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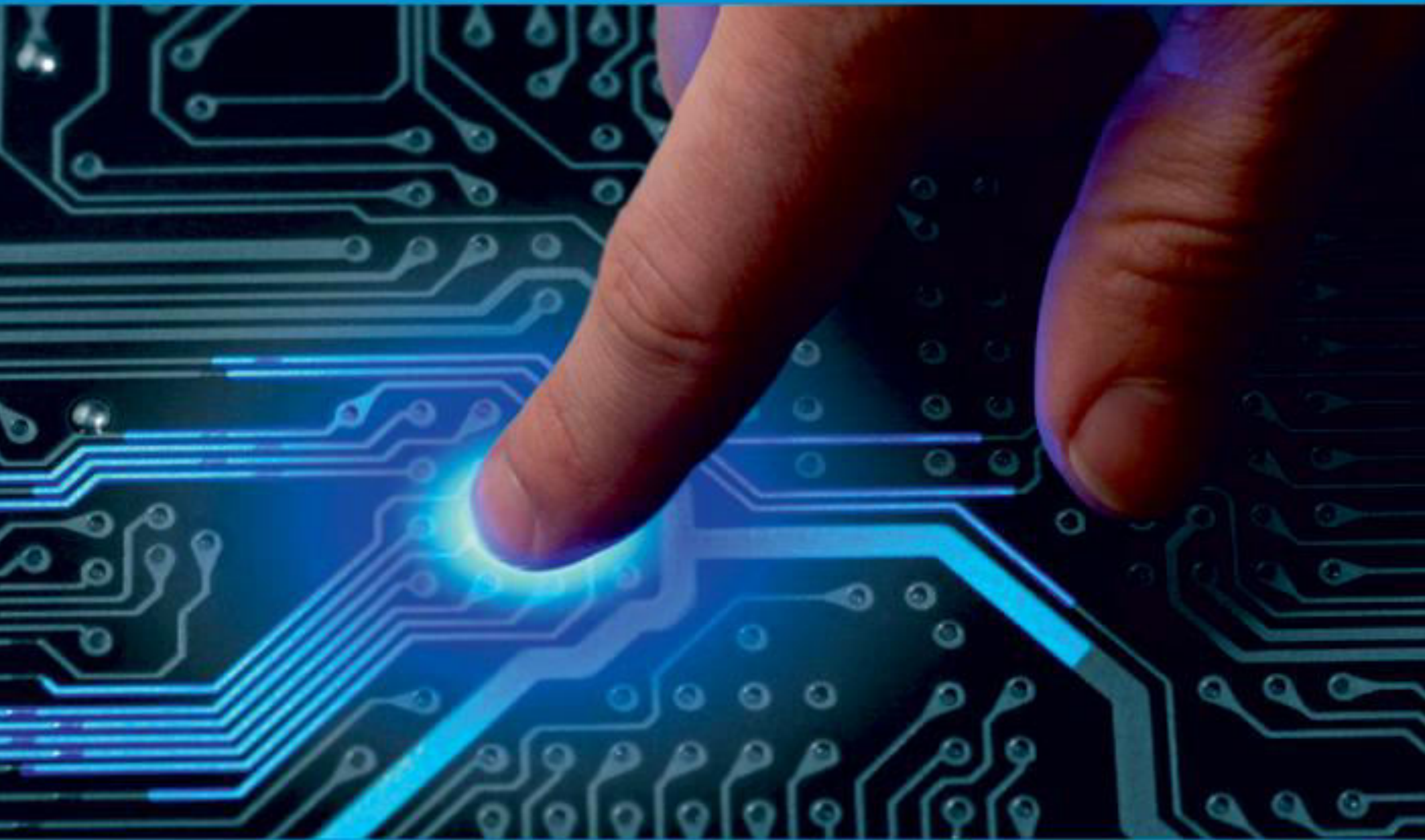

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Automated System for Assisting Blind People

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ABSTRACT: There are millions of blind/visually impaired peoples in the world and they struggle to do their everyday activities or they are dependent on somebody else, but there are some new emerging technologies that have the potential to use Machine Learning and AI tools that can help these people to do their everyday essentials on their own. Our model Blind Assist optimizes such technologies and designed a framework that proves to perform much better that other state-of the art approaches. Blind Assist identifies the surroundings by analyzing the pictures taken on the gear and gives audio direction to the user for his persual. This gear will make the life of a needy person much easier and we have considered the cost efficiency of the model too in our experimentation. Without requiring knowing the total number of common objects, we formulate this unsupervised object discovery as a sub-graph mining problem from a weighted graph of object proposals, where nodes correspond to object proposals and edges represent the similarities between neighboring proposals. The positive images and common objects are jointly discovered by finding sub-graphs of strongly connected nodes, with each sub-graph capturing one object pattern. The human communication is totally based on speech and text. So visually impaired people can gather information from voice. With the help of this project visually impaired people can read the text present in the captured image. In this Project we use Raspberry Pi Camera and this help to take pictures and that picture is converted into scan image for further process. For transformation of text into speech we use TTS (Text to Speech) engine. Experimental results shows that the analysis of different captured images and it will be more helpful to blind people.

KEYWORDS: Raspberry Pi, Blind Assistance, Accessibility, Computer Vision, Object Detection,Navigation Assistance, IoT Integration

I. INTRODUCTION

The ability to navigate and interact with the environment independently is funda-mental to maintaining a high quality of life for individuals with visual impairments. According to the World Health Organization (WHO), an estimated 253 million people worldwide are visually impaired, with 36 million of them being blind. While traditional mobility aids such as canes and guide dogs offer valuable assistance, technological advancements present new opportunities to address the challenges faced by blind individuals more effectively. In recent years, there has been a growing interest in developing assistive technologies that leverage computer vision and machine learning techniques to enhance the autonomy of visually impaired individuals. Object detection, a subfield of computer vision, plays a crucial role in these efforts by enabling systems to identify and classify objects in real-time. By providing auditory feedback about the user's surroundings, object detection systems can significantly improve situational awareness and facilitate independent navigation. This paper presents an automated system designed to assist blind individuals through object detection, utilizing Raspberry Pi as the underlying technology platform. Raspberry Pi, a low-cost, credit card-sized single-board computer, offers the computational power and flexibility necessary to develop sophisticated assistive technologies at an affordable price point. By harnessing the capabilities of Raspberry Pi, we aim to create a portable, cost-effective solution that can be deployed in various environments to benefit a wide range of visually impaired individuals.

II. LITERATURE SURVEY

Ando et al. (2015): Introduce a haptic solution for assisting visually impaired individuals in mobility tasks, focusing on haptic feedback for navigation.

Lan et al. (2015): Present a lightweight smart glass system with audio aid for visually impaired people, offering assistance through audio feedback.

Cheng et al. (2016): Discuss learning rotation-invariant convolutional neural networks for object detection, which could be applicable in recognizing objects in remote sensing images, possibly for assisting visually impaired individuals.

Bai et al. (2017): Present smart guiding glasses for indoor navigation of visually impaired individuals, likely using sensors and possibly computer vision.

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Katzschmann et al. (2018): Present safe local navigation for visually impaired users using a time-of-flight and haptic feedback device, focusing on ensuring safety during navigation.
Islam et al. (2019): Provide a review of walking assistants for visually impaired people, likely covering various technologies and methodologies employed in such systems.
Bolya et al. (2019): Introduce YOLACT, a real-time instance segmentation model that could be useful for object recognition tasks in assisting visually impaired individuals.
Khan et al. (2020): Introduce an AI-based visual aid with an integrated reading assistant for the completely blind, providing support for tasks beyond navigation.
Mohith et al. (2020): Discuss visual assistance for the blind and visually impaired individuals, likely covering a range of technologies and methodologies for providing assistance.

III. SYSTEM ARCHITECHTURE

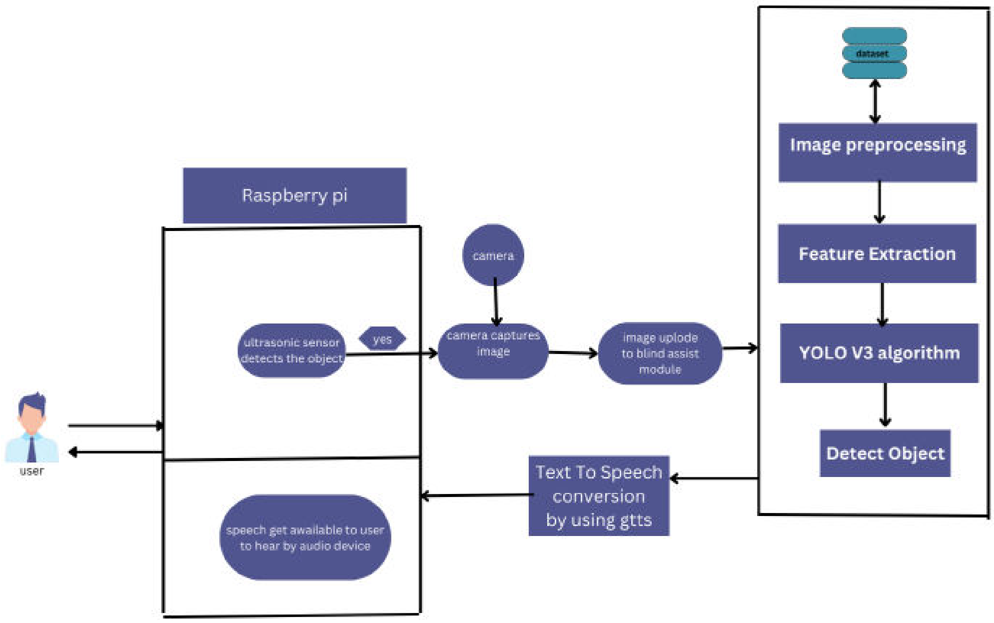

Fig 1. System Architechture

The automated system for assisting blind people relies on a robust architecture to ensure seamless functionality. It integrates hardware components like cameras and sensors with software algorithms for object recognition, text-to-speech conversion, and navigation. Input from sensors and cameras is processed through a central unit, employing machine learning models to interpret surroundings and detect obstacles. The system then generates auditory or haptic feedback to convey information to the user, aiding in navigation and task completion. Cloud connectivity facilitates data storage, updates, and remote assistance. Overall, the architecture prioritizes real-time processing, accessibility, and adaptability to enhance the independence and safety of visually impaired individuals.

IV. DESIGN METHODOLOGY

1.Defining System Requirements: Based on user feedback, define clear and specific requirements for the automated system. Identify key functionalities such as navigation assistance, object recognition, text-to-speech conversion, and any additional features desired by the users.
2.Selecting Hardware Components: Choose appropriate hardware components for the system, with a focus on compatibility with Raspberry Pi. This may include sensors (such as ultrasonic sensors for distance measurement), cameras, microphones, speakers, and any other necessary peripherals.
3.Setting up Raspberry Pi: Install the necessary operating system (e.g., Raspbian) on the Raspberry Pi and configure it according to the system requirements. Ensure that all required software libraries and dependencies are installed.
4.Developing Software Modules: Develop algorithms for real-time navigation assistance, utilizing sensors to detect

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obstacles and guide the user along safe paths.

5.Object Recognition: Implement computer vision algorithms to recognize objects in the environment using a camera module connected to the Raspberry Pi.

6.Text-to-Speech Conversion: Integrate a text-to-speech engine to convert textual information (such as labels, signs, or notifications) into spoken audio for the user.

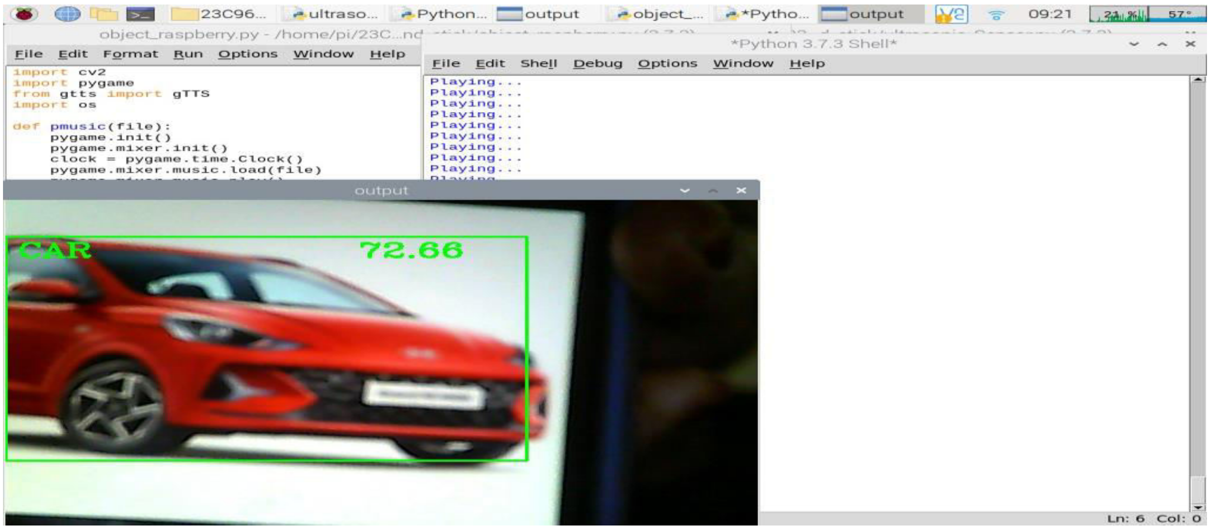
7.User Interface: Design a user-friendly interface for interaction with the system, considering the needs of blind users (e.g., voice commands, tactile feedback).

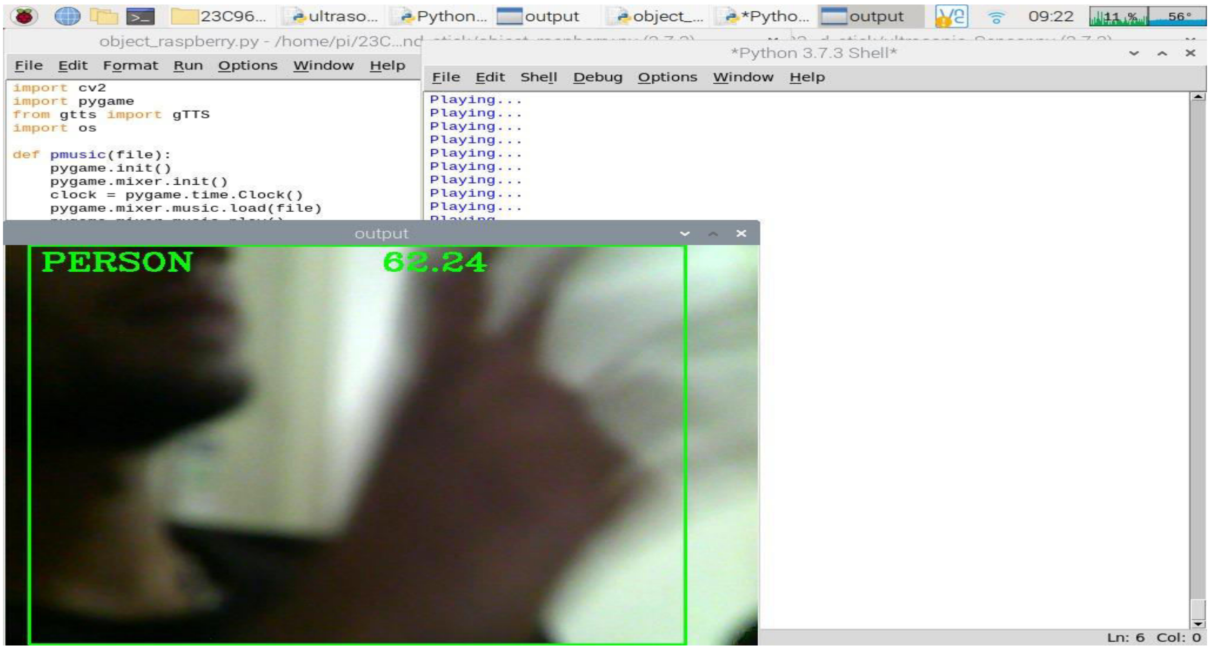
8.Integration: Integrate all software modules to ensure seamless communication and functionality within the system.

9.Testing and Validation: Conduct thorough testing of the system to evaluate its performance and usability. Test the system in various real-world scenarios to identify and address any issues or limitations. Gather feedback from blind users through user testing sessions to validate the effectiveness of the system

10.Documentation and Deployment: Document the system architecture, hardware setup, software components, and usage instructions comprehensively.

V.RESULTS





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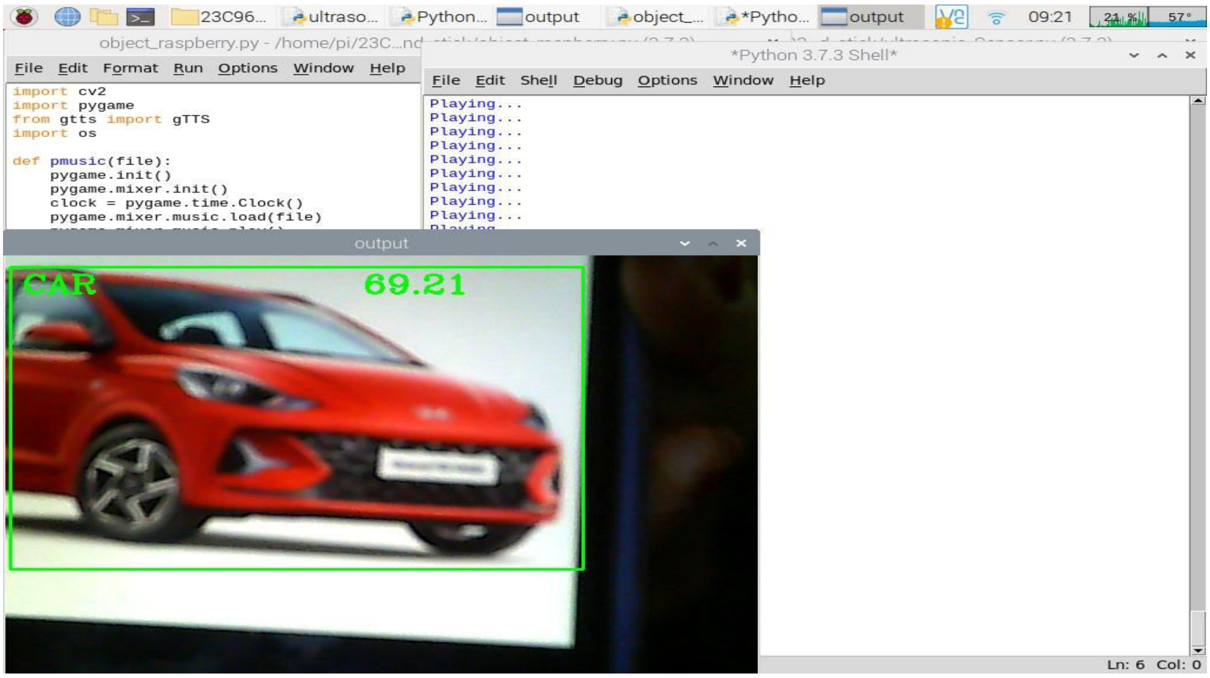

VI. CONCLUSIONS

This research article introduces a novel visual aid system, in the form of a pair of eyeglasses, for the completely blind. The key features of the proposed device include the following. 1) The hands free, wearable, low power, low cost, and com pact design for indoor and outdoor navigation. 2) The complex algorithm processing using the low-end pro cessing power of Raspberry Pi 3 Model B+. 3) Dual capabilities for object detection and distance measurement using a combination of camera and ultrasound sensors. 4) Integrated reading assistant, offering image-to-text con version capabilities, enabling the blind to read texts from any document. Add detailed discussion, on the software and hardware aspects of the proposed blind assistant, has been given. A total of 60 completely blind users have rated the performance of the device in well-controlled indoor settings that represent real-world situations. Although the current setup lacks advanced functions, such as wet-floor and staircases detection or the use of GPS and mobile communication module, the flexibility in the design leaves room for future improvement sand enhancements . In addition , with the advanced machine learning algorithms and a more improved user interface, the system can further be developed and tested in a more complex outdoor environment.

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