CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
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Project Number
J0806

Project Title
Eye Track: An Indoor Navigation System for the Visually Impaired

Abstract

Objectives/Goals
Most individuals can't detect physical obstacles and avoid them. For example, if a table is blocking one's path, most people would walk around it to get to the other side. But unfortunately, visually impaired people don't have this ability. This project focuses on creating a wearable, assistive technology, for the visually impaired, that allows them to navigate their indoor surroundings.

Methods/Materials
There have been many attempts to solve this problem with the use of sensors, vibrotactile and voice feedback, computer vision cameras, and RFID technology. The Eye-Track was created using a cheap computer vision camera (cmuCam5 Pixy Cam), vibration motors for vibrotactile feedback, and a fanny pack. This camera is capable of recording color signatures of objects and detects pre-programmed obstacles, by its hue. The Eye-Track was programmed to vibrate left or right, depending on the placement of the obstacle in the camera's field of vision, to aid the user in avoiding the obstacle. Eye-Track also incorporates an emergency button connected to the user's phone via Bluetooth, to contact a family member via SMS in case of an emergency.

Results
This product was tested in an obstacle course for the blindfolded user to walk through. The test criteria were based off on whether the user was able to identify the obstacle, avoid the obstacle, reach the destination, and make it through the obstacle course without touching a single obstacle. The success (%) was calculated for one, two and three obstacles. In summary, the "Eye-Track" product was 87.5% successful with one obstacle, 85% successful with two obstacles, and 72.5% successful with three obstacles.

Conclusions/Discussion
In conclusion, the success percentage decreased as the number of obstacles increased. A more sophisticated computer vision camera, with the ability to store more signatures and calculate depth would further this product. Additionally, there were numerous qualitative learnings related to the pace of walking, the distance between objects, and external light conditions. Improving these components could make the Eye-Track safer, and more apt for mass production.

Summary Statement
A wearable computer vision based indoor navigation system, for the visually impaired.

Help Received
I received help from my teacher, Ms. Scilingo who was my advisor for this project and guided my thinking as I developed the initial design of the wearable. She provided feedback on the multiple options I was considering. I also received help from my parents in funding the project, and providing support as I