Building

Purpose of Meeting: Redefine our project and its new scope

Items for Discussion:

- Discuss what our final goal for the project is.
- Discuss the different milestones to work towards.
- Determine what goal we will work towards next



Sensible Solutions

MINUTES

September 9, 2014

10:30-12:00

Applied Sciences Building

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Redefine our project and its new scope

Minutes:

Group called the meeting to order at 10:30.

A. Redefine and discuss our final goal for the project

-
- A substitute for a white cane that the visually impaired use
- Will detect the type of obstacle in front of them
- Will detect the distance the obstacle is away from the person

B. Discuss the milestones to work towards

- Each group member should be looking at previous project proposals
- Come up with possible company name

C. Next Meeting Date

The next meeting will be held on September 15, 2014 at 10:30-12:00 in TASC 1



Sensible Solutions

AGENDA

September 15, 2014

10:30-12:00

TASC 1

Purpose of Meeting: Discussion of project proposal and setup for the device

Items for Discussion:

- Project Proposal sections must be sorted
- Parts for the design and development of the device



Sensible Solutions

MINUTES

September 15, 2014

10:30-12:00

TASC 1

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Discussion of project proposal and setup for the device

Minutes:

Group called the meeting to order at 10:30.

A. Project Proposal Discussion

- Possible sections of the proposal organized
- Each person will work on one of the technical aspects, Jess will add the letter of transmittal
- Team member positions decided. Jessica is CEO, Rob is CTO and COO, Ahmad is CFO and CIO
- Google document will be created by Jessica to begin the proposal

B. Device Setup

- Will be using 3 sensors at least, possibly a fourth
- Hopefully using a gyroscope in tandem with the sensors to allow for movement of the wrist
- Audio will be done through a regular speaker, with as many combinations as we are able to implement

C. Next Meeting Date

The next meeting will be held on September 21, 2014 at 10:30-12:20 in TASC 1



Sensible Solutions

AGENDA

September 21, 2014

10:30-12:20

TASC 1

Purpose of Meeting: Final work meeting for Project Proposal to edit

Items for Discussion:

- Discuss and work on the final touches of the Project Proposal



Sensible Solutions

MINUTES

September 21, 2014

10:30-12:20

TASC 1

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Final work meeting for Project Proposal to edit

Minutes:

Group called the meeting to order at 10:30.

A. Project Proposal Final Work

- Finished any paragraphs that needed to be edited or added.
- Made sure references were numbered correctly and referenced in the proper format
- Final logo was designed in Photoshop by Rob and was implemented throughout the document
- Each person read through the document and made final grammar and spelling checks
- Rob made a transfer from Google documents to Microsoft Word for the document to be submitted
- Decided to wait till tomorrow to submit it, once each group member had read through the Proposal one more time and made any other final touches that were not noticed on other checks.

B. Next Meeting Date

The next meeting will be held on September 24, 2014 at 14:30-16:20 in TASC 1



Sensible Solutions

AGENDA

September 24, 2014

14:30-16:30

TASC 1

Purpose of Meeting: Research into Arduinos and functional specifications

Items for Discussion:

- Reading up on Arduinos
- Functional specifications document discussion



Sensible Solutions

MINUTES

September 24, 2014

14:30-16:30

TASC 1

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Work with Arduinos and functional specifications

Minutes:

Group called the meeting to order at 14:30.

A. Arduino research

- Everyone looked into Arduino code today
- Researching possible ways to implement the sensors
- Reading documentation on ultrasonic sensors and Arduinos working together

B. Functional Specifications discussion

- Discussion on how to approach the functional specification document
- Awareness of due date for the document

C. Next Meeting Date

The next meeting will be held on October 1, 2014 at 10:30-12:20 in TASC 1



Sensible Solutions

AGENDA

October 1, 2014

10:30-12:30

TASC 1

Purpose of Meeting: Work and practice with Arduinos

Items for Discussion:

- Hands-on Arduino discussion



Sensible Solutions

MINUTES

October 1, 2014

10:30-12:30

TASC 1

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Work with Arduinos and functional specifications

Minutes:

Group called the meeting to order at 10:30.

A. Arduino work and practice

- Jessica and Ahmad needed to try working with Arduinos, since it is unfamiliar to them
- Practice was done today, with Rob showing some simple steps
- Jessica and Ahmad became more familiar with the process of working with Arduinos and the best ways to approach a problem on Arduinos
- Began to look into working with the sensors on an individual basis

B. Next Meeting Date

The next meeting will be held on October 8, 2014 at 10:30-12:30 in TASC 1



Sensible Solutions

AGENDA

October 8, 2014

10:30-12:30

TASC 1

Purpose of Meeting: Discussion of each persons assigned parts for Functional Specification

Items for Discussion:

- Arduino research
- Functional specifications document discussion



Sensible Solutions

MINUTES

October 8, 2014

10:30-12:30

TASC 1

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Work with Arduinos and functional specifications

Minutes:

Group called the meeting to order at 10:30.

A. Arduino work and practice

- Jessica and Ahmad needed to try working with Arduinos, since it is unfamiliar to them
- Practice was done today, with Rob showing some simple steps
- Jessica and Ahmad became more familiar with the process of working with Arduinos and the best ways to approach a problem on Arduinos
- Began to look into working with the sensors on an individual basis

B. Functional Specifications discussion

- Discussion on how to approach the functional specification document
- Awareness of due date for the document

C. Next Meeting Date

The next meeting will be held on October 14, 2014 at 10:30-12:20 in TASC 1



Sensible Solutions

AGENDA

October 14, 2014

10:30-12:30

TASC 1

Purpose of Meeting: Final edits and markings for the Functional Specification Document and determine what to work towards next

Items for Discussion:

- Discuss the Functional Specification Document In-Depth
- Discuss what needs to be done for the Design Specification



Sensible Solutions

MINUTES

October 14, 2014

10:30-12:30

TASC 1

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Final edits and markings for the Functional Specification Document and determine what to work towards next

Minutes:

Group called the meeting to order at 10:30.

A. Review and Edit Functional Specifications

- Each group member read through and discussed issues with paragraphs or certain sections
- Fixed any grammar or spelling issues within the Google document
- Discussed final issues
- Rob will move the document to Microsoft Word
- Each group member will look at the final PDF before it is submitted

B. Discuss the Design Specification

- Each group member will look at the rubric for the design specification before the next meeting
- Each group member will find a certain part they are interested in discussing and working with

C. Next Meeting Date

The next meeting will be held on October 21, 2014 at 10:30-12:30 in TASC 1



Sensible Solutions

AGENDA

October 21, 2014

10:30-12:30

TASC 1

Purpose of Meeting: Discussion of Design Specification and research focus

Items for Discussion:

- Discussion of Design Specification sections



Sensible Solutions

MINUTES

October 21, 2014

10:30-12:30

TASC 1

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Discussion of Design Specification and research focus

Minutes:

Group called the meeting to order at 10:30.

A. Research and Design Specification

- Each group member was assigned a section to be their main focus until integration
- Rob will be focused on the implementation of all 3 sensors together and the possible fourth sensor
- Ahmad will continue to look into the gyroscope, which he has been researching previously
- Jessica will focus on the audio section and its feedback through an SD card
- Each member will research this specific implementation and how it can be tested in order to have a clear written section on the component for the design specification
- Went through the sections of the design specification and assign written sections to each person

B. Next Meeting Date

The next meeting will be held on October 27, 2014 at 13:30-15:30 in TASC 1



Sensible Solutions

AGENDA

October 27, 2014

13:30-15:30

TASC 1

Purpose of Meeting: Choose sections for the design specification and discuss prototype

Items for Discussion:

- Discuss the Design Specification, specifically sections for each person and Google Drive set-up of document
- Discuss the progress of the prototype and which part we are currently implementing.



Sensible Solutions

MINUTES

October 27, 2014

13:30-15:30

TASC 1

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Choose sections for the design specification and discuss prototype

Minutes:

Group called the meeting to order at 13:30.

A. Discussion of Design Specification

- Decided as a group that we will use the three day extension on this document as we all have midterms and do not want to rush the document.
- Rob has created the Design Specification Document on Google Drive.
- Rob created a list of sections for the design specification document on Google Drive.
- Decided each group member will sign-up for their sections on Google Drive through the use of a first initial beside the section we have chosen to do.
- The goal is to have a draft done by the due date of November 4th, and use the extension time for editing.

B. Prototype Progress Discussion

- Still working on the sensors.
- Struggling with interference between sensors. Need to work on positioning of the sensors.
- Hope to finish sensor implementation (including testing) by November 10th.

C. Next Meeting Date

The next meeting will be held on November 4, 2014 at 10:00-13:00 in TASC 1



Sensible Solutions

AGENDA

November 5, 2014

10:00-13:00

TASC 1

Purpose of Meeting: Go through the design specification document and plan oral progress report

Items for Discussion:

- Edit and add to the Design Specification document
- Write a general outline for the oral progress report, directly checking the rubric



Sensible Solutions

MINUTES

November 5, 2014

10:00-13:00

TASC 1

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Go through the design specification document and plan oral progress report

Minutes:

Group called the meeting to order at 10:00.

A. Edits and Additions to Design Specification

- Each member has finished or is almost finished their design specification sections.
- As a group, went through the document checking for spelling and grammatical errors
- As a group, went through the design document a second time to determine that the design specification has covered what is asked in the rubric.
- Check the labelling and captions on diagrams and figures.

B. Oral Progress Report Planning

- Went through the rubric to determine what needs to be discussed during the presentation
- Wrote up a list of talking points for each of the discussed points mentioned in the rubric.
- Picked which sections each person will be covering and how in-depth each group should go in their discussions.
- Discussed timing of oral progress report to verify we will finish within the 10 minutes.

C. Next Meeting Date

The next meeting will be held on November 10, 2014 at 13:30-15:30 in TASC 1



Sensible Solutions

AGENDA

November 10, 2014

13:30-15:30

TASC 1

Purpose of Meeting: Make progress on the separate Arduino projects and discuss what must be done in the next month

Items for Discussion:

- Progress and discuss where we are currently (at the end of the meeting) on Arduino work
- Discussion of what is left to do in the final month



Sensible Solutions

MINUTES

November 10, 2014

13:30-15:30

TASC 1

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Make progress on the separate Arduino projects and discuss what must be done in the next month

Minutes:

Group called the meeting to order at 13:30.

A. Individual Arduino work

- Each member has finished or is almost finished their design specification sections.
- As a group, went through the document checking for spelling and grammatical errors
- As a group, went through the design document a second time to determine that the design specification has covered what is asked in the rubric.
- Check the labelling and captions on diagrams and figures.

B. Final month discussion

- Went through the rubric to determine what needs to be discussed during the presentation
- Wrote up a list of talking points for each of the discussed points mentioned in the rubric.
- Picked which sections each person will be covering and how in-depth each group should go in their discussions.
- Discussed timing of oral progress report to verify we will finish within the 10 minutes.

C. Next Meeting Date

The next meeting will be held on November 17, 2014 at 13:30-15:30 in TASC 1



Sensible Solutions

AGENDA

November 17, 2014

13:30-15:30

TASC 1

Purpose of Meeting: Each person work on their project components. Final look over the written progress report.

Items for Discussion:

- Discuss work progress made during the meeting
- Final edits on written progress report



Sensible Solutions

MINUTES

November 17, 2014

13:30-15:30

TASC 1

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Each person work on their project components. Final look over the written progress report.

Minutes:

Group called the meeting to order at 13:30.

A. Work Progress made during meeting

- Shield mounted Arduino plays music.
- Need to get audio working without Arduino and shield directly connected
- Deciding on how many layers of PCB we will need in the device
- Rob and Ahmad working on design of the overall product

B. Written Progress Report

- Read through the written progress report
- Made final edits to the overall document
- Went through and checked spelling and grammar
- Handed in the final document

C. Next Meeting Date

The next meeting will be held on November 21, 2014 at 10:30-12:30 in TASC 1



Sensible Solutions

AGENDA

November 21, 2014

10:30-12:30

TASC 1

Purpose of Meeting: Discuss design changes and purchases that must be made

Items for Discussion:

- Discuss audio design changes
- Finalize overall device design decisions
- Purchases to be made for the final product



Sensible Solutions

MINUTES

November 21, 2014

10:30-12:30

TASC 1

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Discuss design changes and purchases that must be made.

Minutes:

Group called the meeting to order at 10:30.

A. Discussion on audio design changes

- Needed to change how audio would be played
- Shield is too large, and does not connect properly with the Arduino, let alone the trinket
- Need something that is convenient for audio setup and smaller to fit in the case

B. Discussion of overall device design

- Discussion of needing a single layer for the design rather than up to 3 layers of PCB.
- Needed to keep everything contained and comfortable for the user
- Weight was another issue factored in that needed to be fixed

B. Purchases to be made

- For audio, decided to purchase the VS1053. Has great ability with regards to audio, and will be smaller within the device cage
- A long PCB board will be purchased for simplicity and sleekness of design

C. Next Meeting Date

The next meeting will be held on November 29, 2014 at 10:30-2:30 in TASC 1



Sensible Solutions

AGENDA

November 29, 2014

10:30-2:30

TASC 1

Purpose of Meeting: Work on individual components and work on integration

Items for Discussion:

- Discuss final touches that need to be finished on the individual work
- Discuss integration and when it will happen



Sensible Solutions

MINUTES

November 29, 2014

10:30-12:30

TASC 1

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Work on individual components and work on integration

Minutes:

Group called the meeting to order at 10:30.

A. Final touches for individual work

- Audio working on the trinket, able to play sounds clips.
- Jess, Ahmad and Rob worked on how the two trinkets will communicate with each other
- Ahmad worked on clarifying angles of the gyroscope
- Rob worked on getting the sensors only communicating through digital pins

B. Integration of Components

- Integration began with the communication between the trinkets today
- Will be working on gyroscope and sensor communication
- Will be working on connection between the two trinkets as an on going goal

C. Next Meeting Date

The next meeting will be held on December 6, 2014 at 10:30-12:30 in TASC 1



Sensible Solutions

AGENDA

December 6, 2014

10:30-12:30

TASC 1

Purpose of Meeting: Long work session and project update

Items for Discussion:

- Discuss obstacle detection algorithm and plans for it
- Discuss how integration is presently going
- Discuss what needs to be finished by the demo



Sensible Solutions

MINUTES

December 6, 2014

10:30-12:30

TASC 1

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Long work session and project update

Minutes:

Group called the meeting to order at 10:30.

A. Obstacle detection algorithm

- Needs to be able to accommodate for sensor error range.
- Should be easy to implement, problems are coming from the sensors.
- Jess will work on implementing the algorithm while Rob and Ahmad write finals.

B. Integration Stages

- Gyroscope and sensors have been integrated and work well together when sensors are reading properly
- Audio has been tested with a signal being sent across Arduinos, so integration should be easiest component to add.
- Once obstacle detection is solidified, testing is the final piece to do.

C. Demo Discussion

- Need to implement the obstacle detection algorithm (which will be discussed further in quick informal session).
- Test the audio triggering with the obstacle detection.
- Continue to test the sensors. They are no longer functioning consistently.
- Write up the post-mortem document.
- Finish the PowerPoint presentation for our demo day.

D. Next Meeting Date

The next meeting will be held on December 13, 2014 at 10:30-12:30 in Lab 1



Sensible Solutions

AGENDA

December 13, 2014

10:30-2:30

Lab 1

Purpose of Meeting: Finish Development and Presentation Discussion

Items for Discussion:

- Discuss how everything will come together
- Discuss final implementation
- Discuss final presentation and demo



Sensible Solutions

MINUTES

December 13, 2014

10:30-12:30

Lab 1

Present: Ahmad Ibrahim, Robert Sanchez, Jessica Zanewich

Absent:

Purpose of Meeting: Finish Development and Presentation Discussion

Minutes:

Group called the meeting to order at 10:30.

A. How will everything come together?

- Possible issues with everything working correctly as sensor readings still inaccurate.
- Discussed backup plan of showing different components if sensor readings completely off.
- Will be working on the product all day today, hoping to have a product more suitable for the demonstration.

B. Final Implementation

- Need to test and narrow the obstacle detection algorithm.
- Need to get the pieces of the case glued together (leave a portion unglued allowing viewing of circuitry).
- Addition of the audio components to the final device.

C. Presentation and Demo

- Each of us will discuss multiple slides in the presentation, each person has written down what slides they will be talking about.
- The group has made cue cards on talking points for the presentation to keep thoughts and presentation stream-lined.
- Will practice presentation multiple times to make sure we have a clear flow to what we present.
- We can move the demo to the main ASB area for less interference on the sensors.
- Will need to explain that the sensors have a tendency to through inaccurate numbers into the mix of good readings.

D. Next Meeting Date

We are demoing December 15th, 2014 at 10:30 in ASB 9705.

