Progress Report for the

VIA: Visually Impaired Assistant

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Sensible Solutions

Introduction

The VIA, or Visually Impaired Assistant, is a navigational tool for the visually impaired to use in their everyday life. Using ultrasonic sensors to detect objects, as well as a speaker to relay the distance and type of object detected, the VIA is a great alternative to the current white cane on the market. Our device will use an AdaFruit Trinket Pro to connect the many components together, and our hope is to add a gyroscope to allow the user to receive accurate readings no matter the angle they hold the device. We hope to appeal to the largest range possible of visually impaired people. This is why we hope to possibly add an external speaker and a headphone jack as secondary features.

Schedule

In terms of scheduling, our goal by November 17th was to be working on our "bonus features" of the gyroscope, separate speaker, and volume control available, as outlined in Figure 1 below. We are unfortunately still working on the process of finishing our initial working product. Looking at our initial plans, we are about 2 weeks behind where we want to be on our product progress. Unfortunately, our sensors are not yet distinguishing between different obstacles and we do not have a proper warning system in place. Our hope was to be done our working model at this point and adding our secondary features. However, we have revised and our current goal is to make up for the lost time and get the working model done in the next two weeks. Work on final testing and the possible addition of the "bonus features" features will happen in our final weeks leading into the demonstration.

Task Name	Duration	Start	Finish
Arduino and Sensor Research	34	09/12/14	10/29/14
Project Proposal	6	09/15/14	09/22/14
Buy components	1	09/18/14	09/18/14
Get familiar with Arduino and test first sensor	4	09/20/14	09/24/14
Sensor Distance Measuring	8	09/24/14	10/03/14
Troubleshooting of sensors	2	10/03/14	10/06/14
Audible warning feedback for all 3 sensors	2	10/06/14	10/07/14
Functional Specification	0	10/14/14	10/14/14
Sensors able to distinguish different types of obstacles	13	10/10/14	10/28/14
Design Specification	0	11/03/14	11/03/14
Proper Warning System	3	10/29/14	10/31/14
Warning system troubleshooting	3	11/01/14	11/04/14
LEDs to indicate visually impaired system in use	3	11/05/14	11/07/14
Gyroscope	5	11/08/14	11/13/14
Speaker Implementation and volume control	3	11/13/14	11/17/14
Put into case (and final troubleshooting)	8	11/18/14	11/27/14
Integration and Final Unit Testing	7	11/21/14	12/01/14
Written progress report	0	11/17/14	11/17/14
Date to be ready for demo	0	12/02/14	12/02/14
Post-Mortem	0	12/02/14	12/02/14

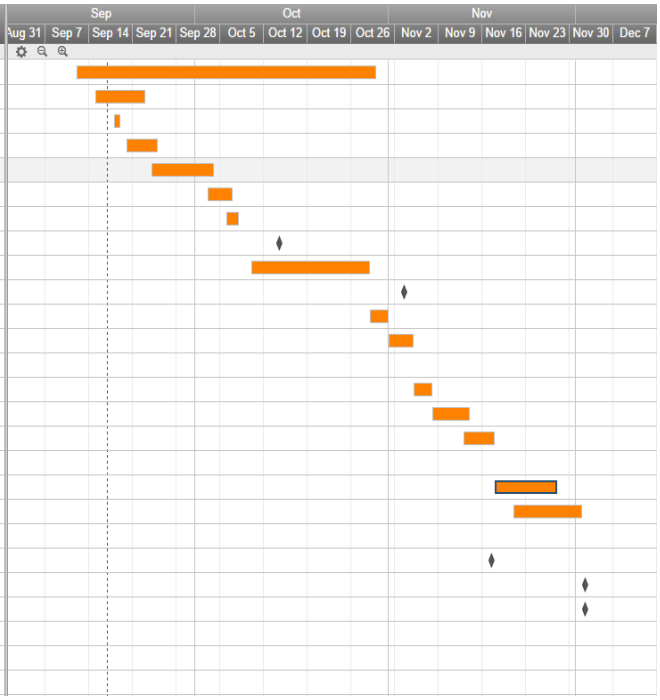

Figure 1: Initial VIA Project Schedule

Financial

At the start of this project, we set our budget to $567.84. This was set with the expectation that some components will fail and that there may be some unexpected expenditures. As of the submission of this document, we have spent $420.09 on components for the VIA. Furthermore, we have received $475 from the ESSEF to help fund our product.

The only major foreseeable costs that are left include buying the SD module for the audio feedback system, and paying for the 3D printing of the casing. We have estimated that the 3D printing could cost up to $50, but because the price is based on the amount of material used to make the casing, we will not know the exact cost until it is time to pay for it. Barring any unforeseen component failures, and a 3D printing price that is much greater than we estimated, we do not expect to exceed our initial budget of $567.84. Upon the completion of this project, we also plan on applying for the Wighton Fund in the case that we have spent more than the $475 that was funded by the ESSEF.

Progress

As of November 16th, we have a functional prototype, phase 1 of our 3 phase plan, which has three ultrasonic sensors, and a primitive object detection algorithm. At this time we are able to detect variations in elevation using the sensors, under the assumption that the device is held at a 45^0. Though there are some bugs in the consistency and accuracy of the distances detected by the ultrasonic sensors - with research of the components we have hypothesized that this will be alleviated by adding capacitors to the output of the sensors. This will be tested in the next week.

While doing the unit testing and research on the gyroscope, we realized that the functionality of a 3-axis gyroscope is insufficient. Instead we will be using a 9-axis motion sensor to fulfill the task of determining the device's position - as well as having the capabilities of being used to implement the 'would be nice' feature of anticipated object warning system. We anticipate the arrival of said component to be this week, and aim to implement it by the week of November 23rd, and integrate it at the end of the same week.

We are currently working on the implementation of the audio warning system using an Arduino SD card shield, and a speaker. The ability to output sound is being hindered by, what we believe, is a lack of either a capacitor or a transistor. We aim finish the implementation and unit testing later this week, and hopefully decide on the SD module to be integrated in the working model during our Monday or Wednesday meetings this week. The final SD module is the only component we have yet to acquire. Our other components were all found in stores within the greater Vancouver area, so we have been able to get all our parts quite easily, and any replacement parts needed as well.

Given the safety concerns that come with testing the VIA on visually impaired subjects, we plan on conducting user meetings and testing once we have a viable product. We will be reaching out to the Centre of Students with Disabilities, and the Canadian National Institute for the Blind.

Remediation

As previously mentioned, we are about two weeks behind. To remedy this, we have scheduled group meetings every Monday, Wednesday, and Friday until the project's completion. These meetings will be at least two hour work meetings, where we focus on development of the working device. As well, we will be able to spend much of our free time on the construction of the product, as our individual schedules have outlined that our other classes do not have much due in the last few weeks. We have also scheduled our demo for December 15th, which is two weeks later than we had originally anticipated we would have to work. If we work hard to get ourselves back to our original schedule, we now have an extra two weeks to deal with any unforeseen issues with the VIA,

Another way we intend to make up time is with our prototyping Arduinos. Buying two Arduinos early on was a decision made by the group to allow multiple group members to work on different components of the device at the same time. Currently, we are hoping to make up on lost time by prototyping the gyroscope and audio system on separate Arduinos.

Finally, we are not very concerned about any issues with components, as we work lucky to have been able to buy everything we needed locally. The only part we are worried about at this time is the casing. The casing is a component with a few unknown variables, as we may have to work on a few SolidWorks iterations, based on where we hope the other pieces will fit. However, we hope to finish the first iteration in the next week so consulting on the product can happen immediately. Our goal is to have a proper casing design when all of the components come together so we can make final measurements on the working model insides and take the casing immediately to the 3D printing station.

Conclusion

The development of the Visually Impaired Assistant is currently well underway and quickly progressing through the different stages in development outlined in our schedule. Although we are about two weeks behind schedule, our late demo date of December 15th gives us an additional two weeks that we did not anticipate we would have. This perfectly compensates for the time lost to documentation. Financially, we are in a great position having not yet run through the $475 funded by ESSEF. We have been very lucky so far with the lack of many component failures and hope that this continues for the rest of the project. If this is the case, we could end up spending well below our anticipated budget.