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Abstract— Visually impaired people often need assistance in day to day life for navigating through their residence and outside. Having a human assistance is not possible all the time and so a solution to this problem is being researched from a long time. A smart solution developed to this problem using Arduino and a camera to detect objects and danger road signs. The system works by using the Arduino to process the video feed from the camera. The Arduino uses a algorithm to detect object and danger road signs. The system can detect a variety of objects, including cars and cyclists and also detect a danger road signs, such as stop signs and yield signs. The system contain wearable glasses on which ESP32camera which detects the object. Once the system has detected an object or danger road sign, it will alert the user using a voice command through speaker. Using image processing the object detection process and danger road signs can be done using yolo algorithm. The system is designed to be used by people with visual impairments, but it can also be used by people who want to be more aware of their surroundings.

Keywords: ESP32CAM, Switch, Lipo battery, 3D printed box, spectacles, YOLO.

I. INTRODUCTION

The ability of the eyes to receive and process visual information for the brain makes them essential to human life. 83% of the information we perceive to be present in the environment comes from our eyes. When it comes to blindness, one of the many disabilities that exist, despite several technological improvements, an individual has to deal with multiple challenges. The condition of being blind is characterized by the inability of the affected person to see or perceive light. Individuals with low vision who rely on other senses to replace their eyesight are also considered blind. Consequently, someone who is visually challenged takes into account someone who has either partial or complete blindness.

We created wearable technology known as smart glasses, which is easier for people with visual impairments to carry and is less expensive and heavy than previous wearable by taking these aspects into account. The majority of people who are visually impaired cannot afford these kinds of devices because some of them are pricey while having numerous innovative functions. Although the design of our suggested device may not be appealing, its purpose was to assist visually impaired people who are less well off financially. Certain elements of the suggested equipment make it easier for people to move autonomously about their environment. People with vision impairments can recognize the person in front of them with the aid of our smart spectacles.

Despite being regarded as blind, they have a problems that can be resolved in a number of ways, one of which is to enhance distinct environmental scenarios in order to improve the remaining vision. This can be accomplished through the use of smart spectacles, which rely on detecting the changes in the wearer's social and intellectual lives as the project's major value. If a product like this is released, consumers independence can be increased, which will encourage them to participate more in society.

II. LITERATURE REVIEW

This section provides a summary of both the old and new systems. Even though a lot of technologies for those with visual impairments have been developed in the previous few years, many of these innovations have various constraints and limitations.

Cho K. and Kim S. Y.[1] In this research, the author suggests that design guidelines can be produced by assessing users' wants and requirements for smart spectacles that have obstacle detection and indication capabilities. The study discovered that because smart spectacles are better at avoiding obstacles than typical white canes, they provide visually impaired persons greater advantages

Z.Saquib, N. Bhargav, and V. Murari. [/2] A highly effective and affordable device for the blind, BlinDar - An Invisible Eye for the Blind People, is a system that the authors have proposed. It uses speech synthesizer, RFTx/RX module, wristband key button, ESP8266 Wi-Fi module, GPS module, ultrasonic sensors, and MQ2 Gas sensors to help with navigation. One drawback of the gadget is that it requires more time to scan, which means the user must wait longer.

O'Keeffe, R., The authors have suggested an obstacle detection system that uses an ESP32cam put on eyewear for the blind and visually handicapped.The system can function in both indoor and outdoor environments, with a maximum range of 12 to 15 meters.The spectacles have a modest power budget, weight, and size while still having the required detection range under a range of environmental circumstances.

M. Maragatharajan, G. Sarath, R. Askash, K. Aniruth, and G. Jegadeeshwaran.[5] The Third Eye for the Blind project, a wearable device that helps people with vision impairments navigate their surroundings, is described by the authors of the paper. The gadget warns the user over voice when it detects impediments around using the ESP32cam. The Arduino platform serves as the foundation for this portable, affordable, and user-friendly obstacle detector. The gadget reduces the need for outside assistance by enabling the visually impaired

The project's goal is to provide a solution for low-vision to travel independently and with greater confidence by enabling the identification of impediments in all directions.

III .PROBLEM STATEMENT

Moving around safely and navigating new situations can be quite difficult for those who are vision impaired. When it comes to identifying barriers and giving current environmental information, assistive technologies like canes and guide dogs fall short. It is challenging for the blind to navigate and avoid hazards and warning signs on the road , which can result in mishaps and injuries, as they are unable to receive visual messages. Consequently, in order to improve mobility and safety for the visually impaired, an assistive device that can deliver precise and up-to-date environmental information is required. By using ESP32cam and YOLO algorithms to recognize and highlight hazards and road blocks, as well as to communicate to the user through a speaker, the Visionary smart spectacles seek to solvethis issue.

IV. PROPOSED METHODOLGY

This project is an Arduino-based solution that uses the YOLO algorithm for danger traffic sign identification and surrounding objects, together with an ESP32 CAM board, spectacles, and a lipo battery. The obstruction is photographed by the ESP32 CAM board, which then sends the picture to a server. Real-time item classification and accurate identification are achieved through the use of machine learning techniques, like YOLO. The speaker delivers speech output to the user. The entire experience is geared to allow the visually impaired user to easily navigate their surroundings, with a smooth data flow from the camera to the web server and, eventually, to the user's device.

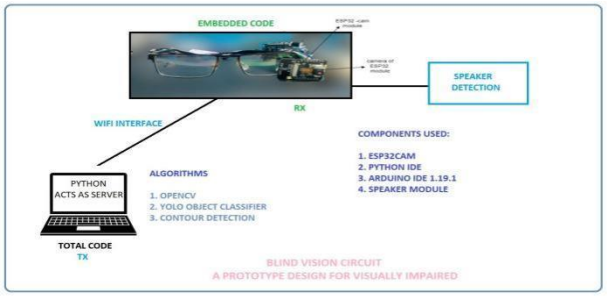


Fig:1 Prototype Design of the Proposed System

V . SYSTEM ARCHITECTURE

An ESP32cam module is housed in a blind folded spectacles that is connected to a lipo battery source as part of the system design. This camera's primary function is to record items and warning signals about potential hazards in its surroundings and upload them to a web server. The Yolov6 method is used on the web server to analyze the image that was obtained from the ESP32 CAM board. The objects in the picture are categorized, and a speech output is given to the user device along with the overall number of barriers found.This output can be adjusted using the voice aid feature of the web server in terms of pitch, volume, and speech. Additionally, a voice alerting the visually handicapped to an

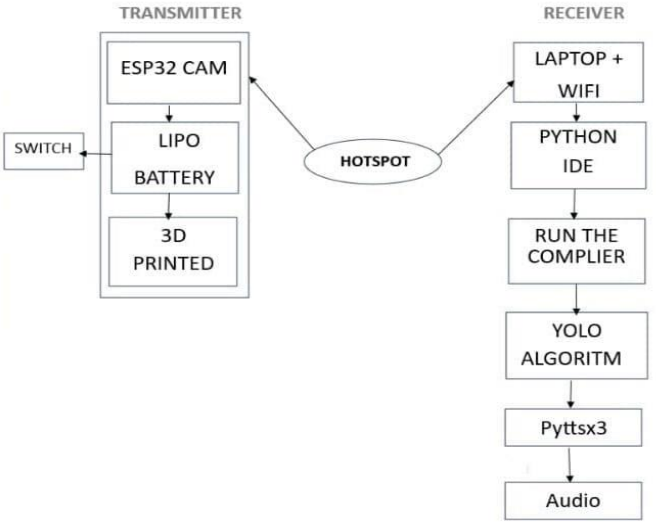


Fig:2 Architecture of smart spectacles

approaching collision is raised in the voice output when the distance to the closest obstacle is less than 15 meters.All things considered, the smart blind spectacles project offers a complete navigational aid for those with visual impairments, and the system design guarantees the device's dependable and effective operation.

All things considered, the smart blind spectacles project offers a complete solution to help people who are visually impaired navigate, and the system guarantees the item will function dependably and effectively.

VI . YOLO ALGORITHM

You Only Look Once(YOLO) : Identifying one or more items within an image and classifying each object that is present in the image are two difficult aspects of object detection in computer vision. In order to forecast the correct class of item, this task involves successful object localization and classification.

YOLOv6, a sophisticated real-time object detection algorithm, surpasses current benchmarks in accuracy. It improves upon earlier iterations of the YOLO (You Only Look Once) algorithms, which were known for their accuracy and speed.

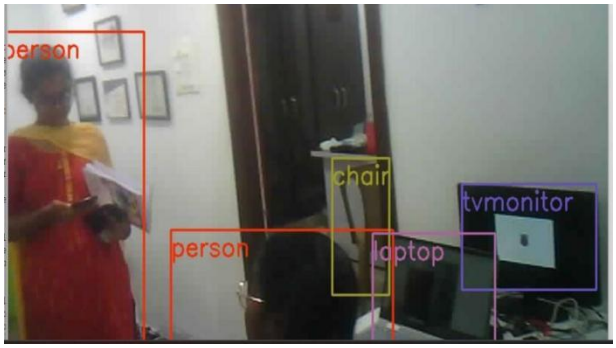
A deep neural network is used by the YOLOv6 method to categorize objects in real-time photos. Compared to many other object detection techniques, it is faster since it is a single-stage object detection model that finds objects in a single network run.

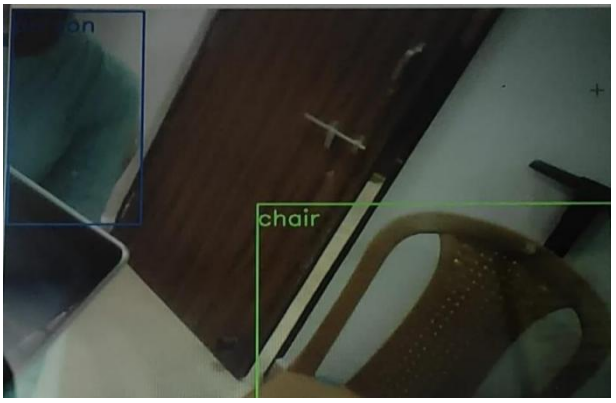
YOLOv6 examines the photos that the ESP32 CAM board takes for this project. The program finds the things in the picture and groups them according to several criteria. After that, the data is utilized to provide a speech output for the user that comprises the names of all objects found, their total count, and the closest object's distance.In order to forecast the items within each grid cell, the YOLOv6 algorithm divides the input image into a grid. Next, the system filters out low-confidence detection's and gives each prediction a confidence score. Lastly, redundant detection's are eliminated by using non-maximum suppression.

The YOLOv6 algorithm can effectively detect objects in a variety of real-world circumstances since it has been trained on big datasets. In addition to being extremely adaptive to various applications, the algorithm can be adjusted for particular use situations. Using real-time photos taken by the ESP32 CAM board, this project uses an extremely precise and quick object detection algorithm to identify items. People with visual impairments can navigate securely since the algorithm gives them a thorough grasp of their environment.

VII . RESULTS

This model can identify items in real time using an ESP32CAM video feed that is fed into it. It categorizes the objects based on their features, finds the objects, and sounds an auditory alarm to the user using a speaker or earbuds. The model's cost is decreased without sacrificing the facilities or the user's safety by utilizing just an ESP32CAM and an Arduino, and maintenance is made simple. As such, this paradigm has practical applications. The approach is used to both outdoor and indoor activities.





VII . CONCLUSION

In conclusion, new avenues for enhancing the quality of life for visually impaired people have been made possible by the development of technologies like Arduino. This project is an illustration of how Internet of Things technology can be utilized to provide creative solutions that help the visually impaired navigate their surroundings more safely and easily. This project's smart blind spectacles classify and identify obstacles in the surrounding environment and give the user feedback in real time using ESP32cam, computer vision algorithms, and speech output. The YOLOv6 algorithm is used in the system for object identification and categorization, which greatly improves accuracy and dependability. Additionally, the voice output can be tailored to an individual's tastes. In conclusion, this project's smart spectacles are an Arduino-based solution that uses speech output, computer vision,

And ESP32cam to give visually impaired people a thorough awareness of their environment output, computer vision, and ESP32cam to give visually impaired people a thorough awareness of their environment and safe navigation. Accurate object identification and classification, real-time feedback, adaptable speech output, affordability, and simplicity of replication are some of this project's standout.

This project has a bright future .This project has a bright future ahead of it, full with chances for additional study and advancement.Using Yolov6 methods and enhancing accuracy and object detection are two potential avenues of development. Optimizing the production process or looking into alternative components could improve the device's accessibility. This study lays the foundation for future advancements in assistive technologies for people with visual impairments, which could significantly increase their freedom and quality of life.

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