IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

SMART SUPPORTING SYSTEM FOR BLIND PEOPLE USING DEEP LEARNING

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Abstract: Based on a recent World Health Organization (WHO) report, there are currently 284 million people with visual impairments worldwide. One of the biggest challenges people with a visual impairment (VI) face in their daily lives is detecting and recognizing objects. A system is developed for an object detector that can identify objects at a certain distance and detect them for visual impairment individuals and other significant uses. Existing object detection algorithms require a significant quantity of training data, which makes the process more time-consuming, complex, and challenging. By using the Raspberry Pi, the ultrasonic sensors included in the system may detect obstacles in the path, and when they do, a camera is activated to take pictures of the object in the path. By using the deep learning object detection algorithms, it will specify the name of the object that is picked up by the camera and output will be produced from the headset, which can allow the person to understand what is in front of them. Accordingly, this system may be of first-rate use for blind people and assist them in their day-to-day work.

Keywords: - Raspberry pi 3 modules, voice assistant, camera module, object detection, pi camera, speech recognition.

1. INTRODUCTION

Visual impairment is one of the main challenges that persons who are blind must overcome. Due to the absence of eye vision, the person is unable to perceive or feel their surroundings. This project's major goal is to give visually impaired persons a method to gaze around them**.**

Visual impairment causes a variety of challenges when performing various duties, such as:

1. Routine daily tasks (eating, moving from room to room)
2. Traveling from one location to another for work, shopping, etc.
3. Reading, writing, and social interaction in various settings.

With the use of a wearing band that transmits ultrasonic waves and an integrated voice assistant, our device enables blind persons to navigate quickly and confidently between different locations by identifying nearby objects.

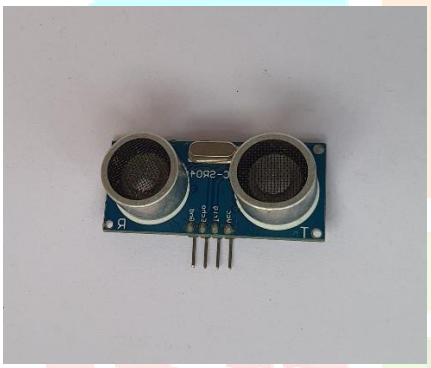
2. BASIC CONCEPTS

Raspberry pi 3 modules:

The Raspberry Pi 3 is a modern, reasonably priced, credit-card-sized computer that connects to a computer monitor or TV and makes use of a regular keyboard and mouse. It is a competent small tool that enables users of all ages to learn about computing and to create in languages like Scratch and Python. People use Raspberry Pi across the world to develop hardware projects, learn to program, automate their homes, and even use them in industrial settings**.**

ULTRASONIC SENSOR:

A transmitter, receiver, and transceiver make up the ultrasonic sensor. Sound waves are produced by the transmitter from electrical signals. And are again converted into electrical signals by the receiver. Crystal oscillators are also a part of it.



HEADSET:

When used with a phone or computer, a headset is a piece of hardware that frees up the user's hands so they can chat and listen without holding anything. Technical support and customer service center frequently employ headsets, which enable staff members to converse with clients while entering data into a computer.

USB CAMERA

A USB webcam is a type of camera that connects to computers by typically being plugged into a USB port on the device. The computer receives the video feed, and a software program allows you to see the images as well as upload them to the Internet.

3. WORKING MODULES

Object Detection:

Identifying and locating things in an image or video is possible with the use of computer vision technology known as object detection. To be more specific, object detection creates bounding boxes around these found things, allowing us to determine where those objects are in (or how they move through) a scene..

Speech Module:
The Text-to-Speech Module is a voice synthesizer that can speak multiple languages and transform streams of digital text into speech that sounds real. Its straightforward command-based interface makes it simple to integrate into any embedded system.

4. TECHNOLOGIES USED IN THE PROPOSED SYSTEM

OPEN CV:

A computer vision and machine learning software library called OpenCV is available for free use. A standard infrastructure for computer vision applications was created with OpenCV to speed up the incorporation of artificial intelligence into products.

More than 2500 optimized algorithms, including a wide range of both traditional and cutting-edge computer vision and machine learning techniques, are available in the collection. These algorithms may be used to identify items, monitor moving objects, track camera movements, extract 3D models of objects, and categorize human activities in films.

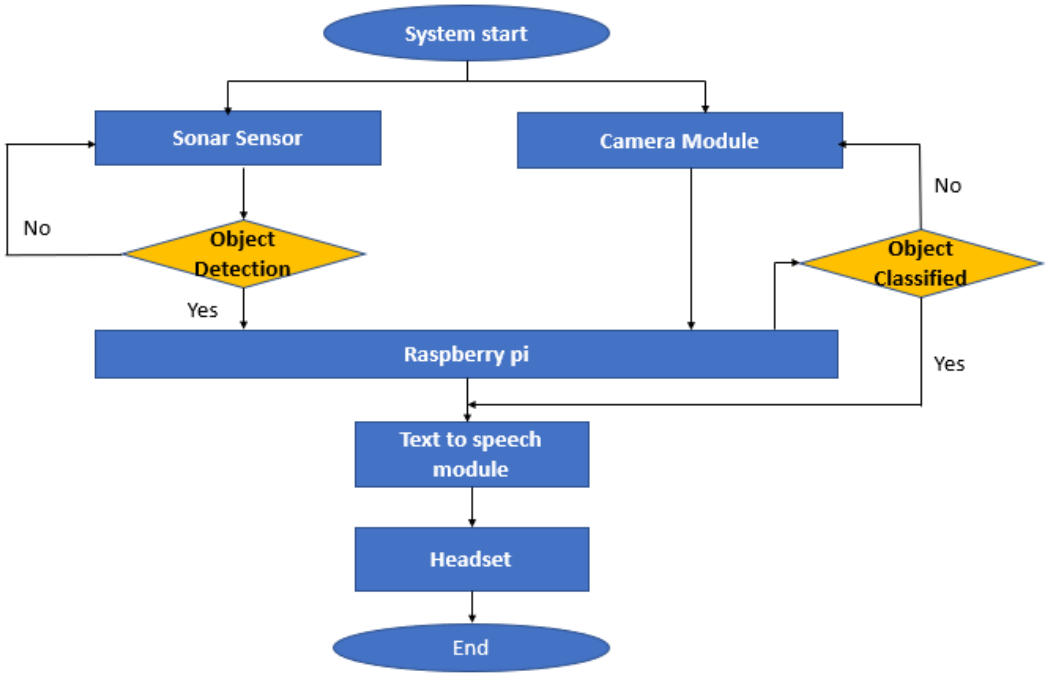
MOBILENET SDD ALGORITHM:

An object detection model called Mobile net SSD uses the input image to calculate the output bounding box and object class. This Single Shot Detector (SSD) object detection approach, which may provide quick object recognition tailored for mobile devices, leverages the Mobile net as a backbone.

Convolution neural network (CNN) architecture model Mobile Net has a clear focus on Image Classification for mobile applications. It makes use of Depth wise separable convolution layers rather than the conventional convolution layers.

5. PROPOSED SYSTEM

Our proposed system is used to overcome the disadvantages of the existing system which is used for visually impaired persons to move with more accurately without depending on anyone. In our project, the navigator system designed will detect obstacle using ultrasonic sensors which uses sound waves and calculate the distance of obstacles from the user and converts them into centimeter. Our proposed system also detects the object by using the USB camera and based on the algorithm we identify the name of the object, and it is produced as audio to the visually impaired person through the headset. By this blind people can easily travel from one place to another without any extra support.



6. RESULT

Output For Ultrasonic Sensor:

Here is the output for the ultrasonic sensor which displays the distance in the form of centimeters (cm).

Shell

```
distance measurement in progress
waiting for sensor to settle
distance: 16.43  cm
distance measurement in progress
waiting for sensor to settle
distance: 26.79  cm
distance measurement in progress
waiting for sensor to settle
distance: 11.83  cm
distance measurement in progress
waiting for sensor to settle
distance: 35.87  cm
distance measurement in progress
waiting for sensor to settle
distance: 35.68  cm
```

Output For Object Detection:

Here is the output for the object detection which displays the object name and its probability class in the form of a percentage.

7. CONCLUSION

This project is an innovation that enables blind people to move around and get from one place to another quickly and confidently by being aware of any nearby obstacles with the use of a wearing band that emits ultrasonic waves and notifies them with audio using a headset. This prototype works wonders for blind people. To move around safely and to prevent collisions with unwelcome objects that arrive in front of the blind person, which leads to fewer accidents, the person must wear this prototype. This tool is incredibly simple to use.

8. ACKNOWLEDGMENT

We express our sincere gratitude towards our project guide, Professor Ch. Lavanya Susanna for supporting our idea and giving moral support throughout our execution. We also convey our gratitude to our Head of Information Technology Dr. K. Sandeep for providing fully designed and equipped labs with a stable internet connection.

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