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SMART GLASS FOR VISUALLY IMPAIRED PEOPLE WITH FACIAL RECOGNITION USING IOT AND MACHINE LEARNING

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I.ABSTRACT :

project presents the design and development of smart glasses aimed at enhancing the daily lives of visually impaired individuals through advanced technologies. The proposed smart glasses integrate facial recognition capabilities with features tailored to improve navigation, communication, and accessibility. The system includes a high-resolution camera for facial feature capture, coupled with real-time facial recognition software. Additionally, the device incorporates text-to-speech and speech-to-text functionalities for seamless communication. Navigation assistance is provided through GPS and obstacle detection sensors, ensuring users can navigate their surroundings independently. Connectivity features such as Bluetooth and Wi-Fi enable seamless communication with smartphones and other devices, allowing for expanded functionality through mobile apps. The smart glasses also support voice commands, gesture controls, and haptic feedback, ensuring hands-free operation and user-friendly interaction. Personalization is a key focus, with customizable settings and user profiles catering to individual preferences. The device prioritizes comfort and accessibility with a lightweight, adjustable design compatible with existing eyewear or prescription lenses. The inclusion of long-lasting batteries and quick charging capabilities ensures sustained use throughout the day. Moreover, the smart glasses integrate with virtual assistants, providing additional support and information. Robust security measures safeguard facial recognition data, and users have control over data sharing and storage.

I. INTRODUCTION :

Visual impairment poses significant challenges to the daily lives of individuals, affecting their ability to navigate, recognize faces, and access information. In response to this, emerging technologies offer promising solutions to enhance the independence and quality of life for visually impaired individuals. This project introduces a groundbreaking development – smart glasses designed specifically for visually impaired people, featuring advanced facial recognition capabilities. The integration of facial recognition technology into smart glasses aims to address the unique needs of the visually impaired community by providing real-time identification of individuals and facilitating improved social interactions. This innovation extends beyond facial recognition, incorporating a range of features such as navigation assistance, communication tools, and accessibility options to create a comprehensive assistive device. In this introduction, we will explore the motivation behind the project, the current landscape of assistive technologies for the visually impaired, and the key objectives of developing smart glasses with facial recognition. Additionally, we will outline the components and features that make this technology a transformative solution for overcoming the challenges faced by visually impaired individuals in their daily lives. By leveraging cutting-edge technology, this project seeks to empower visually impaired individuals, offering them greater autonomy and facilitating a more inclusive and accessible world. The integration of facial recognition into smart glasses represents a significant step towards creating a holistic solution that goes beyond traditional assistive devices, aiming to redefine the way visually impaired individuals interact with their surroundings and engage with others.

II. PURPOSE :

The purpose of developing smart glasses for visually impaired individuals with facial recognition is to address the unique challenges faced by this community and enhance their overall quality of life. Visual impairment often restricts individuals from recognizing faces, navigating unfamiliar environments, and accessing information independently. This project seeks to leverage advanced technologies to create a comprehensive and inclusive solution that goes beyond traditional assistive devices.

By fulfilling these purposes, the smart glasses aim to empower visually impaired individuals, reduce barriers to social interaction, and provide a tool that enhances their overall independence and accessibility in various aspects of daily life. Through a holistic approach to assistive technology, the project endeavors to contribute positively to the lives of those with visual impairments.

III. OBJECTIVES :

The development of smart glasses for visually impaired individuals with facial recognition aims to achieve a set of specific objectives to address the unique challenges faced by this community and enhance their daily lives. The objectives can be outlined as follows:

- Facial Recognition Accuracy:
- Develop and implement facial recognition algorithms with high accuracy, ensuring reliable identification of individuals in real-time.
- Navigation Assistance and Obstacle Detection:

- Integrate GPS-based navigation assistance to provide reliable guidance and enhance mobility.
- Implement obstacle detection sensors to alert users about potential obstacles in their path, reducing the risk of collisions and accidents.
- Communication Tools Integration:

- Incorporate text-to-speech and speech-to-text functionalities to facilitate seamless communication.
- Enable voice commands and gesture controls for hands-free interaction and enhanced user experience.
- Personalization and User Profiles:

- Design customizable settings to allow users to tailor the device to their preferences.
- Implement user profiles for storing personalized configurations, ensuring a user-centric experience.
- Inclusive Design and Comfort:

- Develop a lightweight and comfortable design suitable for extended use.
- Ensure compatibility with existing eyewear and provide options for prescription lenses.
- Integration with Virtual Assistants:

- Integrate the smart glasses with popular virtual assistants (e.g., Siri, Google Assistant) to provide additional support and information.
- Privacy and Security Measures:
- Implement robust security measures to protect facial recognition data.

IV. EXISTING SYSTEM :

The current landscape of assistive technologies for visually impaired individuals is characterized by a variety of solutions aimed at addressing specific challenges associated with impaired vision. Common assistive devices include white canes, guide dogs, and braille-based tools, each serving a specific purpose in aiding mobility or access to information. However, these solutions often fall short in providing comprehensive support for daily tasks, particularly in the realm of social interactions and facial recognition.

In the absence of advanced technologies, visually impaired individuals heavily rely on traditional methods, human assistance, and memorization techniques to navigate their surroundings and identify people. The limitations of existing systems become evident in scenarios where real-time facial recognition, independent navigation, and seamless communication are crucial for fostering a sense of autonomy and inclusivity.

This abstract highlights the gaps in the existing system and emphasizes the need for a more sophisticated and integrated solution. The proposed smart glasses with facial recognition aim to bridge these gaps by leveraging cutting-edge technology to enhance social interactions, navigation, and communication for visually impaired individuals. The integration of facial recognition technology into wearable devices represents a paradigm shift in assistive technology, offering a more comprehensive and empowering solution for those with visual impairments.

DISADVANTAGES

- The above system claimed to provide reliable feedback to visually impaired people to avoid obstacles. The lack of portability may be one drawback of the system.
- Hardware processing boards and external cameras have power supplies and connecting wires, so users may feel uncomfortable carrying them while navigating.
- Smart cane is easy to learn and can be used easily as a mobility aid with hardly any assistance. However, a person must undergo short training to become an expert user. Moreover, although modern smart are expensive and have features such as smartphone integration, they do not provide much information about the surrounding environment or obstacles.
- Smart glasses are convenient to use, their main drawback is their high cost.
- Most users living in middle or low-income countries cannot afford to buy smart glasses.
- Mobile phones are portable solutions, many depend on network connectivity and server processing.
- Users who need to connect to the internet while navigating could raise concerns about privacy and security.
- Although some have explored general-purpose object detection models with better accuracy, they have not shown how they can be integrated into a portable system with low computational resources.

- Generally, when used in real-time environments, object/obstacle detection models should have a low inference time without compromising accuracy.
- However, when general-purpose objection models have been used, they could have adequate accuracy but take more time to deliver the result, which could cause accidents or collisions during navigation due to a delay in response time.

V. PROPOSED SYSTEM

This project introduces a revolutionary assistive technology – smart glasses designed to address the unique challenges faced by visually impaired individuals through advanced facial recognition capabilities. The proposed system aims to redefine the landscape of assistive devices by providing an integrated solution that goes beyond traditional aids, offering enhanced independence, social inclusion, and accessibility.

The smart glasses leverage state-of-the-art facial recognition algorithms, providing real-time identification of individuals to empower users in social interactions. Additionally, the system incorporates GPS-based navigation assistance and obstacle detection sensors to offer seamless mobility and reduce the risk of collisions. Communication tools, including text-tospeech and speech-to-text functionalities, further enhance accessibility, allowing users to interact effortlessly with both printed information and others.

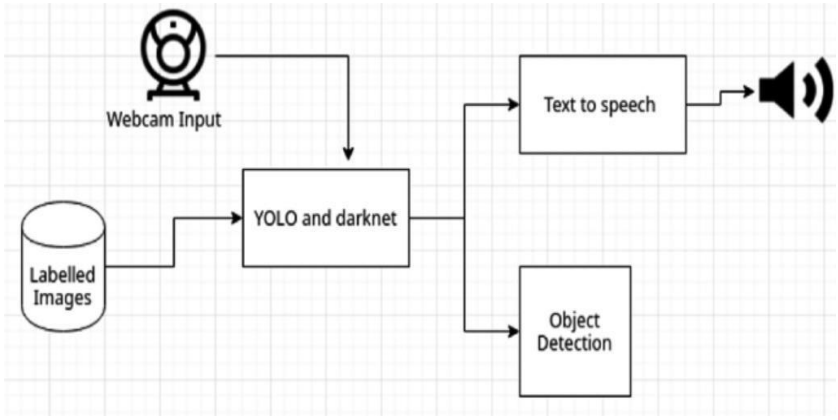
The personalized and user-centric design of the smart glasses ensures a comfortable and customizable experience, accommodating individual preferences and needs. Integration with virtual assistants enhances the overall functionality, providing additional support and information. Robust security measures and ethical guidelines govern the implementation of facial recognition, addressing privacy concerns and fostering user trust.

Usability and accessibility testing involving visually impaired individuals play a pivotal role in refining the system, ensuring it aligns with user expectations and requirements. Continuous improvement is facilitated through over-the-air software updates, introducing new features, enhancements, and security measures.

ADVANTAGES

- This proposed system reduces the injury for the visually challenged people.
- This technology is easy to install.
- This system is easy to scan digital images or real-life scenarios to locate instances of every object, separate them, and analyze their necessary features for real-time predictions.
- It can provide the user with a sense of distance from obstacles, allowing them to navigate more cautiously.
- The main advantage of this single-camera-based method is that it can work even on a smartphone without any other external hardware being connected to the system.
- The results indicate that the module can accurately detect the state of motion in many cases.
- GPS location provide the current location of the visually challenged people.

SYSTEM ARCHITECTURE



VI. FUTURE ENHANCEMENT :

The system integrates an ESP32-CAM, a camera module leveraging the ESP32 microcontroller, to capture a videso stream. Accompanying this hardware is a Python script, executed within the system, responsible for discerning and visually presenting the IP address associated with the video stream. This IP address serves as a crucial identifier, facilitating access and visualization of the captured video feed. The integration harmonizes the capabilities of the ESP32-CAM with the interpretative functionality of the Python script to streamline the monitoring and interaction with the video stream. This module captures a video stream, and your system, which likely includes a Python script, reads the IP address of the video stream and

displays it visually. Essentially, the ESP32-CAM is used for capturing video, and the Python script is responsible for extracting and displaying the IP address of the video stream. This information can be useful for monitoring or interacting with the video feed from the ESP32-CAM. The system comprises an ESP32-CAM capturing a video stream and a Python script within the system. The script extracts and visually displays the IP address linked to the video stream. This IP address is vital for accessing and monitoring the video feed, creating a cohesive integration between the ESP32-CAM and Python script for efficient video stream management.

VII. CONCLUSION :

Our project will help the visually impaired as we were able to detect objects more accurately and independently identify objects with the exact location of an object in the x, y-axis image which is conveyed in audio format using text-to-speech. Using small Deep Neural Network architectures for object detection such as Tiny YOLO are giving good results and show that they can be used for realtime object detection using mobile devices. Thus, the technologies of computer vision and deep learning can be successfully used to develop a real-time app for the visually impaired. It will enable them to detect objects in their vicinity thus helping them in better navigation. We can further enhance this model by adding a Facial Recognition system to it, which will help identify.

The object detection and recognition system uses a simple Haar cascade algorithm in open source computer vision (OpenCV). Haar algorithm is simple and it promotes high speed detection if more, number of positive and negative samples is added. Although the radio frequency identification can be used to recognize objects, there are certain limitations such as complexity and it does not recognize same objects with different features which makes it inapplicable in an outdoor environment. The visually challenged people can easily handle this device as it is portable and easy to operate. This system is also useful in an outdoor environment. Thus, the proposed system increases the confidence of blind people by giving them the proper information of the objects around them and enabling them to move independently in indoor and outdoor environment.

REFERENCES :

1. Abbas Zohrevand, Alireza Ahmadyfard, Aliakbar Pouyan and Zahra Imani, “A SIFT Based object recognition using contextual Information”, Iranian Conference on Intelligent Systems (ICIS),pp. 1 – 4, Feb 2014.
2. Alexander Toshev, Ameesh Makadia and Kostas Daniilidis, “Shapebased Object Recognition in Videos Using 3D Synthetic Object Models”, IEEE Conference on Computer Vision and Pattern Recognition, pp. 288-295, May 2009.
3. Ali Borji, “What is a Salient Object? A Dataset and a Baseline Model for Salient Object
4. Detection”, IEEE Transactions on Image Processing, Vol. 24, No. 2, Feb 2015.
5. Ali Borji, “What is a Salient Object? A Dataset and a Baseline Model for Salient Object Detection”, IEEE Transactions on Image Processing, Vol. 24, No. 2, Feb 2015.
6. Dung Phan, Chi-Min Oh, Soo-Hyung Kim, In-Seop Na and ChilWoo Lee, “Object Recognition by Combining Binary Local Invariant Features and Color Histogram", Second IAPR Asian Conference on Pattern Recognition, pp. 460- 470, Nov 2013.
7. Hamid Ali Abed AL-Asadi, Majida Ali Abed “Object Recognition Using Artificial Fish
8. Swarm Algorithm on Fourier Descriptors”, American Journal of Engineering, Technology and Society, 2015.
9. Hualiang Zhuang, Kay-Soon Low and Wei-Yun Yau, “Multichannel Pulse- Coupled-NeuralNetwork-Based Colour Image Segmentation for Object Detection”, IEEE Transactions on Industrial Electronics, Vol. 59, No. 8, Aug 2012.
10. Hyun Oh Song, Ross Girshick, Stefan Zickler, Christopher Geyer, Pedro Felzenszwalb, and
11. Trevor Darrell, “Generalized Sparselet Models for Real-
12. Time Multiclass Object Recognition”, IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 37, no. 5, May 2015.
13. Kazuyuki Miyazawa, Koichi Ito, Takafumi Aoki Koji Kobayashi, Hiroshi Nakajima,
14. “An Efficient Iris Recognition Algorithm Using Phase-Based Image Matching”, IEEE Journal on Information Sciences, vol. 2,Sep 2005.
15. Reza Oji, “An Automatic Algorithm for Object Recognition And Detection Based on ASIFT Keypoints”, Signal & Image Processing: An International Journal (SIPIJ) Vol.3, No.5, Oct 2012
16. Seungwon Lee, Junghyun Lee, Monson H. Hayes and Joonki Paik, “Adaptive
17. Background Generation for Automatic Detection of Initial Object Region in Multiple
18. Color-Filter Aperture CameraBased Surveillance System”, IEEE Transactions on Consumer Electronics, Vol. 58, No. 1, Feb 2012.
19. Synchronous Object Detection with Voice Feedback by Naman Mishra1, Deepankar
20. Singh.International Research Journal of Engineering and Technology (IRJET) eISSN: 2395- 0056 ,p-ISSN: 2395-0072
21. S. Wei, Q. Hong, and M. Hou, “Automatic image segmentation based on PCNN with adaptive threshold time constant,” Neurocomputing, vol. 74, no. 9, pp. 1485 1491, Apr 2011.
22. Yang Liu, Youngkyoon Jang, Woontack Woo and Tae-Kyun Kim, “Video- based Object Recognition using Novel Set-of-Sets Representations”, IEEE Conference on Computer Vision and Pattern Recognition Workshops, pp. 533- 540, Jun 2014.
23. Yan Zhuang, Member, IEEE, Xueqiu Lin, Huosheng Hu, Senior Member, IEEE, and
24. Ge Guo Member, IEEE, “Using Scale Coordination and Semantic Information for Robust 3-D Object Recognition by a Service Robot”, IEEE Sensors Journal, vol. 15, no. 1, Jan 2015.