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Smart Glasses for Blind People

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ABSTRACT: Blind people's smart glasses are wearable gadgets that employ technology to improve daily life for those who are blind or visually impaired. The user can travel and interact with the environment around them because to the cameras, sensors, and other functions that are included in these glasses. The main function of blind people's smart glasses is to help them see by having real-time object detection, picture recognition, and text-to-speech capabilities.This technology can read labels or signs, recognize impediments in the user's route, and deliver spoken navigational instructions. Additionally, by enabling visually impaired people to complete tasks without the assistance of a sighted person, smart glasses that assist the blind can give them a feeling of independence. They can also enhance social interactions by providing facial recognition and other features that assist with recognizing people. Overall, smart glasses for the blind have the potential to greatly improve the quality of life for visually impaired individuals by providing increased independence, accessibility, and connectivity to the world around them.

KEYWORDS: ultrasonic, voice-assistant,Raspberry pi, camera, object detection.

I. INTRODUCTION

Millions of individuals through the world struggle with visual impairment, which is a serious problem. Many people may become dependent on others for help as a result of the manner in which it may affect everyday activities and independence. Smart glasses for the blind, a wearable gadget that can help people with visual impairments navigate and interact with their environment, have been created as a result of recent technological breakthroughs. Blind users who use smart glasses with text-to-speech, object detection, and picture recognition features may recognise obstacles, read labels and signs, and get given navigational instructions. These glasses can improve social interactions by offering tools to help with detection of faces and other individuals thanks to the use of cameras, sensors, and other cutting-edge capabilities [1]. By giving visually impaired people more independence, accessibility, and connectedness to their surroundings, smart glasses for the blind have the potential to greatly improve their quality of life. In this post, we'll look at the characteristics and advantages of smart glasses for the blind, as well as their present state of development and potential [2].By making it easier and more confident for them to navigate their surroundings, smart glasses for the blind aim to improve their independence and quality of life. They can aid people in overcoming some of the difficulties and obstacles they might have in everyday life, including as navigating crowded streets, identifying people, or reading signs [4].While still in the early phases of research, smart glasses for the blind have the potential to completely change how persons with visual impairments interact with their environment [5].

II. PROBLEM STATEMENT

A. According to WHO, 284 million people in the world suffering from the vision deficiencies.Smart glasses should provide efficient and effective real-time assistance with both audio and video applications for the blind.

*B.*Daily tasks, such as navigating through unfamiliar situations, can be challenging for blind individuals. Even while there are helpful devices like canes and guide dogs, they might not be able to provide you enough information about the area. By offering auditory or tactile input about the surroundings, smart glasses might help blind individuals navigate their environment. The simplicity of use and compatibility with existing assistive technology, among other factors, may not be optimized for blind people's needs in the market's present smart glasses. Therefore, there is a need to create smart glasses that are adapted to the needs of blind people and can provide them precise and understandable information about their surroundings, enabling them to navigate on their own.

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III. LITERATURE SURVEY

It has proved difficult to identify and recognize text in many computer vision applications. There are several academic articles that describe various techniques and algorithms for extracting text from photos.The primary goal of this literature review is to examine some of these techniques and their efficacy in terms of accuracy rates. Learning growth made use of the well-known framework for the train to achieve high accuracy of the text and character detection and recognition modules in end-to-end text recognition using the strength of neural network paired with the new unsupervised feature. Simple techniques have been used to integrate these two models to create a complete text recognition system. ICDAR 2003 and SVT were the datasets utilized. A cropped character from the first dataset was classified with 83.9% accuracy using the 62-way character classifier algorithm [1].
The system for new scene text identification heavily relied on machine learning techniques. There are two different kinds of classifiers. The first one was created to generate candidates with a higher degree of precision, whilst the second one was created to filter out candidates that are not text. An innovative method has been created to benefit from information coming from several channels. This analysis employed the ICDAR 2005 and ICDAR 2011 datasets. This technique has produced noteworthy outcomes in a variety of evaluation methodologies[2].

In photoOCR, a system created to recognise and extract any text from any image using machine learning approaches, various distributed language modelling was also implemented. ICDAR and SVT databases were utilised to create this system. The outcomes shown that one image's processing time for text detection and identification is around 600ms [3].
In natural sense image method, text recognition has presented an accurate and reliable way for recognising texts in photographs of natural scenes for text recognition. The (MSER) algorithm was employed in this technique to virtually completely identify every character in each picture. Multilingual datasets and ICDAR 2011 datasets are the datasets utilised by this system. The outcomes revealed that the MSER's character-level recall rate was 88.52% [4].

IV. METHODOLOGY

A pair of glasses, an embedded CPU (Raspberry Pi) board serving as the primary processing module, an ultrasonic sensor, a depth camera for acquiring depth information from the surroundings, and an earphone to play the guiding sound make up the smart glasses system. The blind is able to recognise the object thanks to their senser-enabled smart glasses. In this case, a distance senser tells bystanders of the depth of objects. The proposed remedy is on offering wide coverage for less expensive and efficient obstacle detection. The fig.1 describes the block diagram of smart glasses for blind people.

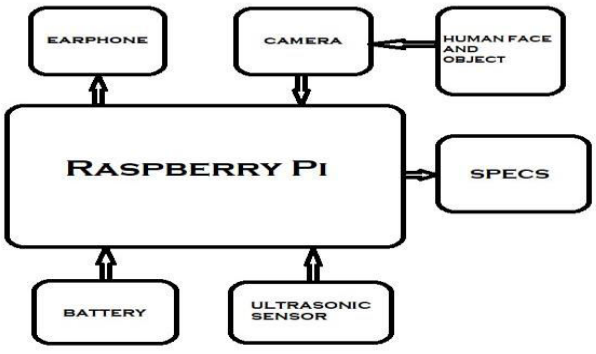

Fig.1 Block diagram of smart glasses for blind people.

V. WORKING

The obstacle in front of a person is found utilizing soundwaves by an ultrasonic sensor at a specific distance. Here, a transceiver is an ultrasonic sensor. When the transmitter detects the items, ultrasonic waves are released. Inside the ultrasonic sensor are the transmitter and receiver [1]. The time elapsed between the broadcast and received signals is calculated. The fig.2 represents the python code for calculating distance.So, distance is calculated by using below formula:

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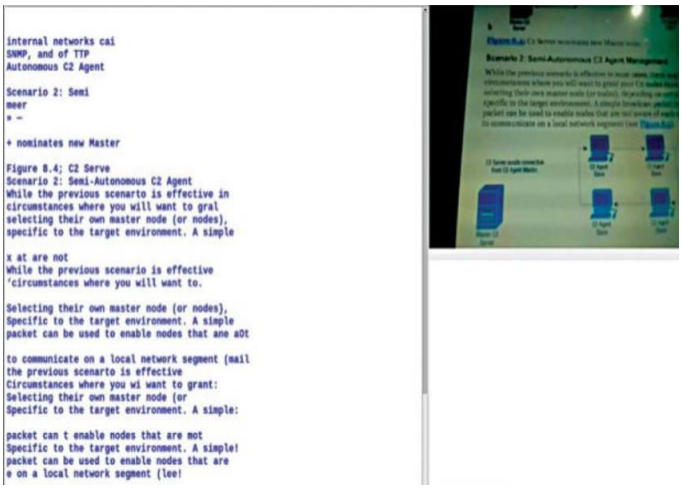

Fig.2 Python code for calculating distance.

A web camera may be used to take pictures of the user's surroundings, identify significant things with object recognition software, and recognize text so that the user can read menus, signs, and other written materials[2]. The fig.3 shows the flowchart of object detection.

The Raspberry Pi can be used to interpret sensor data from devices like cameras, GPS, and ultrasonic sensors and provide the user a prompt answer. Given the importance of battery life, its relatively low power consumption makes it a fantastic choice for smart glasses[2].

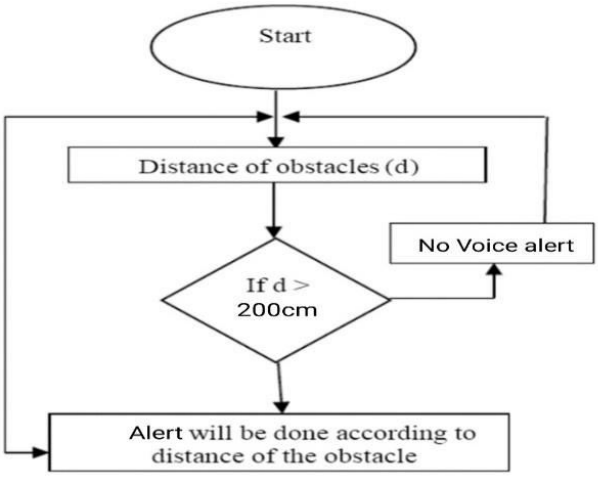

Fig.3 Flowchart of object detection.

Smart glasses for the visually impaired employ OCR (Optical Character Recognition) technology to extract text from images of text in their environment and then transform it into a machine-readable format using python espeak module [1].

The smart glasses have a tiny camera installed on them that takes a picture of the text in the surrounding environment [2].The taken image is pre-processed to get rid of noise and distortion and improve the text so it can be read more easily. The fig.4 represents OCR processing.

After being processed, the picture is passed into an OCR engine, which extracts the text from the image and turns it into text that can be read by the system using espeak module. Pattern recognition algorithms are often used by OCR engines to recognize individual characters in the picture and then combine them to create words and phrases. Audio voice output will be set based on the requirements.

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```
pulseDuration = pulseEndTime - pulseStartTime
distance = round(pulseDuration * 17150, 2)

print("Distance: %.2f cm" % (distance))
```

Fig.4 Optical Character Recognition

VI. ADVANTAGES

- This tool can prevent accidents for blind persons by allowing them to more readily detect obstructions in their path.
- Blind individuals can autonomously go from one location to another and carry on with their daily lives.
- The ease of use and simplicity of this gadget make it incredibly user-friendly. Device that is portable and light.
- This gadget was primarily designed with blind people, enabling them to use it everywhere and at any time, including at schools, malls, hospitals, museums, and on public roads.
- Optical character recognition can provide readability to the visually impaired in order to read texts.

VII. RESULT AND DISCUSSION

A potential assistive device that can improve the freedom and quality of life for persons who are blind or visually impaired is smart glasses with object distance computation, audio notifications, and OCR technology. These gadgets can identify and recognise items in the environment, including written text, and can also provide users real-time auditory warnings to assist them navigate their surroundings and avoid hazards. The fig.5 represents the final model.
The proposed system's performance has been determined to be successful. The user can be informed verbally if an obstacle is detected by the ultrasonic sensors. With these smart glasses, the user can read any printed content with ease. The suggested model is simple to use and wear, and it can be easily carried around by the visually impaired [2].

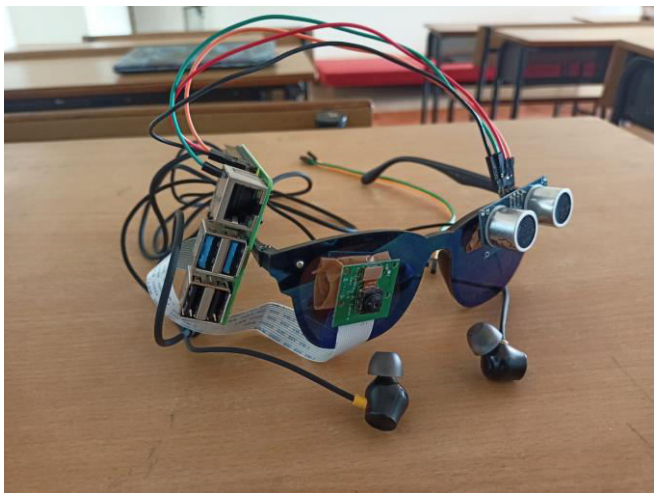

Fig.5 Resulted Model

VIII.FUTURE SCOPE

Future advancements in object detection, navigation system integration, smart device compatibility, enhanced OCR capabilities, integration with augmented reality, battery life and design improvements, as well as increased compatibility with smart devices, can make smart glasses better for the blind and those with vision impairments. These advancements may result in more precise object detection, more navigational aid, improved communication with other devices, improved language recognition capabilities, more immersive augmented reality experiences, and improved comfort and durability of the glasses. Overall, these developments might considerably enhance the quality of life for blind people by increasing independence and making daily chores more accessible [4].

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IX. CONCLUSION

The goal of this project, Third Eye for the Blind, is to create a product that is incredibly helpful to persons who are blind and frequently depend on others. With the use of a wearing band that emits ultrasonic waves and notifies them of surrounding impediments with a buzzing sound or vibrations, it is an innovation that enables blind people to travel quickly and confidently from one area to another. By identifying impediments, it enables users who are blind or visually handicapped to move about freely.They merely need to wear this item on their bodies as a ring or piece of fabric.As a result, this project, an obstacle detector for blind persons based on raspberry pi, offers a fresh approach to dealing with their issues. The provision of help for the blind is suggested using a less complicated, portable, affordable, simple to administer, and effective system with many more astonishing qualities and advantages. Finding the distance between the items and the sensor will be extremely simple for the system.It allows a blind individual to perceive items in all directions.The blind individual is capable of independent movement from one location to another and daily living.In the future, we may expand on this project with a few more concepts, such as adding programmes that track the user's heart rate and other vital signs.

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