/*cool name of our device*/

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Table of Contents

Abstract

Introduction

Vision is an integral tool for human beings to function in the society. After this fact, for a long time, visually impaired people has not been able to practice the same rights and responsibilities like others with functional vision. While variants of cane have been used for thousands of years, it was not until World War I when the modern white cane has come to existence [1]. Since then, visually impaired people have less reliance on other people; the white cane has become a symbol of their independence and confidence [1].

Visual impairment has two types: legally blind and blind. Being legally blind means that the person has a central vision acuity of 20/200. Practically, this means that the legally blind person can only see up to 20 feet, whereas a person with normal vision can see up to 200 feet [2]. On the other hand, being blind simply means that the person has no vision at all [2]. For the purpose of simplicity, in this proposal, the two types of visual impairment are combined into the umbrella term, "blind."

While the white cane has been a celebrated tool for blind people, it still does not provide sufficient information about the environment if order for its user to navigate a path safely. The white cane assists in avoidance of obstacles only with height ranges from the waist and down. This conveys that blind people are highly susceptible to head and torso injuries, where the vital organs are located. In a survey interview with 300 blind respondents, 88% have experienced head-level accidents with a frequency range of once in a year to more than once in a month [3]. 86% of their head-level accidents happen outdoors due to tree branches, poles and signs, and construction equipment [3]. While majority of the head-level accidents happen outdoors, blind people are not completely safe indoors either.

Plan of Work

We will create glasses that utilize infrared (ultrasonic distance sensors) to indicate how far away an object is. We are using an Arduino as a microcontroller to control the information about distance that we will receive from a distance sensor. We are using this specific microcontroller because we already have some experience with the language it uses to code and it has extensive documentation. Any problems we may run into with coding on the Arduino have probably already been solved by someone else in the past. Once the Arduino knows how far away an object is, it varies the loudness of a buzzer connected on the glasses. We are using a microcontroller because we want to vary the loudness of the buzzer. The closer an object is to a person, the louder and faster the buzzer will sound. The location of the buzzer on the glasses will tell the blind person where the obstacle is located. For example, if a blind person is approaching a tree branch on their left side, the buzzer on the left will sound. We have a master on and off switch and a vibration switch so that the user can choose whether to have a vibration alert as well as a sound alert. This is because we felt it might be awkward to have vibrating glasses.

Two sensors with 75 degrees of vision, so that a blind person will have an effective field of vision of 150 degrees. It will have a forward range of 2 meters, and a side to side range of approximately 10 meters. This is to ensure that anything in front of a blind person will be easily detected. 9V Battery Chargers will be sold alongside the product, so that the glasses can charge. However, we are not creating these chargers. The batteries are not proprietary, and as such consumers can use the glasses with any 9V rechargeable batteries.

Timeline

December 2018: Brainstorming of ideas and requirements for glasses

We are considering the different visual needs of blind people, and accounting for any situation that they might require the use of our glasses in. For example, we elected not to use lidar because it's too expensive and infrared because it doesn't work well in bad weather. Furthermore, we will consider concerns from a bind person about issues that they have with just using a cane.

January-February 2019: Design of prototype

Using our initial idea, we will flesh out the dimensions, material, and cost of creation.

May 2019: Building of First Prototype

We are 3D printing a pair of glasses that can is custom designed to fit one specific person. We also must test its structural integrity and make sure it can hold up to any weather condition.

June - December 2019: Beta Testing

We will conduct a study in the field, giving a random group of blind people our product and following them for a year.

January – April 2024: Further Iterations and Beta Testing

We will consider different alternatives to the initial prototype, such has having different sizes of glasses for different head sizes and consider the feedback from the beta testing. We will start trying to mass produce these glasses.

January 2020 – December 2023: FDA Approval

The FDA needs to approve our product for use as medical equipment so that insurance will be able to pay for some of the cost. This will take several steps

June 2021: Release to Commercial Market

Finally, we will cooperate with large pharmacies and medical equipment suppliers like Walgreens and Rite Aid to bring our product to consumers. This way, our product will reach the most people. Furthermore, they will be able to lower the cost because they need wholesale shipments of our glasses to place in every single store and each retailer is competing to sell our product.

Budget

Initial costs will be directed towards the building and testing of the prototype. In order to ensure perfection of the product, parts for the device will be bought individually rather than in bulk for this phase. In this manner, financial losses will be minimized if the products used in the prototype are found to be inefficient. Initial projections have shown that an individual prototype should cost approximately 120 dollars [4]. For the beta testing phase, five prototypes will be created in order to determine the most effective variants of the product. A 3D printer will also be required in order to make affordable housing for the prototypes. As such, an investment of $3,500 should be sufficient in refining the product before it meets the commercial market.

Qualifications

Reference List

[1] Status of White Cane

[2] “Blindness.” Human Diseases and Conditions. Ed. Miranda Herbert Ferrara. Vol. 1. 2nd ed. Detroit, MI: Charles Scribner's Sons, 2010. p228-234.

[3] mobility-related accidents experienced by people with visual impairment

[4] Digikey.

[5]https://www.fda.gov/medicaldevices/deviceregulationandguidance/overview/default.htm