AI- POWERED BASED BLIND AND VISUALLY IMPAIRED SYSTEM FOR SMART GLASS

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***Abstract*— Visual impairment causes serious problems in daily life and mobility for millions of people worldwide. Against this background, smart assistive technology is gaining momentum to improve the independence and quality of life of the blind and visually impaired. They have difficulty in daily life because they cannot detect the problems around them, and one of their biggest problems is identifying people. Besides automation, there are many unexplored uses of search engines. This project includes an app that uses search to help blind people see things in front of them safely, and a facial recognition system with visual feedback that can help visually impaired people see familiar and unfamiliar people. The speaker will provide them with sound support. In this work, we use deep learning-based Regional Convolutional Neural Network (Faster R-CNN) to detect and identify people and objects in the environment. Faster local convolutional neural network technology processes and distributes images captured by cameras. The operator takes the image as input. Therefore, this model helps visually impaired people in a simpler way than a white cane.**

***Keywords*— VisualImpairment,Objectdetection,Faster Region Convolutional Neural Network.**

I. INTRODUCTION

Visual impairment is a broad term that refers to any visual impairment that affects a person's ability to perform daily tasks. Types of visual impairment Visual impairment is defined differently in different countries. The World Health Organization (WHO) divides visual impairments into two types: visual field, or visual acuity, and visual field, which is the area where visual information can be discovered if the eyes are fixed and looking directly at an object. SnellenChart is a visual assessment. Use two values to calculate your visibility. The first value represents the distance between the reader and the image. Use two values to calculate your visibility. The first value represents the distance between the reader and the image. The distance to the object you normally see is what you see at 20 feet, as you would have to stand in front of the object to see it. For example, 20/80 vision means you can see a map from 20 feet away and read a map from 80 feet away. In other words, what a person with normal vision would see from 80 feet away, you won't be able to see until you get closer than 20 feet. Face DetectionFace detection is a computer vision task that involves identifying and finding faces in images or videos. The goal is to determine whether an image has one or more faces, and if so, place a checkbox around each visible face. Technologies designed to help people with disabilities complete daily tasks in their daily lives like normal people. That's why we want to do something to help them achieve freedom. We want to create an open glasses project. Taking advantage of today's technology, this report explores how to transform everyday objects used by the visually impaired to aid mobility, ultimately improving the quality of life for these people around the world.

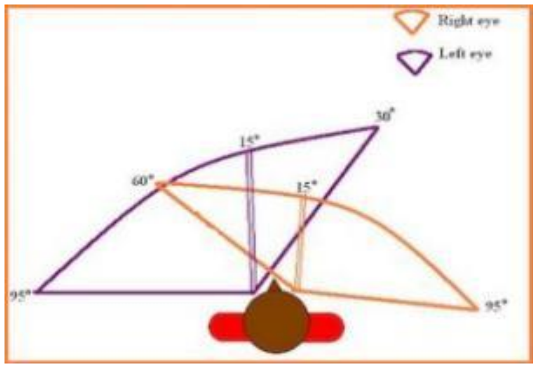

Figure.1.Snellen Chart using for calculating distance to opposite object

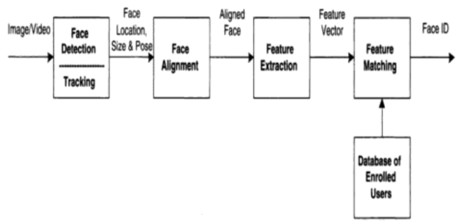

Fig. 1.2. Face recognition processing flow.

A.Haar Cascades or Convolutional Neural Networks (CNNs):

Face detection algorithms often utilize either traditional Haar cascades or deep learning techniques like CNNs to analyze and recognize facial features.

B.Feature Extraction:

Algorithms focus on distinctive features, such as the eyes, nose, and mouth, to identify and differentiate faces from the background.

C.Bounding Boxes:

The output typically includes bounding boxes that outline the detected faces, indicating their position within the image..

II.RELATED WORK

In addition to providing services, technology services offer many examples of helping the disabled, intellectuals and the disabled by combining artificial intelligence, engineering products and robots. A. Visual tools used by artificial intelligence Microsoft's Vision AI software for the visually impaired has been published.

The software allows users to hold their phone up to someone and describe the person's appearance, hair color, age, whether they are happy or unhappy, and more. By pointing your phone at the product, you can find out what the product is, when it expires and other information. Additionally, the software can read text and analyze materials such as sentences, paragraphs, lists. Smart glasses have the ability to distinguish the face accurately and precisely, allowing people to use them instead of glasses or protective glasses. These glasses help people focus on a specific point by allowing light rays to converge and diverge.

PlanThe solution of this project is to create smartglasses that will help blind people see faces and objects. Facial recognition and object detection are computer techniques used to find patterns of details of specific objects (such as people, buildings, or cars) in images and movies. Face recognition and object detection are two disciplines that have been successfully implemented. Facial recognition (used by Facebook to distinguish people), tumor detection (used in medical applications), and other uses. Deep learning models outperform traditional computer video algorithms in terms of accuracy, time, complexity, and overall performance.

Deep learning has outperformed previous computer vision at object recognition, leading to the use of deep learning models. One of the best things to know about algorithms (deep learning) is this:1. RCNN (Region Based Convolutional Neural Network)2. Fast RCNN3. Improved RCNN A.RCNN (Region Based Convolutional Neural Network)R-CNN uses selection to extract multiple regions from a given image and then evaluates whether these boxes contain items. We first extract these regions, then use CNN to extract the unique features of each region.

These characteristics are then used to describe the product. Unfortunately, R-CNN is slow due to the many steps involved in the process. Known or unknown person or thing. In this change, training deployment results and testing Live Cemara store deployment data are equal. Machine for finding semantic objects of a group (such as people, buildings, or cars) in images and videos. Deep learning surpasses previous computer vision in object recognition, leading to widespread use of deep learning models

Figure.2.SmartClassforblindpeople

Object Detection

Object detection is a broader computer vision task that involves identifying and locating multiple objects of various classes within images or video frames. It goes beyond face detection and encompasses a wide range of oanimals, and everyday items.

Figure.3.Object Detectio

A.**Regional Proposal Networks (RPN) or Single Shot Multibox Detectors (SSD):**

Object detection algorithms often use RPN or SSD to propose regions of interest where objects may be located.

B.Classifiers:

A classifier assigns a class label to each proposed region, indicating the type of object it might contain.

C.Bounding Boxes:

Similar to face detection, object detection outputs bounding boxes around the detected objects, providing information about their position and size.

D.Problem Identified

The blind and visually impaired face several challenges that impact their effectiveness and user experience. One significant issue is the accuracy of obstacle detection and navigation, as existing systems may struggle with recognizing small objects or providing precise depth perception. User interfaces on these devices can be complex and challenging for individuals with visual impairments to navigate.Limitations in battery life and the weight of the devices can impact their practicality for extended use.

Integration with other technologies and infrastructure, concerns about privacy and security, high costs, and the need for adaptability to various types of visual impairments also pose substantial obstacles. Addressing these challenges is essential for improving the functionality, accessibility, and overall acceptance of smart glasses as assistive devices for the blind and visually impaired.

D.Scope of the project

Assistive technologies nowadays have limitations and incon- venience. Assistive technologies nowadays, such as white canes and guide dogs, can be helpful. However, they have their limitations, such as white canes can only sense obstacles within their range and guide dogs must feed, house and care for their guide dogs which sometimes might be expensive.Develop a robust facial recognition system using AI algorithms to identify unknown individuals.Implement real-time analysis of live camera feeds or captured images to recognize faces.Ensure the system is capable of handling variations in facial expressions, lighting conditions, and different facial features.Implement real-time mapping and navigation algorithms to help users navigate around detected obstacles.Integrate a natural language processing (NLP) system for generating human-like voice alerts.Develop a is voice alert system that communicates information about identified individuals and detected obstacles clearly

A. *Proposed Architecture*

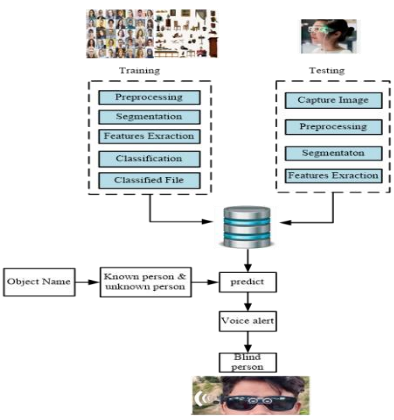

Figure.4.Block Diagram

IV.MODULE DESCRIPTION

A.Hardware and Software Setup:

- ❖ Assemble the Raspberry Pi, camera, and ultrasonicsensor.
- ❖ Install Raspberry Pi OS on the Raspberry Pi.
- ❖ Install TensorFlow Lite and any necessary libraries onthe Raspberry Pi.
- ❖ Configure the camera and ultrasonic sensor to work withthe Raspberry Pi.
- ❖ Test the hardware components to ensure proper func-tionality.

Algorithm Development

- ❖ Develop the object detection system using TensorFlowLite.
- ❖ Develop the distance calculation algorithm using theultrasonic sensor

B.System Integration and Testing:

- ❖ Integrate the object detection system and distancecalculation algorithms with the hardware components.
- ❖ Test the system in various scenarios to ensure properfunctionality.
- ❖ Optimize the system to improve performance andaccuracy.
- ❖ Address any bugs or issues that arise during testing

C.Output Feature Implementation

- ❖ Implement the output feature in the form of vibrationand audio.
- ❖ Test the output feature to ensure proper functionality.

D.Deployment and Support:

- ❖ Deploy the system to the target environment.
- ❖ Provide training for users on how to operate the system.
- ❖ Monitor system performance and address any issues orbugs that arise.

Web Simulation Module

- ❖ This module serves as a virtual environment where the AI-powered smart glasses' functionalities can be simulated and tested.
- ❖ It provides a graphical interface accessible via a web browser, allowing users to interact with the system's features, such as object recognition, navigation assistance, and voice alerts, in a controlled environment.

AdminModule

- ❖ The admin module enables administrators to manage the AI-powered smart glasses system.
- ❖ Admins can configure system settings, update software, monitor usage analytics, and perform maintenance tasks.

C.User Model

❖ The user module provides access to the AI-powered smart glasses' features for visually impaired individuals.

❖ Users can customize settings, such as voice preferences, navigation preferences, and alert thresholds, to tailor the system to their specific needs.

D.Training Module

❖ The training module offers educational resources and interactive tutorials to help users familiarize themselves with the AI-powered smart glasses' functionalities.

❖ It provides step-by-step guidance on using features such as object recognition, navigation assistance, and voice alerts, helping users build confidence and proficiency in using the system.

Testing Module

❖ The testing module allows users to evaluate the performance and accuracy of the AI-powered smart glasses' features in real-world scenarios.

❖ Users can simulate various environments and situations to assess how well the system detects obstacles, recognizes objects, and provides navigation assistance. Feedback from testing sessions is used to refine and improve the system's algorithms and functionality.

Voice Alert Module

❖ The voice alert module delivers auditory feedback and alerts to users based on the AI-powered smart glasses' detections and analyses. .

❖ Using text-to-speech technology, the system converts important information, such as obstacle warnings, object identifications, and navigation instructions, into spoken messages that are relayed to the user in real-time.

❖ Voice alerts help users navigate safely and independently by providing timely informatiom about their surroundings.

V.CONCLUSION

In conclusion, the development of AI-powered systems for smart glasses aimed at assisting the blind and visually impaired represents a significant stride towards enhancing their independence and quality of life. Through the integration of advanced technologies such as computer vision, natural language processing, and machine learning, these systems have the potential to revolutionize the way individuals with visual impairments navigate the world around them.

One of the key advantages of such systems is their ability to provide real-time auditory or tactile feedback, enabling users to interpret their surroundings and make informed decisions. From recognizing objects and text to identifying obstacles and guiding users along safe routes, AI-powered smart glasses offer a comprehensive solution to address the various challenges faced by the visually impaired community.

VI.FEATURE WORK

The system utilizes computer vision algorithms to identify and categorize objects in the user's environment. This feature enables users to receive auditory or tactile feedback about their surroundings, helping them to navigate safely and independently. Using optical character recognition (OCR) technology, the smart glasses can capture and interpret text from various sources such as signs, labels, and documents. The AI translates this text into audible or tactile output, allowing users to access information that would otherwise be inaccessible.

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