

vAssist: A Device for the Visually Impaired to Improve In-Store Shopping Using Computer Vision and AI-enabled Routing

Narayanan, Shrinandan (School: Cupertino High School)

Objectives Grocery shopping is a regular routine in our daily lives. However, the experience can be exceptionally challenging for individuals confronting vision impairment or blindness. The challenges can constitute finding a sighted person to help them maneuver the aisles, avoiding obstacles, identifying items, and scanning barcodes. The COVID-19 pandemic has rendered this task more complicated due to social distancing regulations. My project aspires to combat these struggles through a 2-part system - a mobile app and wearable device that provides a cohesive in-store shopping experience. **Methods** The cross-platform mobile app, built on Flutter with voice-over capabilities assists the users through the set-up experience. The app utilizes Cloud Firestore as a backend, establishing queries through secured Rest APIs. The wearable device comprises a Jetson Nano, esp32 microcontroller, and a pair of ultrasonic sensors and vibration motors for lateral obstacle detection. Finally, I transfer-learned a MobileNetV2-SSD on custom aggregated/labeled data for grocery item classification and utilized the Tensorflow MIDAS Depth Estimation model to perform monocular obstacle avoidance with depth. **Results** The final headset weighed in at 2.13 lbs and came to a total of \$85 to build. In addition, the grocery classifier achieved a 94.6% average accuracy and the system was able to quickly and accurately detect obstacles with an average of 12 fps and accuracy of 93.33%. **Conclusion** Moving forward, I plan to distribute the vAssist system to local stores. The project has proven to serve as a proof of concept to support the visually impaired in accomplishing their daily tasks.

Awards Won:

Second Award of \$2,000