Visual Aid Glasses for Sightless People

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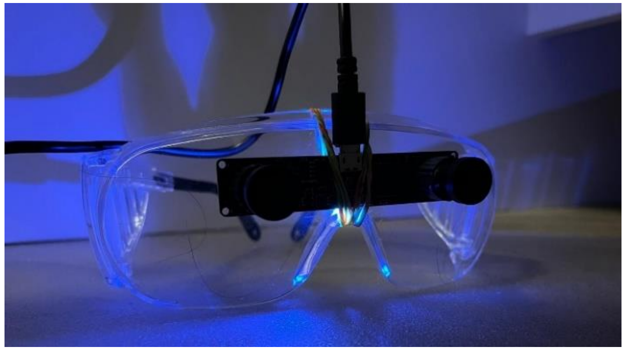
Goal:

The goal of the project is to create a wearable device that can provide real-time assistance to visually impaired individuals by helping them locate and navigate towards specific objects. By leveraging cutting-edge technologies in computer vision, machine learning, and sensor technology, your visual aid glasses have the potential to significantly improve the quality of life for visually impaired individuals.

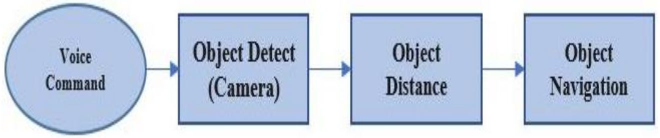
Prototype:

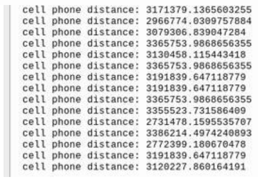


Background:

Visual aid glasses are wearable devices that leverage computer vision, machine learning, and sensor technology to help visually impaired individuals navigate their environment and locate specific objects. With an estimated 253 million people worldwide suffering from visual impairment, visual aid glasses have the potential to significantly improve quality of life and increase independence for millions of people. As the technology continues to evolve, visual aid glasses are likely to become even more effective and accessible, helping to address the global challenge of visual impairment.

Flow Chart:





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cell phone distance: 2966774.0309757884
cell phone distance: 3079306.839047284
cell phone distance: 3365753.9868656355
cell phone distance: 3130458.115443418
cell phone distance: 3365753.9868656355
cell phone distance: 3191839.647118779
cell phone distance: 3191839.647118779
cell phone distance: 3365753.9868656355
cell phone distance: 3355523.731586409
cell phone distance: 2731478.1595535707
cell phone distance: 3386214.4974240893
cell phone distance: 2772399.180670478
cell phone distance: 3191839.647118779
cell phone distance: 3120227.860164191
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Fig1: The output from the dual camera and real time calculation of object distance.

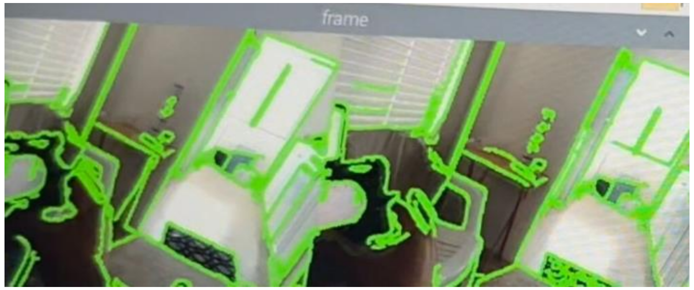

Fig2: Using canny edge detection to find polygons in frame and measure distance from those polygons.

Process:

For object recognition, we utilized the popular COCO (Common Objects in Context) library, which contains a large dataset of annotated images for training computer vision models. By leveraging machine learning algorithms trained on the COCO dataset, the visual aid glasses are able to recognize a wide range of objects in the user's field of view. When the user issues a voice command requesting the location of a specific object, the glasses can identify the object and its location.

To calculate distance, we used a dual camera setup connected to a Raspberry Pi 4 microcontroller. By capturing two images of the same object from slightly different perspectives, we can use triangulation to estimate the distance to the object. This approach provides depth perception capabilities to the glasses, allowing them to accurately calculate the distance to the identified object. Once the distance to the object has been calculated, the glasses can provide voice alert the distance to the object and navigate the user to the object.

Math:

$$\textit{distance to object (mm) is calculated by:}$$

$$\frac{\textit{focal length}(mm) * \textit{real height of the objectfocal length}(mm) * \textit{real height of the object}\ (mm) * \textit{image height}(Pixels)}{\textit{object height}\ (pixels) * \textit{sensor height}(mm)}$$

References:

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