Year II: Designing a Novel LiDAR Navigation System With Haptic Feedback, Bluetooth and App Integration for the Visually Impaired

Gay, Tiffani (School: Orlando Science Schools)

Globally 2.2 billion people have a form of visual impairment; and an estimated 8.8-17.6 million rely on a white cane for navigation. In interviews with visually impaired individuals, the white cane was described as an inconvenient form of navigation. Given so many people rely on technologies like the white cane for navigation despite their inconvenience, this study focuses on developing an alternative, more convenient, Bluetooth LiDAR navigation system to assist those with visual impairments. The research was broken into two phases. The first phase involved the construction of a LiDAR prototype, including the electronic assembly/AutoCAD design of the device. The second phase was dedicated to evaluating the efficacy of the proposed device via testing with human subjects. The final prototype uses an Arduino Mega microprocessor, 12 sensors, ERM motors and Neopixels. It uses a printed circuit board to connect components with Bluetooth so the device provides android app connectivity. As the user approaches an obstacle, the LiDAR system verifies its existence and relays the information to the user with an ERM haptic response. For the second phase, data was collected from a diverse group of uninvolved human participants. Participants were asked to navigate a maze 15 times while blindfolded. 8 volunteers navigated using the LiDAR device, 8 volunteers navigated the maze without it. Time taken to navigate the maze was documented. The data showed a progressive navigation time improvement for individuals using the LiDAR technology, with the overall trend proving that the LiDAR system was a more convenient/effective alternative.

Awards Won:
University of Texas at Dallas: Back-up scholarship recipients