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AN INNOVATIVE SMART GLASSES FOR BLIND PEOPLE USING ARTIFICIAL INTELLIGENCE

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Abstract :

Blindness poses significant challenges to daily life, limiting independence and access information. Assistive technologies play a crucial role in addressing these challenges, with computer vision offering promising solutions. Smart Glasses for Blind people utilizing Artificial Intelligence(AI) focuses on developing a system using YOLOv4, a state-of-the-art object detection algorithm, to aid blind individuals in navigating their surroundings. The system uses a camera to detect and recognize objects in real-time, providing auditory feedback through a text-to- speech converter. The implementation includes setting up the hardware, configuring the software, and integrating the components into a wearable device. The project aims to enhance the mobility and independence of blind individuals by providing them with information about their environment. The system's performance is evaluated in terms of accuracy, speed and usability with feedback collected from blind users. The results demonstrate the system's effectiveness in detecting a wide range of objects and providing meaningful feedback to users. The project concludes with recommendations for further improvements and integration of additional features to enhance the user experience. Overall, this project highlights the computer vision and assistive technologies in improving the quality of file for blind individuals.

Keywords— Raspberry pi, smart glasses, Text to speech

I INTRODUCTION

Blindness is a profound disability that affects millions of people worldwide, limiting their ability to perceive and interact with the world around them. One of the key challenges faced by blind individuals is navigating their environment safely and independently. While traditional aids such as canes and guide dogs are effective to some extent, they have limitations in providing detailed information about the surroundings. Advancements in technology, particularly in the field of computer vision, offer new possibilities for assisting blind individuals.

Computer vision algorithms can analyze visual information from cameras and provide auditory or tactile feedback to convey important information about the environment. This project focuses on the

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development of a system using the YOLOv4 object detection algorithm to assist blind individuals in navigating their surroundings. YOLOv4 is a state-of-the-art algorithm known for its speed and accuracy in detecting objects in images and videos. By leveraging the capabilities of YOLOv4, we aim to create a system that can identify common objects in real-time and provide auditory feedback to the user. The system consists of a camera mounted on a wearable device, such as glasses or a headset, that captures live video feed of the user's surroundings. The video feed is processed using the YOLOv4 algorithm to detect objects, which are then verbally communicated to the user using a text- to-speech converter. The primary goal of this project is to enhance the mobility and independence of blind individuals by providing them with real-time information about their environment. By leveraging the power of computer vision, we aim to provide a more intuitive and informative way for blind individuals to navigate their surroundings. So these smart glasses are designed specifically for blind people and they use Artificial Intelligence to enhance their daily lives. With advanced cameras, the glasses can detect objects, obstacles and even recognize faces. The AI technology then processes this information and provides real-time audio feedback to the wearer, helping them navigate their surroundings more easily. It’s an incredible combination of technology and accessibility.

II INTRODUCTION TO OBJECT DETECTION

Object Detection is the process of finding and recognizing real- world object instances such as car, bike, TV, flowers, and humans out of an images or videos. An object detection technique lets you understand the details of an image or a video as it allows for the recognition, localization, and detection of multiple objects within an image. It is usually utilized in applications like image retrieval, security, surveillance, and advanced driver assistance systems (ADAS). Object Detection is done through many ways:

- Feature Based Object Detection
- Viola Jones Object Detection
- SVM Classifications with HOG Features
- Deep Learning Object Detection

Object detection from a video in video surveillance applications is the major task these days. Object detection technique is used to identify required objects in video sequences and to cluster pixels of these objects. The detection of an object in video sequence plays a major role in several applications specifically as video surveillance applications. Object detection in a video stream can be done by processes like pre-processing, segmentation, foreground and background extraction, feature extraction. Humans can easily detect and identify objects present in an image. The human visual system is fast and accurate and can perform complex tasks like identifying multiple objects with little conscious thought. With the availability of large amounts of data, faster GPUs, and better algorithms, we can now easily train computers to detect and classify multiple objects within an image with high

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accuracy.

III DIGITAL IMAGE PROCESSING

A picture might be characterized as a two-dimensional capacity f(x, y), where x, y are spatial directions, and the adequacy off at any combine of directions (x, y) is known as the power or dark level of the picture by then. Whenever x, y and the abundance estimation of are all limited discrete amounts, we call the picture a computerized picture. The field of DIP alludes to preparing advanced picture by methods for computerized PC. Advanced picture is made out of a

limited number of components, each of which has a specific area and esteem. The components are called pixels. Vision is the most progressive of our sensor, so it is not amazing that picture play the absolute most imperative part in human observation. Be that as it may, dissimilar to people, who are constrained to the visual band of the EM range imaging machines cover practically the whole EM range, going from gamma to radio waves. They can work likewise on pictures produced by sources that people are not acclimated to partner with picture. There is no broad understanding among creators in regards to where picture handling stops and other related territories, for example, picture examination and PC vision begin. Now and then a qualification is made by characterizing picture handling as a teach in which both the info and yield at a procedure are pictures. This is constraining and to some degree manufactured limit. The range of picture investigation is in the middle of picture preparing and PC vision. There are no obvious limits in the continuum from picture handling toward one side to finish vision at the other. In any case, one helpful worldview is to consider three sorts of mechanized procedures in this continuum: low, mid and abnormal state forms. Low-level process includes primitive operations, for example, picture preparing to decrease commotion differentiate upgrade and picture honing. A low level process is described by the way that both its sources of info and yields are pictures. Mid-level process on pictures includes assignments, for example, division, depiction of that 11 Question diminish them to a frame reasonable for PC handling and characterization of individual articles A mid-level process is portrayed by the way that its sources of info by and large are pictures however its yields are properties removed from those pictures. At long last more elevated amount handling includes "Understanding an outlet of perceived items, as in picture examination and at the farthest end of the continuum playing out the intellectual capacities typically connected with human vision. Advanced picture handling, as effectively characterized is utilized effectively in a wide scope of regions of outstanding social and monetary esteem.

IV PROPOSED METHOD

One innovative approach could be combining AI with advanced sensors to interpret the wearer's surroundings and provide real-time auditory or tactile feedback. This feedback could include descriptions of objects, obstacles, or even facial expressions of people nearby. Integrating navigation

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assistance and object recognition would be crucial for enhancing independence and safety.

1. Object Recognition: Utilize AI algorithms to recognize objects in the wearer's environment. This can include common objects like furniture, doors, and obstacles, as well as more specific items like street signs or products on shelves.
2. Navigation Assistance: Implement GPS and mapping technology to provide real-time navigation guidance. The glasses could use audio cues or haptic feedback to direct the wearer along a chosen route, alerting them to upcoming turns or obstacles.
3. Facial Recognition: Enable the glasses to recognize faces and provide auditory or tactile feedback about the people nearby. This could include identifying familiar faces or alerting the wearer to the presence of strangers.
4. Text Recognition: Incorporate OCR (Optical Character Recognition) technology to read text from signs, labels, or screens, converting it into audible or tactile information for the wearer.
5. Obstacle Detection: Utilize depth-sensing cameras or LiDAR sensors to detect obstacles in the wearer's path, providing timely alerts to avoid collisions.
6. Customizable Interface: Allow users to customize the feedback they receive based on their preferences and specific needs. This could include adjusting the volume and frequency of alerts, choosing different voices or languages for auditory feedback, and setting preferences for navigation routes.
7. Connectivity: Enable the glasses to connect to smartphones or other devices for additional functionality, such as receiving text messages or emails, making phone calls, or accessing digital assistants like Siri or Google Assistant.
8. Battery Life and Comfort: Ensure the glasses are lightweight, comfortable to wear for extended periods, and have a long-lasting battery to support all-day use.
9. Training and Support: Provide comprehensive training and support for users to learn how to effectively use the smart glasses and troubleshoot any issues that may arise.
10. Affordability and Accessibility: Strive to make the technology affordable and accessible to as many visually impaired individuals as possible, potentially through partnerships with healthcare providers, government agencies, or non-profit organizations.

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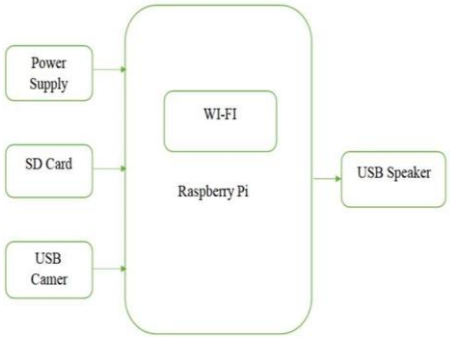
Fig. Block diagram



v YOLO

YOLO is real-time object detection. It applies one neural network to the complete image dividing the image into regions and predicts bounding boxes and possibilities for every region. Predicted probabilities are the basis on which these bounding boxes are weighted. A single neural network predicts bounding boxes and class possibilities directly from full pictures in one evaluation. Since the full detection pipeline is a single network, it can be optimized end-to- end directly on detection performance.

Components used in An Innovative Smart Glasses for Blind People using Artificial Intelligence:

1. Raspberry Pi
2. USB Camera
3. SD Card
4. USB Speakers

1) Raspberry Pi

Raspberry Pi is a series of small single-board computers developed by the Raspberry Pi Foundation in the United Kingdom. These computers are designed to promote computer science education and facilitate experimentation with programming and hardware projects. The Raspberry Pi boards are affordable, credit card-sized devices that feature various input-output ports, including HDMI, USB, GPIO (General Purpose Input/Output), and others, allowing users to connect peripherals such as displays, keyboards, and sensors.

Raspberry Pi computers run on various operating systems,

SD Card

An SD (Secure Digital) card is a type of flash with the most popular being Raspbian, a Linux distribution based on Debian, optimized for the Raspberry Pi. These devices are widely used in education, DIY projects, home automation, media centers, and various other applications where a small, inexpensive, and versatile computing platform is needed.

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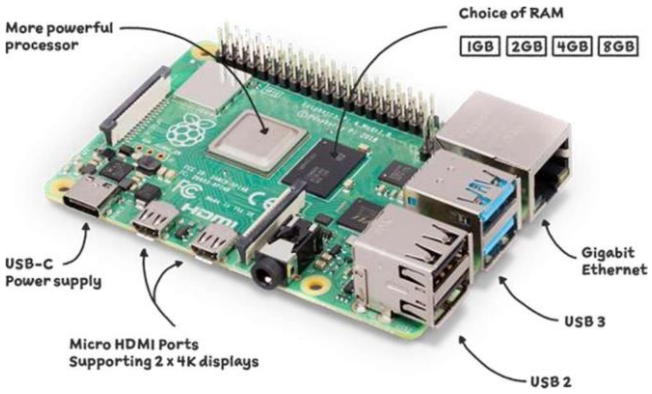

Fig. Block Diagram of Raspberry Pi

2) USB Camera

A USB camera, also known as a webcam, is a digital camera that connects to a computer or other device via a USB (Universal Serial Bus) port. These cameras are typically small and designed for video capture and conferencing purposes. USB cameras vary widely in quality and features, ranging from basic models suitable for video chatting to more advanced cameras capable of high- definition video capture and streaming. USB cameras are commonly used for various applications, including:

1. Video conferencing: They enable face-to-face communication over the internet, allowing individuals or groups to hold meetings or conversations remotely.
2. Live streaming: Many content creators use USB cameras to broadcast live video content on platforms like YouTube, Twitch, or social media.
3. Surveillance: USB cameras can be used for monitoring purposes, such as home security or workplace surveillance.
4. Video recording: They can capture video footage for various purposes, such as creating educational content, documenting events, or recording tutorials.

Fig. USB Camera

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memory storage device commonly used in portable electronic devices such as digital cameras, smartphones, tablets, and handheld gaming consoles. SD cards are used to store and transfer data, including photos, videos, music, documents, and software applications.

SD cards come in various sizes and capacities, ranging from a few megabytes to several terabytes. The physical size of an SD card can vary, with standard SD cards being larger and microSD cards being smaller. The most common sizes are SD, mini SD (less common), and microSD.

SD cards have become a popular storage medium due to their compact size, high storage capacity, and relatively fast data transfer speeds. They are also widely supported by a wide range of devices and operating systems.

SD cards can be inserted into compatible devices equipped with an SD card slot or used with SD card readers connected to computers or other devices via USB or other interfaces. They are often used for expanding the storage capacity of devices with limited built-in storage or for transferring data between devices.

Fig. SD Card

4) USB Speakers

USB speakers are audio output devices that connect to a computer or other compatible device via USB (Universal Serial Bus) port. Unlike traditional speakers that connect via audio jacks (such as 3.5mm headphone jacks), USB speakers draw power and transmit audio data through the USB connection.

USB speakers offer several advantages over conventional speakers: **Digital Audio Quality**: USB speakers typically provide better sound quality compared to analog speakers connected through audio jacks, as they can deliver digital audio directly to the speakers without the need for analog

Fig. USB Speakers

conversion.

Plug-and-Play Installation: USB speakers are often plug-and- play devices, meaning they can be easily connected to a computer without requiring additional drivers or software installation in most cases. This simplifies setup and configuration.

Power Source: Since USB speakers draw power from the USB port, they do not require a separate power adapter or battery for operation, making them more convenient for use with laptops and other portable devices.

Additional Features: Some USB speakers may include built-in volume controls, equalizers, and other features accessible directly from the speakers themselves or through software provided by the manufacturer.

USB speakers are commonly used for various purposes, including:

Multimedia: They are suitable for playing music, watching movies, or gaming on computers or laptops.

Conference Calls: USB speakers with integrated microphones are often used for voice and video conferencing applications.

Presentations: They can provide enhanced audio output for presentations or multimedia content in classrooms or conference rooms.

Portable Audio: USB speakers are sometimes used with portable devices such as tablets or smartphones that support USB audio output.

Overall, USB speakers offer a convenient and versatile solution for delivering audio output from computers and other compatible devices.

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VIII CONCLUSION

In conclusion, these smart glasses are especially designed for visually impaired people. So that they can have more confident and independent life. This glass can help them move around safely as it can detect nearby object. It can also help them read text blocks so they can read any type of books, or anything written in their YOLOv4 is known for its high speed, making it suitable for real- time applications.

Accuracy:

YOLOv4 offers high accuracy in object detection, which is crucial for reliable assistance to the blind.

Efficiency:

YOLOv4 is optimized for efficiency, making it suitable for deployment on resource-constrained devices like Raspberry Pi.

Versatility:

YOLOv4 can detect a wide range of objects, providing comprehensive environmental awareness for the blind.

VI RESULT

Smart glasses for blind people using AI can definitely be a game- changer. With AI algorithms and sensors, these glasses can help detect obstacles, read text, and even recognize faces. It's incredible how technology can make a positive impact on people's lives.

The results that have been obtained from the above set up can be seen in been shown below:
surroundings. Our prototype system is to read the printed text in the objects or products for assisting blind persons. The text characters are recognized using Optical Character Recognition, the text codes are transformed as speech for blind persons. Our future work will extend the text localization algorithm with furthermore features and we will address the human interface issues associated with text reading by the blind user.

IX FUTURE SCOPE

There can be number of future advancements that can be associated with this project work . The system can be made to translate a text into various languages. The system can be further expanded for the alphabets, numbers in gesture control. The input can be also taken in the form of videos and they are divided into frames and then it is converted into text. We can also add grammatical structure for

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sign language. We can produce a product for blind people that converts the information in any hand-written notes more efficiently.

REFERENCES

- S. Tosun and E. Karaarslan, "Real-Time Object Detection Application for Visually Impaired People: Third Eye," 2018 International Conference on Artificial Intelligence and Data Processing (IDAP), Malatya, Turkey, 2018, pp. 1- 6, doi: 10.1109/IDAP.2018.8620773.
- Suresh, C. Arora, D. Laha, D. Gaba, and S. Bhambri, "Intelligent smart glass for visualimpaired using deep learning machine vision techniques and robot operating system (ROS)," Advances in Intelligent Systems and Computing, vol. 751, 2019, doi: 10.1007/978-3-319-78452-6_10.
- P. Akkapusit and I.-Y. Ko, "Task-oriented approach to guide visually impaired people during smart device usage," 21stIEEE International Conference on Big Data and Smart Computing, pp. 28-35. IEEE, 2021, doi: 10.1109/BigComp51126.2021.00015.
- W.-J. Chang, L.-B. Chen, M.-C. Chen, J.-P. Su, C.-Y.Sie, and C.-H. Yang, "Design and implementation of an intelligent assistive system for visually impaired people for aerial obstacle avoidance and fall detection," IEEE Sensor Journal, vol. 20, pp. 10199-10210, 2020, doi: 10.1109/ICCE.2019.8661943.
- D. Velmurugan, M. S. Sonam, S.Umamaheswari, S.Parthasarathy, K.R.Arun[2016]. A Smart Reader for Visually Impaired People Using Raspberry PI. International Journal of Engineering Science and Computing IJESC Volume 6 Issue No. 3.
- K Nirmala Kumari, Meghana Reddy J [2016]. Image Text to Speech Conversion Using OCR Technique in Raspberry Pi. International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 5, Issue 5, May 2016.
- Alessandro Bissacco, Mark Cummins, Yuval Netzer, and Hartmut Neven. Photo OCR: Reading Text in Uncontrolled Conditions. 12 2013.
- H. I. Koo and D. H. Kim. Scene Text Detection via Connected Component Clustering and Nontext Filtering, volume 22. 2013.
- Alexandre Trilla and Francesc Alías. (2013), "Sentence Based Sentiment Analysis for Expressive Text to- Speech", IEEE Transactions on Audio, Speech, and Language Processing, Vol. 21, Issue. 2. pp. 223-233.
- Alías F. Sevillano X. Socoró J. C Gonzalvo X. (2008), Towards high-quality next-generation text-to-speech synthesi", IEEE Trans. Audio, Speech, Language Process, Vol. 16, No. 7. pp. 1340-1354.

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