



VISUAL ASSISTANCE FOR CECITY PERSON

Narayanan C*, Sridevi R**, Menaka T***, Monisha P***, Safvana***
& Subhashini K***

* Professor, Department of Bio Medical Engineering, Dhanalakshmi Srinivasan Engineering College (Autonomous), Perambalur, Tamil Nadu

** Assistant Professor, Department of Bio Medical Engineering, Dhanalakshmi Srinivasan Engineering College (Autonomous), Perambalur, Tamil Nadu

*** UG Student, Department of Bio Medical Engineering, Dhanalakshmi Srinivasan Engineering College (Autonomous), Perambalur, Tamil Nadu

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Abstract:

In this paper, we propose the development of a Virtual Blind Assistant system aimed at enhancing the independence and safety of visually impaired individuals. The system leverages various technologies, including ZigBee for data transmission, ultrasonic sensors for object detection, speakers for auditory feedback, WiFi for connectivity, mobile cameras for environmental perception, and microcontrollers for system control. By integrating these components, the virtual Blind Assistant can detect obstacles in the user's surroundings using ultrasonic sensors and provide real-time feedback through auditory alerts via speakers. The system also utilizes WiFi and mobile cameras to gather additional environmental information, which is then processed by the microcontroller to enhance the user's situational awareness. Through the seamless integration of these technologies, the Virtual Blind Assistant aims to empower visually impaired individuals with greater mobility and autonomy in navigating their Surroundings.

Key Words: Blind Assistance, ZigBee, Ultrasonic Sensor, Speaker, Microcontroller, Wi-Fi.

1. Introduction:

Today with the advancement in technologies various technologies are used like watch dogs, walking canes to overcome the problem. But due to limitations of these technologies they are not efficient in some cases like traffic and also if that people wants to travel in public transport with long distances. So in order to overcome that problems related to these technologies a possible proposed wireless system using ZigBee which guide the people and bus number notification gave to that people which is to used. As we know that in today's communication world there are numerous high data rate communication standards were available, but none of these meet the sensors' and control devices' communication standards, which requires Low - latency and low-energy consumption with lower bandwidths.

A ZigBee is a wireless technology developed to overcome these limitations and also of Wi-Fi & Bluetooth. It's a system which has excellent characteristics with best communication for different applications related to embedded system. The below figure 1 represent the ZigBee technology. ZigBee communication is specially built for control and sensor networks on IEEE 802.15.4 standard for wireless personal area networks (WPANs), and it is the product from ZigBee alliance. This communication standard defines physical and Media Access Control (MAC) layers to handle many devices at low-data rates. The data rate of 250 kbps is best suited for periodic as well as intermediate two way transmission of data between sensors and controllers. ZigBee is low-cost, low-powered mesh network widely used for controlling and monitoring applications within the range of 10-100 meters.

This communication system is less expensive and simpler than the other proprietary short-range wireless sensor networks as Bluetooth and Wi-Fi. In recent years, the field of visual assistant technology has witnessed exponential growth, revolutionizing various industries and transforming the way we interact with information and the world around us. Visual assistants are intelligent systems designed to interpret and understand visual data, enabling seamless communication between humans and machines. From smart phones to smart glasses, these technologies have become ubiquitous, enhancing productivity, accessibility, and convenience across diverse domains.

At its core, visual assistant technology leverages advanced computer vision algorithms, machine learning, and artificial intelligence to analyze and extract meaningful insights from visual inputs such as images, videos, and live streams. These systems can identify objects, recognize faces, understand gestures, and even interpret emotions, empowering users with a range of capabilities previously thought to be the realm of science fiction. One of the most prominent applications of visual assistant technology is in the realm of augmented reality (AR) and mixed reality (MR). AR overlays digital information onto the user's real-world environment, providing contextualized insights and enhancing situational awareness. MR takes this a step further by seamlessly blending virtual and physical elements, creating immersive experiences where digital and real-world interactions coexist harmoniously.

2. Overview:

The Virtual Blind Assistant (VBA) paper is a groundbreaking initiative aimed at revolutionizing accessibility and independence for visually impaired individuals. By harnessing cutting-edge technologies such as object detection, tensor flow deep learning, ZigBee transmitter and receiver, text-to-speech conversion, and ultrasonic sensors, the VBA offers a comprehensive solution for navigating environments and accessing information. The system employs tensor flow models for real-time object detection, enabling users to identify obstacles and navigate safely.

ZigBee technology facilitates wireless communication with external devices, allowing users to interact with smart home systems and IoT devices. The integration of text-to-speech conversion enables the VBA to provide auditory feedback on various types of information, including text messages and navigation instructions. Furthermore, object distance detection using ultrasonic sensors ensures that users receive timely updates on the proximity of obstacles, helping them avoid collisions and navigate with confidence. Overall, the VBA represents a significant advancement in assistive technology, empowering visually impaired individuals to navigate their surroundings independently and with greater ease. Here's an:

- **Purpose:** The main goal of our paper is to provide visual assistance for visually impaired person and make them not to depend on others for assisting them for their daily life.
- **Components:** This assist prototype device that includes ultrasonic sensor, Mobile camera, Wifi, Microcontroller, ZIGBEE, Speaker.
- **Technologies used:**
 - Virtual assistant for blind by detecting object
 - Object detection using image processing and tensor flow and deep learning
 - Text to speech
 - Object distance detection using ultrasonic sensor
 - Zigbee transmitter and receiver
- **Detection of images:** The image which is captured by using mobile camera, then the captured image is converted into text format and the name of the image can be detected by using tensor flow.
- **Communication:** The system may utilize the software knowledge and the real time image detection will occur.
- **Notification alert:** The image will only get detected if the blind people seems to hit the object and it also measure the distance so that the blind can get easily alerted.

3. Existing System:

In the existing system of using Open CV image processing for visual assistance for individuals with visual impairments, computer vision techniques are employed to analyze and interpret visual information in real-time. Open CV, an open-source library, facilitates the development of applications that can capture, process, and understand images and videos. In this system, cameras or other imaging devices capture the surrounding environment, and Open CV algorithms Process these visual inputs to extract relevant information. This information is then presented to the user through auditory or tactile feedback, enabling individuals with visual impairments to perceive their surroundings more effectively. Techniques such as object detection, image segmentation, and optical character recognition (OCR) are utilized to identify objects, text, and other relevant features within the captured images. By leveraging Open CV capabilities, the existing system enhances the independence and accessibility of individuals with visual impairments, providing them with valuable visual assistance in various daily activities. Open CV-Based visual Assistance System for Individuals with Visual Impairment.

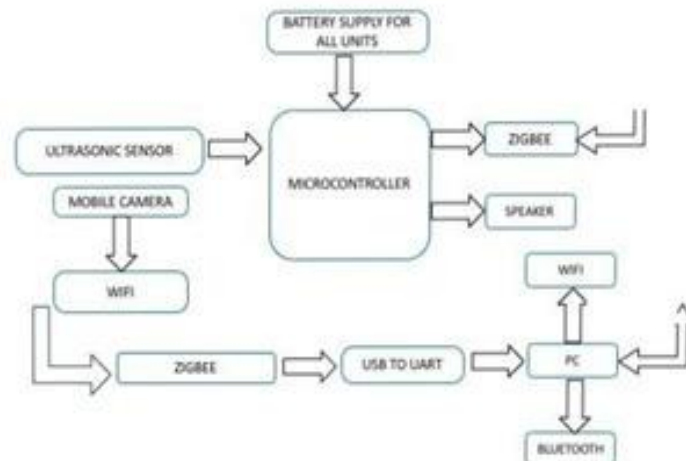
A. Disadvantage of Existing System:

- Open CV is primarily designed for desktop environments and may not offer optimal performance or compatibility on all platforms, particularly on mobile devices or in web applications. Adapting Open CV to different platforms and integrating it with other software components can require additional effort and may introduce compatibility issues.
- Its complexity for beginners, requiring a steep learning curve to understand and implement effectively. Additionally, it might not always provide optimal performance on resource- constrained devices due to its extensive computational requirements.

B. Problem Description:

Visually impaired individuals often face challenges when navigating indoor spaces such as offices, shopping malls, or public buildings due to obstacles, unclear pathways, and lack of visual cues. Shopping independently can be difficult for visually impaired individuals who cannot read product labels, pricing information, or other visual displays commonly found in stores. Navigating public transportation networks, including buses, trains, and subway systems, can be complex for visually impaired individuals, leading to difficulties in planning routes and boarding vehicles independently. Identifying obstacles, uneven terrain, or hazards such as steps or curbs while walking can pose safety risks for visually impaired individuals, particularly in unfamiliar environments.

4. Proposed System Architecture:



The proposed visual assistance system consists of the following key components:

- Ultrasonic sensor
- Mobile camera
- Microcontroller
- ZigBee
- Speaker

A. Ultrasonic Sensor:

An ultrasonic sensor is a device that uses sound waves with frequencies above the human hearing. These sound waves travel through the air and bounce off the target object. The receiver detects the reflected waves and measures the time it takes for them to return to calculate the distance to the object.

B. Mobile Camera:

Mobile cameras are integral components of smart phones, designed to capture Photos and videos. Mobile cameras come with varying resolutions, usually measured in megapixels (MP). Higher resolution cameras capture more detail in photos. Some smart phones utilize artificial intelligence (AI) to optimize camera settings automatically, recognize scenes, or enhance portraits with features like beautification or background blur.

C. Microcontroller:

A microcontroller is a small, integrated circuit (IC) designed to control and Perform a specific task within an electronic system. Microcontrollers typically consist of a central processing unit (CPU), memory (RAM and ROM), input/output (I/O) ports, timers, and often additional peripherals like analog-to-digital converters (ADC), serial communication interfaces (UART, SPI, I2C), and pulse- width modulation (PWM) controllers. Microcontrollers are used in a wide range of embedded systems, including consumer electronics, industrial automation, automotive applications, medical devices, and more. They provide intelligence and control to devices, enabling them to perform specific functions. Microcontrollers vary in processing power, ranging from simple 8-bit microcontrollers with limited capabilities to more powerful 32-bit microcontrollers capable of running complex algorithms and handling sophisticated tasks.

D. ZigBee Transmitter and Receiver:

ZigBee is a wireless mesh network standard designed for low-power devices in control and monitoring applications. It offers low-latency communication and is commonly integrated with microcontrollers and radios. Operating in the industrial, scientific, and medical (ISM) radio bands, ZigBee primarily uses the 2.4 GHz band.

E. Speaker:

A speaker is an electro acoustic transducer that converts electrical signals into sound waves. It consists of various components designed to reproduce audio frequencies accurate. The main component responsible for producing sound. It typically consists of a diaphragm (cone), voice coil, magnet, and suspension system. The range of frequencies a speaker can reproduce. Human hearing typically ranges from 20 Hz to 20 kHz, so speakers aim to reproduce this range. The electrical resistance of the speaker measured in ohms. Impedance affects how much current a speaker draws from an amplifier.

Software Description:

- Tensor flow API detection
- Object detection using tensor flow
- Text to speech converter
- Software for connecting ZigBee and python

A. Tensor Flow API Detection:

The Tensor Flow Object Detection API is a powerful open- source framework built on top of Tensor Flow, designed to simplify the construction, training, and deployment of object detection models. It offers a range of pre-trained models, known as the Model Zoo, trained on diverse datasets such as COCO, KITTI,

and Open Images. These models vary in architecture, providing different accuracies and execution speeds, allowing users to choose based on their specific requirements and trade-offs between speed and accuracy.

B. Object Detection Using Tensor Flow:

Object detection using Tensor Flow is a cutting-edge technique in computer vision that enables the identification, localization, and tracking of objects within images or videos. Leveraging the Tensor Flow framework, this approach utilizes deep learning accurately detect objects of interest and draw bounding boxes around them. Tensor Flow provides a comprehensive ecosystem for developing and deploying object detection models, offering pre-trained models through its Object Detection API.

C. Text to Speech Converter:

Text-to-speech (TTS) conversion plays a vital role in virtual assistants designed to assist blind people, offering them access to textual information through auditory output. This technology has significantly contributed to enhancing the accessibility and functionality of virtual assistants for blind individuals. By converting written text into spoken words, TTS systems enable blind users to access a wide range of information, including emails, messages, news articles, and more.

D. Software for connecting ZigBee and Python:

Anaconda Prompt is a command-line interface that comes bundled with the Anaconda distribution, a popular Python distribution for data science and machine learning tasks. It provides users with a convenient way to manage Python packages, environments, and dependencies. Additionally, Anaconda Prompt allows users to install packages from the extensive Anaconda repository or other sources using the conda package manager. This simplifies the process of installing and managing dependencies for data science and machine learning libraries, ensuring that all required packages are available and compatible with each other. Furthermore, Anaconda Prompt provides utilities for updating packages, managing channels, exporting and importing environment configurations, and more, making it an indispensable tool for Python developers and data scientists. Overall, Anaconda Prompt streamlines the process of managing Python environments and packages, facilitating efficient development workflows and enabling users to focus on building and deploying their data-driven applications with ease. Anaconda Prompt is a command-line interface included with Anaconda, a popular open-source distribution of Python and R programming languages used for data science and machine learning tasks.

5. Advantages:

- Visually impaired individuals often face challenges when navigating indoor spaces such as offices, shopping malls, or public buildings due to obstacles, unclear pathways, and lack of visual cues.
- Shopping independently can be difficult for visually impaired individuals who cannot read product labels, pricing information, or other visual displays commonly found in stores.
- Recognizing faces and interpreting facial expressions are important social skills that can be challenging for visually impaired individuals, leading to difficulties in social interactions and networking.
- Many visually impaired individuals struggle to access printed materials such as books, newspapers, and documents due to the lack of accessibility features or the availability of alternative formats.

6. Applications:

- Various applications and software have been developed specifically for blind users, offering features such as voice commands, text-to-speech, and audio feedback for navigation and accessing information.
- Voice guidance help blind individuals navigate outdoor environments, providing directions and information about nearby points of interest.

7. Results:

In conclusion, the Virtual Blind Assistant (VBA) paper represents a significant step forward in leveraging cutting-edge technologies to enhance the independence and quality of life for visually impaired individuals. By integrating object detection using Tensor Flow deep learning, ZigBee transmitter and receiver for connectivity, text-to-speech conversion, and ultrasonic sensors for distance detection, the VBA offers a comprehensive solution for assisting users in navigating their surroundings and accessing information. The project's future scope includes further enhancements in object detection accuracy, connectivity with other smart devices, refinement of natural language processing, and integration of additional sensor technologies. With continued innovation and development, the VBA has the potential to make a meaningful impact in empowering visually impaired individuals to navigate the world with greater confidence and autonomy.

```
Model has a coco model name, loading coco labels.
```

```
Building net ...
```

Source	Train?	Layer description	Output size

WARNING:tensorflow:From C:\Users\Shamzad\AppData\Roaming\Python\Python36\site-packages\tensorflow\python\framework\ops.py:1654: tf.nn.conv2d is deprecated and will be removed in a future version. Instructions for updating:			
Colocations handled automatically by placer.			
		input	(?, 608, 608, 3)
Load	Yep!	conv 3x3p1_1 +bnorm leaky	(?, 608, 608, 32)
Load	Yep!	maxp 2x2p0_2	(?, 304, 304, 32)
Load	Yep!	conv 3x3p1_1 +bnorm leaky	(?, 304, 304, 64)
Load	Yep!	maxp 2x2p0_2	(?, 152, 152, 64)
Load	Yep!	conv 3x3p1_1 +bnorm leaky	(?, 152, 152, 128)
Load	Yep!	conv 1x1p0_1 +bnorm leaky	(?, 152, 152, 64)
Load	Yep!	conv 3x3p1_1 +bnorm leaky	(?, 152, 152, 128)
Load	Yep!	maxp 2x2p0_2	(?, 76, 76, 128)
Load	Yep!	conv 3x3p1_1 +bnorm leaky	(?, 76, 76, 256)
Load	Yep!	conv 1x1p0_1 +bnorm leaky	(?, 76, 76, 128)
Load	Yep!	conv 3x3p1_1 +bnorm leaky	(?, 76, 76, 256)
Load	Yep!	maxp 2x2p0_2	(?, 38, 38, 256)

The future scope of the Virtual Blind Assistant (VBA) paper is promising, with several avenues for further enhancement and expansion. This could involve training Tensor Flow models on larger and more diverse datasets to enhance the system’s ability to identify a wider variety of objects. Another area of future development is the refinement of the text-to- speech conversion functionality to improve natural language processing and synthesis. Advancements in natural language understanding and generation could enable the VBA to provide more natural and expressive speech output, enhancing the overall user

experience. Additionally, incorporating multilingual support and dialect recognition could make the VBA more accessible to users from diverse linguistic backgrounds. Overall, the future scope of the VBA paper is vast, with opportunities for continued innovation and improvement across various dimensions, including object detection, connectivity, natural language processing, and environmental.

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