HELPING THE VISUALLY IMPAIRED USING ARTIFICIAL INTELLIGENCE OBJECT DETECTION WHILE REDUCING LIGHTING DISTORTIONS

Jose Figueroa, Frankie Sanchez,
Enrique Tapia Ramirez, Eduardo Ramos Soriano
Outdoor mobility is essential to human life

Approx. 2.2 billion people suffer from visual impairment

Intersections, Objects, entrances
**Problem / How to Solve it**

<table>
<thead>
<tr>
<th>White canes are not efficient.</th>
<th>Create an object detective algorithm that can direct:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- it cannot detect objects above the waste.</td>
<td>- doors</td>
</tr>
<tr>
<td>- difficult to detect hazards.</td>
<td>- people</td>
</tr>
<tr>
<td></td>
<td>- cars</td>
</tr>
<tr>
<td>Campus are limited to visual impaired individuals</td>
<td>- intersections</td>
</tr>
<tr>
<td>- difficult to find entrance of buildings.</td>
<td>- stairs</td>
</tr>
<tr>
<td>- in campus intersections.</td>
<td>- moving objects</td>
</tr>
<tr>
<td>- over populated</td>
<td>- hazards/other</td>
</tr>
<tr>
<td>- Stairs and other undetectable objects.</td>
<td></td>
</tr>
</tbody>
</table>
Technical details

- IDE for android app development, virtualbox
- Xcode for iOS app development
- Python3, Java, Swift
- Programming package libraries
- Raspberry pi, jetson nano
- Cameras
- Ultrasonic sensors
- Gyroscope
- Battery pack
Features

Computer Vision
Real time object detection & object tracking

Lighting Distortion
Ensure great accuracy in all lighting conditions

Notifications
Sound or haptic feedback

Voice commands
Simple voice commands to assist in finding objects
Cost vs. Performance

Goal
- Make it cheap
- Zero compromise with performance

Analysis
- High performance hardware is expensive
- Expensive hardware is harder to obtain
- Cheap hardware can cause performance issues
- Poor performance can become useless or frustrating to use
Scope/Delimitations

- **Scope:**
  - Test project via a random volunteer or ourselves
  - Tester will have the device mounted on the chest and data will be collected for improvement

- **Delimitations:**
  - Currently since it would be very difficult to get a visually impaired volunteer to help with our experiment, we are limited to only testing the device between the people in our group or with a random volunteer.