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# Object Identification and Recognition System For Blind Persons

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**Abstract:**
This paper helps with the ability to inform blind individuals about things and their spatial palcements, this initiative contibute to the transformation of the visual world into the audible world. The scene's identifiable objects are recognized by their lables and rendered as speech. Utilizing 3D binarual source modeling, the 2-channel audio is used to encode their spatial positions. The system has many components. A portable camera device will be used to record viedo, which will then sent to the server for real-time object identification and picture recognition (OpenCV).The position and size of the bounding boxes from the detection technique are used to estimate the 3D sound creation program bulit on the unity game engine. With wireless earbuds, the user receives the sound. When the detected item varies from the previous one, or every few seconds, whichever come first, the sound is produced. With the help of the device, the user will able to successfully detect objects that are three to five meters away. Potential issues for the current prototype include information overload when the system tries to tell users of too many things and detect failure when objects are too close or far away

**Introduction:**
Vision loss or visual impairment are other names for visual impairment. It is a visual issue that cannot be resolved with regular glasses. A person who is completely blind has lost all of their eyesight. It is difficult for persons of both types—whether they are blind or have mild to severe vision impairment—to carry out their daily tasks. They can only adjust to this and that in a comfortable setting. However, things get more difficult for them when they are in a completely foreign setting. Millions of individuals throughout the world struggle to interpret their surroundings due to vision impairment. They may adopt different strategies to deal with everyday tasks, but they also have certain navigational issues and social difficulties. For instance, it is quite challenging for them to locate a certain room in a strange setting. Additionally, it might be challenging for those who are blind or visually impaired to determine who is being spoken to during a discussion. WHO research estimates that there are 217 million individuals with mild to severe vision impairment and 36 million persons who are blind. WHO study lists cataracts, trachoma and river blindness infections, glaucoma, diabetic retinopathy, uncorrected refractive errors, and certain occurrences of infant blindness among visual impairments. Many persons with severe visual impairment get advantages from vision therapy, environment adjustments, and new equipment. We are now able to solve almost any problem because of the advances in technology. In recent

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years, "deep neural network" technology, in particular, has advanced quickly. Blind users of common computers can employ access technologies including screen readers, screen amplifiers, dynamic Braille displays applications, and cell phones. Tools are becoming more widely available, and there are coordinated efforts to ensure that information technology is accessible to all potential users, including the blind. An accessibility wizard, a magnification for those with low vision, and Microsoft Narrator, a straightforward screen reader are all included in later versions of Microsoft Windows. Vinux and Adriane Knoppix are Linux distributions (as live CDs) for the blind; Adriane Knopper, a person with vision impairment, helped build the latter. In addition to VoiceOver, which is included with macOS and iOS, most Android devices also have Google TalkBack as a built-in screen reader.

**Literature Survey**

A thorough investigation and effort have been done on this topic by numerous researchers. From among them, the following works have been listed:

Developers of [1] provided a portable, real-time solution. Using mobile cameras, a rapid HD video connection, and a powerful server, they showed off a platform that generates 3D sounds. The device used a powerful wireless transmitter and algorithm to do accurate real-time objective detection with live streaming at a rate of 30 frames per second and 1080P quality. The study creates a model for sensory replacement (from visual to hearing). Through the research, they showed how computer vision techniques may be used as a form of assistive technology.

The suggested visual replacement method in [2] is based on the recognition of things in the blind person's immediate environment. They suggested a method of identifying and locating 2D in the video. This approach identifies the properties of objects that are resistant to changes in viewpoint, offers identification, and lessens the difficulty of detection. The technique is focused on extracting and matching essential parts from videos. To identify objects in each frame, a comparison between the query frame and database objects is performed. An audio file with the object's details is activated for each object that is detected. As a result, both object detection and identification are handled. For object identification in this study, SIFTS key point extraction and feature matching were employed.

Researchers from the group [3] created an app with a buzzer and vibration mode that uses sensors to guide the blind. Using a key-matching method, the item is found by comparing it to an image stored in the database.

[4] presents a method for identifying items in a series of color photos captured by a moving camera. The estimate of motion in the picture plane is the initial step of the method. The motion of clusters is calculated and constructed by a grouping of pixels in a color/position feature space, as opposed to optical flow, monitoring single points, edges, or areas throughout a succession of pictures. A motion-based segmentation is the second phase when nearby clusters with comparable trajectory combinations are joined to create object hypotheses. Researchers forecast dynamic changes in cluster placements using Kalman filters. The primary use was for aid with vision.

In order to address the concerns of real-time factor and accuracy factors in video image tracking, a method for tracking moving vehicles in real-time based on feature points was put out in the paper [9]. They developed a simple and effective feature points matching method based on the Adaptive Kalman Filter (AKF). The results of simulation testing show that the algorithm does a good job of quickly monitoring moving targets, which not only allows for accurate target characterization but also reduces the amount of time required for matching calculations.

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In an article [5], a different group of researchers concentrated on A forward-looking video camera in a car that is traveling down a highway that has been outfitted with a real-time vision system that can evaluate color films. To identify and track lane markers, road edges, and other moving objects, the system combines motion, edge, and color information. The internet input data is chopped into templates that match cars, and characteristics of the highway scene are detected and their relationships to one another are assessed. Additionally, automobiles may be found using motion tracking and temporal differentiation of car-specific motion characteristics. The system uses a recursive least-squares filter to identify and track lane markers and road borders. The findings of the experiments show reliable, real-time automobile tracking and detection across thousands of camera frames. The data contains footage that was captured in poor visibility circumstances.

However, Ricardo Chincha and Yingli Tian have developed an object identification technique in the article [6] named "Finding Objects for Blind People Based on SURF Features" to assist blind people in finding lost goods by utilizing Speeded-Up Robust Features (SURF).

The user-queried object's particular features are compared to a database of features from other personal things that have been stored in advance as part of the proposed recognition procedure. Out of 100 total items in the studies, 84 were spotted, demonstrating the need for higher performance; as a result, SIFT may be employed in place of SURF to improve object recognition.

"Portable Camera-Based Assistive Text and Product Label Reading From Hand-Held Items for Blind People" is the title of their research paper. A framework for camera-based assistive text reading was proposed by Chucai. They made a system that helps the blind to read the labels of the products, which are held by hand. They recommended a quick and easy motion-based method for determining the keyframes in a video. The effectiveness of the suggested text localization algorithm is assessed quantitatively. After that, they produced text data as audio using the Microsoft Speech Software Development Kit.

In [8], researchers proposed a technique known as "VOCAL VISION." Its operation is based on the video to audio conversion. The webcam detects the image, which is then processed with an item identification algorithm, enhanced, and compared to database photographs. If the comparison is successful, the user or blind person will receive a message with the name of the object and the name of the scene via headphones and an Android device. This system's various components included blurring, grey scalability, cropping, RGB to HSV, and histograms. Following a successful comparison of the object or scene with database images, the blind person is told about the object or scene.

**Software and Hardware requirements:**
**Hardware requirements:**

- Raspberry PI
- Power Supply
- LCD
- APR Voice Module
- Speaker
- Camera
- SD CARD
- WI-FI

**Raspberry Pi Components:**
Raspberry Pi can best be summed up in one sentence: "It is a small-sized computer at a low cost." It's a gadget that uses a regular mouse or keyboard and may be used with a TV or PC. It is able to carry out all the computation exercises. A UK-based non-profit organization

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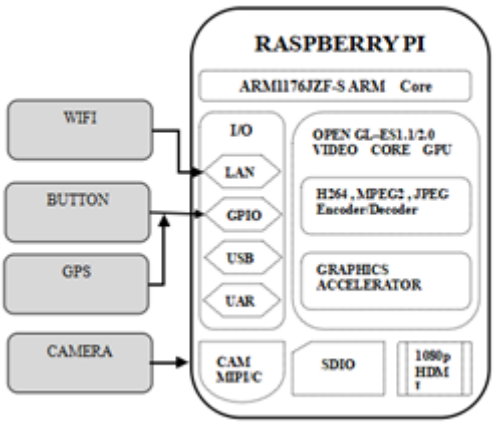
called the Raspberry Pi Foundation seeks to empower individuals all over the world with access to computing and digital creating tools.

They do this to enable more people to use computing and digital technologies for work, find solutions to issues that are important to them, and engage in creative expression. I can utilize programming languages like Python and Scratch with Raspberry Pi.

Everyone of any age can use this tool, and it is easy to use. It is a device that is capable of carrying out all of a computer's functions, including watching high-definition videos, making spreadsheets, and using the internet. It is a device that can interact with the outside environment and offers a good variety of digital maker projects and many more.

It serves as the project's client. Here Footage is live-streamed to the server end using this and the Raspberry Pi Noir camera. The connection is wireless and the only prerequisite is that both the server and the client are present on the same network for improved communication between them.




**Software Requirements:**

- Raspberry PI IDE
- Python
- OpenCV

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**Proposed Work:**

The development of technology has made it possible for us to solve numerous issues. Even humans have advanced to the point where a team recently succeeded in clicking an image of a black hole thanks to some amazing computational work. But as of right now, it's clear that blind individuals have a lot of difficulties carrying out their daily tasks. They rely on other people to perform all or many of their tasks. That inspired us to create a prototype. This is a modest effort to help blind individuals become independent. An autonomous navigation system for blind individuals is being developed as part of this research. It's an effort in which I won't donate the eyeballs but will instead give them to these unique folks nearby. The project's primary goal is to help blind individual become familiar with their surroundings. This would help the individual manage his or her workload and inform them of what is coming next. They could recognize fundamental and frequent items in their daily lives with the aid of technology. The use of object detection algorithms can create new opportunities for helping with both interior and outdoor navigation for differently abled people.

The system will be composed of several parts. The video is recorded on a portable raspberry pi and sent to the server via a raspberry pi camera device. The server features an object

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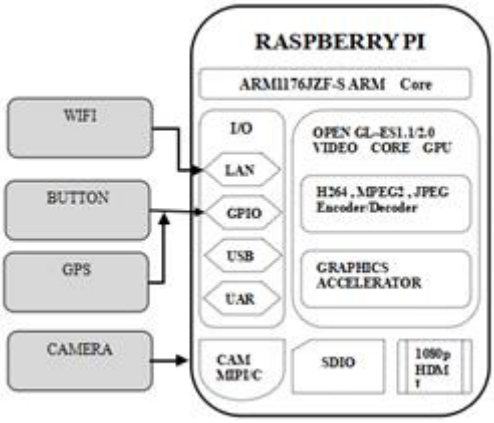
detection model for real-time picture recognition using OpenCV models. To estimate the 3D location of the items, the position and size of the bounding boxes from the detection technique are employed. A 3D sound generation program built on the Unity game engine then renders the binaural sound with places encoded. The user hears the sound through wired or wireless earbuds. The sound is emitted when the detected object differs from the preceding one or every few seconds, whichever occurs first. With the use of the device, the user will be able to successfully detect objects from 3-5 meters away. Potential issues for the current prototype include information overload when the system tries to tell users of numerous objects and failure of detection when items are too close or far away.

**Block Diagram:**




**Working:**

**Open CV:**

Computer vision is a method that enables us to comprehend how images and videos are stored, how to change them, and how to extract data from them. The foundation or primary tool utilized in artificial intelligence is computer vision. Robotics, photo-editing software, and self-driving cars all significantly rely on computer vision.

Importance of the real-time operation is, it is essential in systems which are contemporary, and is currently played by OpenCV, a big open-source library for computer vision and ML. In order to identify items like people, objects, and even human handwriting, it may be used to analyze images and movies. Python uses numerous libraries for handling OpenCV array structure for analysis. For recognizing a visual pattern, we employ vector space and perform mathematical operations on its features.

**Applications of OpenCV:**

There are many applications that OpenCV can be used to solve, some of them are described

- Recognizing faces
- Automated surveillance and inspection
- Count of individuals (foot traffic in a mall, etc)
- Retrieval of videos and images
- Robotic navigation and object identification in driverless vehicles
- 3D motion structure from motion TV channel ad recognition

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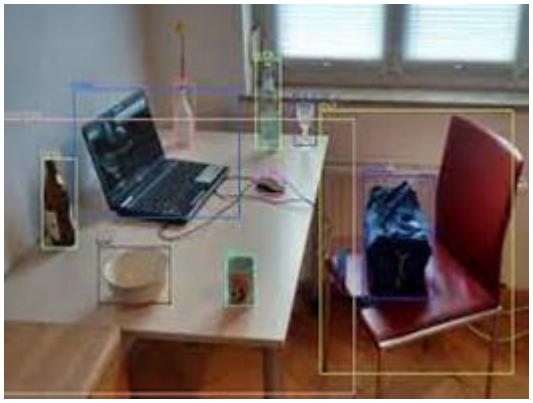
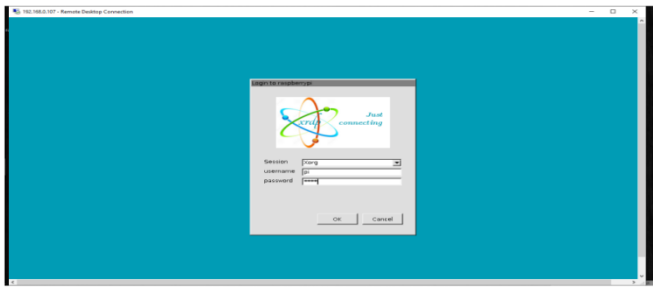
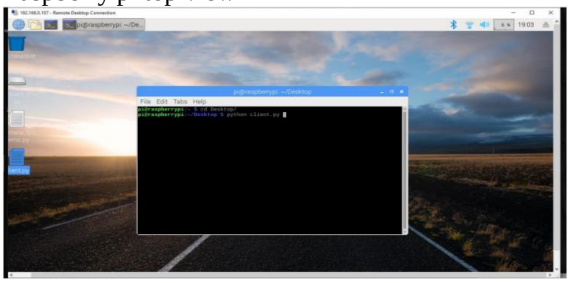



**Results and Discussions**

Raspberry pi top view



Remote desktop connection login panel



Raspberry pi terminal (client)

Depiction of the whole system

**Conclusion:**

To best assist, the blind person, an object recognition code is built and combined with unity code for a 3D sound engine. The system necessitates extensive network data transfers. In case of flawless data transport, the system offers the best outcomes. Many items that we come across in our daily lives are named and explained to the person.

In accordance with the concept described in the paper, we have developed a model for object detection. The solution is capable of performing precise real-time objective detection by utilizing the Open CV and transmission of 3d audio. This project offers a real-time, portable solution.

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