CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

Austin Hartman; Edryd van Bruggen

Project Number

36088

Project Title

Ultrasonic Rangefinders Aiding the Visually Impaired

Abstract

Objectives/Goals

Fractures in the elderly that result from falls are often due to impaired eyesight and are a major health problem. These falls are estimated to exceed 2 million per year in number, leading to nearly 20 billion dollars in health care costs in the United States. These falls are often simply due to uneven pavement on sidewalks or curbs. As of now, visually impaired people have few options to help them avoid such falls. It was our objective to build a simple, low cost yet effective device that could be worn by anyone and will alert them of potential hazards as they go about daily activities.

Methods/Materials

In order to alert the visually impaired about potential tripping hazards, we used two ultrasonic sensors attached to each shoe to detect objects in the wearer#s vicinity. The users were informed about these tripping hazards through small vibrating motors placed on either side of the ankles. The magnitude of the vibration informed the wearer about the relative proximity of the tripping hazard, enabling them to take evasive action. The motors and logic of the device were controlled by a microcontroller (ATtiny84) embedded on a custom etched printed circuit board.

Results

Our effective circuit design and apparatus when attached to the shoe was able to detect objects and inform the user of their approximate position. The success of the positioning system was demonstrated by a blinded test subject#s ability to navigate an obstacle course. By using an ATtiny to control the logic and motors the final product is very compact and inexpensive (approximate cost of all components is less than $10).

Conclusions/Discussion

We achieved our primary objective, namely to design, build, and implement a low cost solution to enable the visually impaired the ability to avoid potential hazards. By using this product the visually impaired can receive additional sensory input about their surroundings and mitigate the risk for potential accidents.

Summary Statement

We engineered an inexpensive device that when worn on the shoes of someone who is visually impaired can alert them to potential tripping hazards and thereby reduce the risk of fractures that result from falling

Help Received

We designed and implemented the project but received help from Dr Don Louie to make a custom etched PCB (to avoid using toxic chemicals).