VISVESVARAYA TECHNOLOGICAL UNIVERSITY

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A MINI PROJECT (BAI586) REPORT ON

"ECHO-EYE: THIRD EYE FOR BLIND"

Submitted in partial fulfillment of the requirement for the award of the degree of

BACHELOR OF ENGINEERING

IN

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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CERTIFICATE

This is to certify that **Kushal Hallikar Y(1EW22AI021), Shriya N(1EW22AI047), Smitha K V(1EW22AI048), Vignesh K V(1EW22AI059)** has satisfactorily submitted Mini Project (21CSMP67) Report titled in **"ECHO-EYE: THIRD EYE FOR BLIND"** in fulfillment of the requirements as prescribed by the Visvesvaraya Technological University for 6th semester, Bachelor of Engineering in **"ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING"**, during the academic year 2023-24.

Signature of the Guide	Signature of the HOD
Prof. Savitha N	**Prof.Vidya E V**
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DECLARATION

KUSHAL HALLIKAR Y(1EW22AI021), SHRIYA N(1EW22AI047), SMITHA KV (1EW22AI048), VIGNESH KV(1EW22AI059) student of fifth semester Bachelor of Engineering in the Department of Artificial Intelligence and Machine Learning, of East West Institute of Technology, Bengalore-560091, hereby declare that the Mini (21CSMP67) entitled **"ECHO-EYE: Third Eye for Blind"** has been carried out by us under the supervision of Internal Guide **Prof. Savitha N**, Assistant Professor, Department of Computer Science and Engineering, EWIT, Bangalore submitted in the fulfillment of the course requirement for the award of the degree of **Bachelor of Engineering in Department of Artificial Intelligence and Machine Learning** in the academic year 2023-2024.

Place: Bengaluru

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ABSTRACT

The "Third Eye for Blind" model is an innovative approach to assist individuals with visual impairments by leveraging advanced technologies to provide real-time environmental awareness and navigation support. The system integrates computer vision, artificial intelligence (AI), and sensory feedback mechanisms to detect and interpret objects, obstacles, and people in the user's environment. This model uses a wearable device, such as a smart glasses system or a vest, equipped with cameras, ultrasonic sensors, and haptic feedback actuators to communicate visual data through non-visual channels. The AI-powered algorithm processes the sensory input and translates it into audio cues or vibrations, effectively guiding the user through their surroundings with a heightened sense of spatial awareness. By enhancing the user's ability to detect obstacles, navigate complex environments, and recognize everyday objects, the "Third Eye for Blind" model aims to improve the independence, mobility, and overall quality of life for visually impaired individuals. This cutting-edge technology not only provides essential safety but also promotes greater autonomy, fostering a more inclusive world for those with vision loss.

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CHAPTER 1

INTRODUCTION

1.1. Introduction

As per the definition of blindness, we mean the person without sense of sight. A blind person has no ability to see anything. While struggling for the different levels of comforts of the general population, we have reached to a point where we have started to completely ignore the people who are living a miserable life due to lack of vision. They face enormous challenges in their daily lives and hence end up living a dependent life. They experience a completely different life from the normal people and experience detached and uninterested conduct towards them for being physically disabled. They need other individuals for their movement from one place to another. Sight is the basic sense of life and therefore a person's movement from place to place in this condition is a major challenge for the visually impaired. The target of this task, this project for the blind or visually impaired person will provide a gadget that is helpful to them as well as the persons who depend on any individual due to lack of sight. Third eye for blind task can be an innovation for the sightless individuals, it will help them to move from here and there and among different places with confidence by knowing the nearest obstructions while wearing the band which leaves the ultrasonic waves which inform the person with beep-sound or vibration. It can let the person who is not able to move and distinguish even snags due to lack of vision. They just have to put on the gadget as a band/bracelet or it can be adjusted on the dress on their body. As per WHO (world health organisation) 2.2 billion people suffer from vision impairment. They experience a lot of troubles in the daily lives. This device can be an innovation for the physically disabled or blind individuals. The people with physical disability used the common way that is white cane previously that was also efficient, but it had lot of limitations. Second approach is, having a pet, like a dog, though it is costly but is helpful. Therefore, this task, third eye for blind will be developed as a moderate, very productive approach to help the blind person traverse with confidence and more interest. The device acts as an innovation for blinds which helps to solve all issues. At Present, enormous techniques and brilliant innovations are available for the physically disabled 9 people, almost all of these devices have solved some of the issues for the sightless people but there exist many demerits like they require considerable measures of preparing and and high maintenance. The uniqueness of the proposed advancement is, it is fair for everyone, the total cost being under $20 or 1500 INR. In the market, no such devices are available that look like an item that can be worn with so much less effort, clarity. By increasing the usage of the gadget and the upgrading the changes in the model, it would definitely be profitable to the people with less or no vision at all.

The basic mechanical gadget that is the strolling stick is manufactured so that it can be used in identifying stationary objects on floors, unbalanced surfaces, holes, steps using the basic mechanical matter. The gadget is fine, convenient but because of compact area it cannot be used for vast snag identification The device works like radar, orientation of the device uses the ultrasonic waves and collect them to note the altitude, direction or also velocity of that object. The separation among the object and person is assessed on the travelling of the wave. Nevertheless, all present systems advise the person about the closeness of the protest at a certain space in forefront or nearby the individual. The interesting aspects enable the unsighted person in distinguishing snags and grants him access to choose his path properly with no issue. This device can help the person in identifying any type of hindrance like a snag. For surviving the earlier stated restrictions, this project work provides primary, productive, customizable and effective solution to the visually impaired.

1.1. HISTORY

The concept of assisting the visually impaired has existed for centuries, with braille being one of the most significant early inventions. However, when it comes to technology for the blind, advancements gained significant traction in the 20th century with the development of devices that could translate visual information into audible or tactile signals. Early research into assistive technologies for blind people began with experimental devices like the "Optacon" (Optical to Tactile Converter), developed in the 1960s. This device allowed users to "feel" printed text by converting the optical image into tactile sensations. Another innovation from this period was the development of audio-based tools for navigation, like electronic talking watches and reading machines. In the 1990s and early 2000s, the advent of digital and electronic technologies, such as the introduction of screen readers (e.g., JAWS, a popular screen reader) and GPS-based navigation apps, further revolutionized the lives of blind individuals. Technologies like the "Braille Note", which allowed users to access information on digital screens via braille, became widely used. In the past decade, innovative projects have worked toward creating a "third eye" that helps the blind sense their environment using technologies like wearable cameras, auditory feedback systems, and even brain-computer interfaces (BCIs). Devices like the "The Sunu Band" or "Brain Port" offer haptic feedback or visual information through auditory channels to help the blind navigate obstacles or even recognize faces and objects. With advancements in artificial intelligence, many new systems have been developed to help blind individuals. For example, apps like Aira use real-time video feeds and human assistants to describe the environment to blind users. Meanwhile, Seeing AI, an app by Microsoft, uses a smartphone camera to read and describe text, recognize objects, and even interpret emotions on people’s faces

Research into more advanced technologies, like brain- computer interfaces, aims to directly interface with the brain to offer a more direct form of sensory input. Though still in its infancy, these technologies hold the potential to radically alter the way blind individuals experience the world around them, offering the possibility of a true "third eye" that can restore or enhance sensory perception.

1.3.PURPOSE

The primary purpose of developing a "third eye" for the blind is to empower visually impaired individuals, providing them greater autonomy and mobility. This technology can replace or enhance existing tools like canes or guide dogs, allowing for more precise navigation and better interaction with the environment. Beyond navigation, such technologies help visually impaired individuals engage with the world around them more easily. This includes recognizing objects, understanding spatial relationships, reading documents, and even social interactions (e.g., recognizing faces or emotional expressions). One of the key goals is to help blind individuals integrate more fully into society by providing them with a tool that enhances their sense of "sight," which is often a key barrier in social and professional settings. These technologies can also provide access to information that would otherwise be inaccessible, improving literacy and educational opportunities. The report would also discuss how these technologies can drive advancements in accessibility. With the growing use of artificial intelligence, machine learning, and sensors, there's potential for new assistive technologies that are more affordable, portable, and efficient. These technologies can also assist with daily tasks such as reading, navigating buildings or streets, and interacting with other people. For instance, a wearable camera could provide real-time auditory descriptions of the surroundings, helping a user understand their environment and avoid obstacles. With more intuitive and interactive technologies, blind people are better equipped to learn and engage with the world. For instance, tactile reading technologies like Braille displays and the ability to "see" images or objects through auditory or haptic feedback opens new avenues for blind people to learn about the world around them. These tools can help them interact with educational materials and gain experiences that were previously unavailable to them. The overarching aim of these technologies is to tap into the brain's ability to reinterpret sensory input. By converting visual information into sound or touch, the brain can adapt and process that information, providing the user with a "third eye" that allows them to experience the world in new ways. This taps into neuroplasticity, where the brain learns to process new types of data through non-traditional senses.

CHAPTER 2

LITERATURE REVIEW

2.1. Paper 1:

Title: Third Eye for Blind

Author: Azra Batool, Shaheen Naz

Year: 2023

2.1.1. Introduction:

The "Third Eye for Blind" project is aimed at providing visually impaired individuals with a wearable device to assist in navigation. This system uses ultrasonic waves to detect nearby obstacles and alerts the user through vibrations or a beep sound. The device is designed to be a cost-effective, portable, and efficient solution to enhance the mobility of visually impaired individuals, offering them independence and confidence in movement.

2.1.2. Objectives:

Develop a wearable band-like device that aids blind people in detecting obstacles. To provide an affordable alternative to current costly tools (e.g., trained dogs, smart canes). To enhance the safety and mobility of visually impaired individuals. To create a user-friendly and reliable system that alerts users through sound and vibration. To improve quality of life by making navigation simple and independent for the blind.

2.1.3.Advantages:

- **Cost-Effective**: The device costs under $20 (1500 INR), making it affordable compared to other technologies.
- **Portability**: Designed to be worn as a band or bracelet, making it lightweight and convenient.

2.1.4. Disadvantages:

- **Limited Range:** Ultrasonic sensors have a restricted detection range and may not identify distant objects.
- **Power Dependency**: Requires a power source, increasing the need for battery management.

2.2.Paper 2:

Title: Arduino Based Third Eye for Blind People.

Author: S.B.Totade, P.V.Raut, S.Kurekar and A.Lone

Year:2022

2.1.1. Introduction:

The "Third Eye for Blind Person" project aims to assist visually impaired individuals by providing an Arduinobased wearable device. It uses ultrasonic waves to detect nearby objects and alerts the user with a buzzer sound or vibration. This innovative device eliminates the need for carrying traditional tools like white canes, making it easier and more convenient for blind individuals to navigate independently.

2.2.2. Objectives:

To design a wearable device for blind people to detect obstacles.To provide an affordable and efficient alternative to traditional navigation tools like white canes and guide dogs. To improve mobility and independence for visually impaired individuals. To enhance obstacle detection using ultrasonic sensors with audible or vibration alerts.

2.2.3. Advantages:

- **Guides Blind People**: Helps users navigate safely by detecting obstacles.
- **Low-Cost Design:** An efficient and economical solution compared to existing alternatives.

2.2.4. Disadvantages:

- **Limited Detection Range:** Ultrasonic sensors have a restricted range and may fail to detect objects that are far away.
- **Obstacle Detection Accuracy:** The system might not accurately detect small or thin objects, such as wires or poles.

2.3.PAPER 3

Title: Third Eye

Authors: Dr M Arun Kumar

Year: 2021

2.1.2. Introduction:

The "Third Eye" project aims to assist visually impaired individuals by creating a wearable device that detects obstacles using ultrasonic sensors and alerts users through vibrations and buzzer sounds. This innovative and affordable technology can enhance the mobility, confidence, and safety of blind people. It overcomes limitations of traditional tools like white canes and guide dogs by being cost-effective, efficient, and easy to use.

2.1.3. Objectives:

Design a portable, wearable device for the visually impaired to detect obstacles and navigate safely. Empower visually impaired individuals to move confidently using ultrasonic sensors that provide feedback via vibrations and buzzer sounds. Develop a cost-effective, efficient, and user-friendly system to improve daily mobility and safety.

2.1.4. Advantages:

- **Affordability:** The device is inexpensive compared to existing navigation aids like guide dogs.
- **Portability:** Wearable as a glove or band, making it convenient for users.

2.1.5. Disadvantages:

- **Limited Range**: The detection range is dependent on the capabilities of the ultrasonic sensor.
- **Prototype Limitations:** Current prototype is not yet optimized for mass production or long-term durability.

CHAPTER 3

EXISTING SYSTEM

1. Smart Glasses

Smart glasses are wearable assistive devices designed to provide visually impaired individuals with a better understanding of their surroundings. They typically consist of a small camera, a processor, and an audio output system, allowing them to interpret and describe the environment in real-time. One of the most advanced examples is the OrCam MyEye, a lightweight device that attaches to regular glasses. It reads text from books, signs, and screens, identifies objects, and even recognizes faces, providing the user with audio

2. Smart Canes

Smart canes build on the traditional white cane by incorporating technology to provide enhanced navigation and obstacle detection. The We Walk Smart Cane is a notable example, equipped with ultrasonic sensors to detect obstacles above chest level and provide vibration feedback. Additionally, it integrates with GPS systems and accessibility apps on smartphones to guide users through unfamiliar areas. Another innovative option is the Smart Cane developed by IIT Delhi, which uses similar ultrasonic technology to detect obstacles within three meters and offers affordable solutions for low-income regions.

3.AI-Powered Wearables

AI-powered wearables are compact devices designed to assist visually impaired individuals through advanced sensor technologies. One such device is the Sunu Band, a sonar wristband that uses echolocation to detect objects and provide haptic feedback based on the distance and direction of the obstacle. This wearable is lightweight and works well in conjunction with traditional mobility aids like canes. Another example is the Buzz Clip, a small clip-on device that uses ultrasound to detect obstacles and alerts the user with vibrations.

CHAPTER 4

PROPOSED SYSTEM

4.1. Problem Statement

Design a "Third Eye" device for visually impaired individuals using an Arduino Uno, which detects nearby obstacles and alerts the user through buzzer feedback. The system should use sensors, such as ultrasonic or infrared, to gauge the distance to obstacles in the user's path, enabling safer navigation in real-time.

4.2. Our Solution

The "Third Eye" device for visually impaired individuals is an Arduino Uno-based wearable system that detects nearby obstacles and provides real-time auditory feedback through a buzzer. It utilizes an ultrasonic sensor (such as the HC-SR04) to measure the distance to obstacles in the user's path. The ultrasonic sensor emits sound waves, which bounce back upon hitting an object, and calculates the time taken for the echo to return. This time data is processed by the Arduino using the formula Distance = (Time × Speed of Sound) / 2 to determine the object's distance. When an obstacle is detected within a predefined threshold (e.g., 50 cm), the buzzer emits a beeping sound to alert the user. The closer the obstacle, the faster the beeping frequency, providing intuitive guidance. The device is powered by a 9V battery or a USB power source, making it portable and easy to use. The circuit involves connecting the ultrasonic sensor's pins (Trig and Echo) to designated Arduino digital pins and the buzzer to another digital pin. The Arduino program processes the sensor data and triggers the buzzer when necessary. Compact and efficient, the system is designed to be worn on the user's chest or as a handheld device, enabling safer navigation in real-time by alerting the user to obstacles in their immediate surroundings. The design is versatile, allowing the device to be worn on the body, such as on a belt or chest strap, or used as a handheld unit. Its compact design ensures minimal interference with the user’s mobility. By combining lowcost components with open-source programming, the Third Eye device is both affordable and customizable, making it accessible for widespread adoption.

CHAPTER 5

GOALS OF THE PROJECT

5.1. Objectives

The primary objective of this project is to design and implement a "Third Eye" device that assists visually impaired individuals by detecting obstacles in their path and alerting them through buzzer feedback. This system aims to improve navigation, safety, and independence for the user. Specific objectives include:

- **Obstacle Detection:** Develop a system capable of detecting obstacles at varying distances using ultrasonic or infrared sensors.
- **Compact and Wearable Design**: Create a portable and lightweight device that can be worn or carried conveniently by the user. Ensure the design is user-friendly and unobtrusive.
- **Low-Cost and Accessible**: Use readily available, cost-effective components such as the Arduino Uno, ultrasonic/infrared sensors, and a buzzer. Make the device affordable and replicable for widespread adoption.
- **Energy Efficiency:** Optimize the system for low power consumption to enhance battery life and usability.

5.2. Goal Description

The goal of this project is to develop an efficient, reliable, and affordable "Third Eye" device that empowers visually impaired individuals to navigate their surroundings safely and confidently. By leveraging the capabilities of the Arduino Uno microcontroller and distance sensors, the system will detect obstacles and alert the user in real time using a buzzer. The feedback mechanism will vary based on the proximity of the obstacles, providing an intuitive way for users to understand their environment. This project addresses the pressing need for assistive technology tailored to the unique requirements of visually impaired individuals.

CHAPTER 6

PROJECT DESIGN

The "Third Eye" device is designed to assist visually impaired individuals by helping them navigate their surroundings safely. Using an Arduino Uno microcontroller, the device employs an ultrasonic sensor to detect obstacles in the user's path and provides feedback via a buzzer.

6.1. Data Extraction

The "Third Eye" device involves capturing real-time distance information from the sensors, which can be either ultrasonic or infrared. The ultrasonic sensor works by sending out a trigger pulse and measuring the time it takes for the echo to return after hitting an obstacle. The Arduino Uno then calculates the distance using the formula: Distance = (Time × Speed of Sound) / 2, where "Time" is the time taken for the echo to return, and the "Speed of Sound" is a known constant. This distance data is continuously monitored and processed by the Arduino in real-time to detect any changes in the environment, ensuring that immediate feedback is provided to the user. The distance readings are used to determine the proximity of obstacles, with pre-set threshold values (e.g., less than 30 cm, 30–50 cm, and greater than 50 cm) triggering different levels of feedback from the buzzer and, optionally, a vibration motor. This allows the user to receive accurate and timely alerts about the obstacles in their path, making the navigation process safer and more intuitive.

6.2. Security Enhancement

The "Third Eye" device are designed to ensure both the reliability and safety of the system in real-world environments. One key enhancement is sensor fusion, where both ultrasonic and infrared sensors are used together to provide redundancy. This ensures that if one sensor becomes obstructed or malfunctions, the other can still function correctly, reducing the risk of false readings or failure to detect obstacles. Additionally, noise filtering techniques can be implemented in the software to smooth out any irregular sensor data caused by environmental factors like background noise or interference. This ensures the system consistently provides accurate distance readings, improving the reliability of the feedback provided to the user. Another important security feature is the emergency alert system. If the user remains stationary in close proximity to an obstacle for an extended period, the device could trigger an alert to caregivers or emergency services,connected system that sends notifications if the user is in a potentially hazardous situation. Power management is also crucial, as ensuring the device uses minimal power when idle can extend battery life.

Additionally, the system can alert the user when the battery is running low, ensuring the device is always operational when needed. Finally, calibration options should be available to adapt the device to different environments, such as indoor or outdoor settings, ensuring it performs optimally in various conditions. These security enhancements help ensure the device remains reliable, accurate, and safe for the user, minimizing the risks of malfunction or unpredicted behaviour.

6.3. User Interface

The "Third Eye" device primarily relies on auditory and tactile feedback to communicate information about the surrounding environment to visually impaired users. The main component of the interface is a buzzer that emits varying frequencies based on the proximity of obstacles detected by the sensors. As the user approaches an obstacle, the frequency of the buzzer increases, providing an audible cue about the distance—faster beeps indicate closer obstacles, while slower beeps suggest the user is further away. Additionally, a vibration motor can be integrated for tactile feedback, which provides a vibrating signal to complement the auditory cues. The vibration intensity or speed can also change based on proximity to obstacles, offering another layer of feedback for the user. To allow the user to interact with the device, simple control buttons can be added. For example, a mode button can allow the user to switch between different feedback modes, such as buzzer-only, vibrationonly, or both, depending on the user's preferences.

6.4. Block Diagram

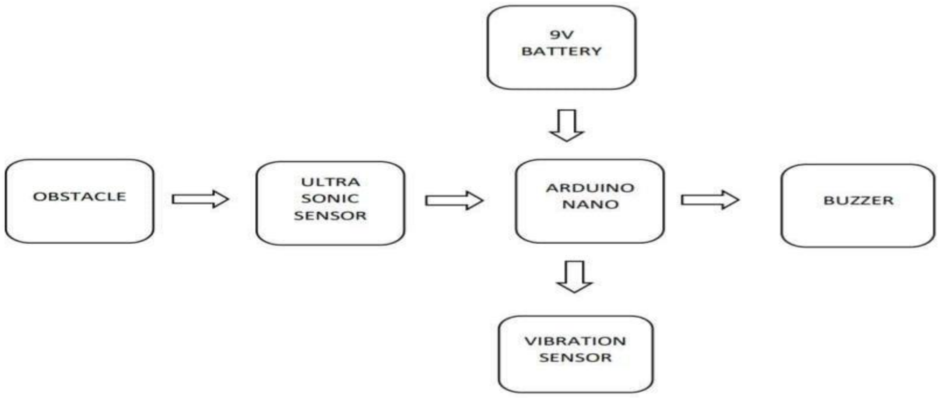


Fig.6.1. Block Diagram

6.5. Algorithm for Third Eye

1.Initialize the System:

- Set up the ultrasonic sensor pins (trigger and echo).
- Initialize the buzzer pin and vibration motor pin.
- Set the serial communication for debugging (optional).
- Set up any mode buttons if needed (for user preferences like switching between buzzer and vibration).

2.Start the Loop:

- Continuously measure the distance to the nearest obstacle using the ultrasonic sensor.

3.Distance Measurement:

- Trigger the ultrasonic sensor to send a pulse.
- Measure the time it takes for the pulse to return (echo).
- Calculate the distance using the formula:\text {Distance} = \frac {\text {Time} \time\text {Speed of Sound}}{2}

4.Distance Evaluation:

Check the distance against predefined thresholds:

- 15 cm: Very close to an obstacle (high alert).
- 25 cm: Moderate distance (medium alert).
- 40 cm: Safe distance (low alert).

5.Provide Feedback:

- If the distance is less than 15 cm, activate the buzzer with a high-frequency sound (fast beeping) to indicate an obstacle is very close. Optionally, turn on the vibration motor for additional tactile feedback.
- If the distance is 25 cm, activate the buzzer with a moderate-frequency sound (slower beeping).
- If the distance is greater than 40 cm, turn off the buzzer and vibration motor, indicating a clear path.

6.Loop Continuously:

- Repeat the distance measurement and feedback process indefinitely to provide real- time navigation assistance.

6.4. Algorithm in Pseudocode

Begin

Initialize triggerPin, echoPin, buzzerPin

Set serial

communication

Initialize mode

button (if

applicable) Loop:

Trigger ultrasonic sensor to send pulse

Wait for echo pulse

Calculate distance (Distance = (Time * Speed_of_Sound) / 2) If Distance < 20 cm:

Activate buzzer with high frequency (fast beeping)

Activate vibration motor

Else If Distance >= 20 cm and Distance <=50 cm:

Activate buzzer with moderate frequency (slower beeping)

Else:

Deactivate buzzer (clear path)

Delay for a short time (e.g., 100ms)

End

CHAPTER 7

RESOURCE REQUIREMENTS

7.1. Hardware Requirements

- Arduino Uno Board
- Ultrasonic Sensor (HC-SR04)
- Buzzer
- Power Supply
- Jumper Wires
- Breadboard

7.2. Software Requirements

- Arduino IDE
- Arduino Libraries
- Arduino Sketch/Code
- Serial Monitor (for debugging)

CHAPTER 8

DESCRIPTION OF TOOLS AND TECHNOLOGIES

8.1. Description of tools

The "third eye" for blind individuals refers to technologies that enable them to perceive their surroundings using non-visual means. Echolocation devices, for example, emit sound waves and use their reflection to detect objects in the environment, helping users navigate. Haptic feedback devices provide tactile sensations, allowing blind individuals to feel changes in their surroundings, while vibration-based navigation systems use wearables to direct users and alert them to obstacles. Smart glasses equipped with cameras can convert visual information into audio or haptic feedback, aiding in navigation. Sensory substitution devices convert visual data into sounds or touch, while brain-computer interfaces (BCIs) interpret brain signals to enhance perception. Sonar technology, similar to echolocation, detects nearby objects by emitting sound waves, while voice-activated systems and audio-based mapping tools provide verbal guidance to assist in navigation. Wearable sensors, radar devices, and obstacle detection systems use various technologies to notify users of their surroundings through sound or vibrations. Additionally, devices like smart canes, Braille displays, and portable cameras capture and convey environmental details to help users interact with their world. AI-based assistive tools, such as speech recognition and interactive navigation apps, are also becoming more common, enabling greater independence. These technologies, from ultrasonic sensors to RFID and AI-driven devices, work together to offer blind individuals an enhanced sense of perception and navigation.

8.1.1. Arduino Uno

The Arduino Uno is a widely used microcontroller board based on the ATmega328P chip, making it a popular choice for electronics and programming projects. It features 14 digital input/output pins, which can be used to interact with various sensors, LEDs, and other components. Six of these pins are capable of Pulse Width Modulation (PWM), allowing for control over devices like motors. Additionally, the board has 6 analog input pins, which can read signals from analog sensors such as temperature sensors or potentiometers. The Arduino Uno can be powered through a USB connection or an external power supply, and it has a voltage regulator to ensure stable operation. It also includes a built-in LED on pin 13, which is often used for basic testing and debugging.

Communication with a computer for programming and data transfer is facilitated via the USB interface, while the board supports serial communication through its RX and TX pins for connecting to other devices. Advanced users can also reprogram the microcontroller using the In-Circuit Serial Programming (ICSP) header. The board is programmed through the Arduino IDE, a user-friendly platform that is compatible with Windows, macOS, and Linux. Its small size, around 2.7 x 2.1 inches, makes it easy to incorporate into various projects, and it can be extended with shields to add additional functionalities like motor control, Wi-Fi, or Bluetooth. As an open-source platform, both the hardware and software designs are publicly available, making it a favourite among hobbyists, students, and professionals. The large global community also provides a wealth of resources, tutorials, and project ideas, ensuring that the Arduino Uno is a versatile tool for creating a wide range of innovative devices.

Fig 8.1. Arduino Uno Board

8.1.1. Ultrasonic Sensor (HC-SR04)

The HC-SR04 is a popular ultrasonic sensor used for measuring distance by emitting high- frequency sound waves and calculating the time it takes for the waves to bounce back after hitting an object. It operates with a 5V power supply and consists of two main components: a transmitter (which sends out the sound waves) and a receiver (which detects the reflected waves). The sensor provides two primary outputs: a trigger pin to start the measurement and an echo pin to return the time delay. The time taken for the echo to return is used to calculate the distance to the object based on the speed of sound. It is widely used in projects with platforms like Arduino for simple, efficient distance sensing.

The HC-SR04 can measure distances typically between 2 cm and 400 cm with an accuracy of around 3 mm, making it suitable for various applications like robotics, object detection, and proximity sensing.

Fig.8.2. Ultrasonic Sensor (HC-S04)

8.1.2. Buzzer

A buzzer is a common component used in assistive technologies for blind individuals, particularly in devices like the "third eye" systems that help with navigation and environmental awareness. In these systems, buzzers are employed as a form of auditory feedback to alert users to nearby obstacles or guide them through specific actions. For example, when a sensor detects an object or a person in the path of the user, the buzzer emits a sound, with variations in tone or frequency indicating proximity or danger. This auditory signal helps the blind person understand their surroundings without needing to rely on vision. The buzzer's simplicity, affordability, and effectiveness make it an essential component in systems designed to enhance mobility and independencefor blind individuals, as it provides immediate, easy-to-interpret feedback in real-time.

Fig.8.3. Buzzer

8.1.3. Jumper Wires

Jumper wires are commonly used in the assembly of assistive devices for blind individuals, particularly in systems designed to enhance sensory perception, such as those that aim to provide a "third eye" experience. These devices often use cameras, sensors, or ultrasonic technologies to detect environmental stimuli, which are then translated into auditory, tactile, or vibrational feedback. Jumper wires serve as crucial connectors, linking various electronic components like sensors, processors, and feedback actuators, allowing them to work together. For example, in wearable navigation aids, jumper wires might connect sensors that detect obstacles to vibration motors that alert the user. These wires are also integral in more advanced systems, such as brain-computer interfaces (BCIs), where they link electrodes and sensors that help create sensory experiences beyond traditional sight. In all these cases, jumper wires facilitate the operation of complex electronic systems that provide visually impaired users with enhanced perception and navigation capabilities.

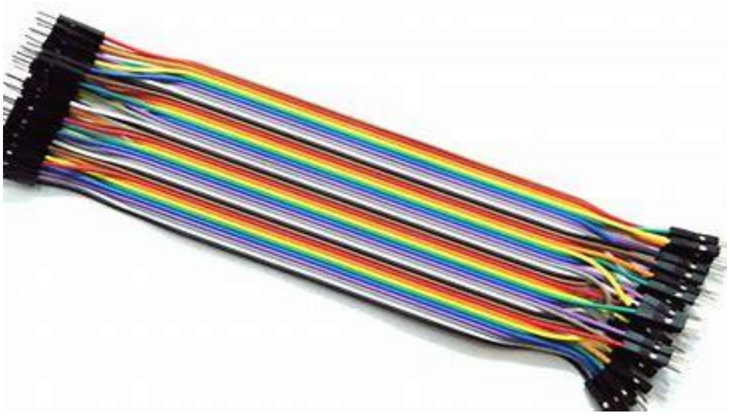


Fig.8.4. Jumper Wires

8.1.4. Breadboard

A breadboard is a tool used for prototyping and testing electronic circuits without the need for soldering, making it ideal for quickly creating and modifying circuit designs. It consists of a grid of holes arranged in rows and columns, where electronic components like resistors, capacitors, and transistors can be inserted, and connections can be made using jumper wires. The breadboard has power rails for providing positive and negative power to the circuit, and terminal strips where the components are placed. These strips are electrically connected in rows, allowing components to share connections easily. Breadboards are particularly useful in the design and testing phases, as they allow for rapid experimentation and troubleshooting without permanent alterations. The advantages of using a breadboard include the ability to reuse it for different projects, ease of modification, and the cost-effectiveness of creating prototypes without the need for soldering. Breadboards are commonly used in education, engineering, and hobbyist projects, providing a flexible platform for developing and testing circuit ideas.

Fig.8.5. Breadboard

8.1.5. Volt Battery

A Volt Battery Hi-Watt typically refers to a high-power, high-voltage battery designed to deliver significant energy output, often used in applications that require substantial power. These batteries are commonly found in high-performance devices like power tools, electric vehicles, solar energy systems, and other equipment that demands a large amount of energy over a relatively short period. The term "Hi-Watt" refers to the ability of the battery to provide a high wattage output, which is a measure of electrical power, indicating that the battery can supply a large amount of energy to power high-demand devices.

a high wattage output, which is a measure of electrical power, indicating that the battery can supply a large amount of energy to power high-demand devices. Volt, referring to the unit of electrical potential, indicates the battery's ability to deliver voltage to the circuit. These batteries are designed for efficiency, ensuring that devices run longer and more effectively, while also offering high voltage output to meet the energy needs of power-intensive applications. They are crucial in industries where both high voltage and high power are needed for performance, such as renewable energy storage or in electric vehicles where quick bursts of energy are often required for acceleration and long-term operation.

Fig 8.6. Volt Battery

8.2. Language used

8.2.1.C++:

C++ is a high-level, general-purpose programming language that is widely used for developing software applications, games, and system-level programming. It was created by Bjarne Stroustrup in the early 1980s as an extension of the C language, adding object-oriented programming (OOP) features like classes, inheritance, and polymorphism. C++ is known for its performance, efficiency, and versatility, as it allows developers to write both high-level code for applications and low-level code for systems and hardware. It supports multiple programming paradigms, including procedural, object-oriented, and generic programming, making it suitable for a wide range of applications. C++ is commonly used in areas where performance is critical, such as game development, operating systems, embedded systems, and real-time applications. The language provides powerful tools for memory management, giving developers fine control over system resources, although this also requires careful attention to avoid errors such as memory leaks. Its widespread use, robust standard library, and compatibility with other languages have made C++ a fundamental language in the programming world.

8.3.Arduino IDE

The Arduino IDE (Integrated Development Environment) is a software platform used to write, compile, and upload code to Arduino microcontrollers, which are popular in electronics and embedded systems projects. In the context of the "third eye" for blind individuals, the Arduino IDE plays a crucial role in developing assistive technologies designed to enhance the sensory experiences of visually impaired users. The "third eye" concept often refers to a device or system that helps blind people perceive their environment using alternative senses, such as sound, touch, or vibrations. Using the Arduino IDE, developers can create projects that involve sensors (like ultrasonic, infrared, or cameras) to help blind users navigate their surroundings. For example, an Arduinobased system might use an ultrasonic sensor to detect obstacles and provide feedback through vibration or audio signals, giving users the ability to "see" their environment through non-visual means. The Arduino IDE is used to program the logic of these sensors, manage the feedback mechanisms, and process data in real-time. Arduino's flexibility, ease of use, and extensive community support make it an ideal choice for creating prototypes of such assistive technologies. By writing code in the Arduino IDE, developers can quickly iterate on ideas, adjusting the sensors' sensitivity, feedback types, or integration with other devices like haptic feedback modules or wearable systems. Overall, the Arduino IDE is a powerful tool for bringing innovative "third eye" solutions to life, allowing for more accessible, affordable, and customizable assistive devices for blind individuals.

CHAPTER 9

IMPLEMENTATION OF CODE

Pin definitions const int trigPin = 2;

// Trigger pin of ultrasonic sensor

const int echoPin = 3; // Echo pin of

ultrasonic sensor const int buzzerPin

= 12; // Buzzer pin

// Constants for

distance thresholds in

cm const int

slowBeepDistance =

40; const int

mediumBeepDistance

= 25; const int

fastBeepDistance =

15;

slowBeepInterval = 1000; // Slow beep every 1

second const int mediumBeepInterval = 500; //

Medium beep every 0.5 seconds const int

fastBeepInterval = 200; // Fast beep every 0

// Variables for

timing

```
unsigned long
previousMillis
= 0; void
setup() {
pinMode(trigPi
n, OUTPUT);
pinMode(echo
Pin, INPUT);
pinMode(buzz
erPin,
OUTPUT);
Serial.begin(96
00);

}void loop()

{

  // Measure the distance using the ultrasonic sensor   long
distance = measureDistance();// Determine the beep interval
based on distance   int beepInterval = 0;   if (distance <
fastBeepDistance) {     beepInterval = fastBeepInterval;
  } else if (distance <
mediumBeepDistance) {
beepInterval =
mediumBeepInterval;   }
```

```
else if (distance <
slowBeepDistance) {
beepInterval =
slowBeepInterval;
  } else {   beepInterval = 0; // No beep if distance is
above 40 cm} Check if it's time to beep based on the
interval   if   (beepInterval   >   0)   {    unsigned   long
currentMillis  =  millis();              if   (currentMillis   -
previousMillis  >=  beepInterval)  {    previousMillis  =
currentMillis; // Activate the buzzer for a short beep
tone(buzzerPin,  1000);  //  Frequency  of  1kHz    delay
(100);            // Beep duration        noTone(buzzerPin);
// Turn off the buzzer
    }}

// Function to measure distance using the ultrasonic
sensor long measureDistance() {   digitalWrite(trigPin,
LOW);   delayMicroseconds(2);   digitalWrite(trigPin,
HIGH);   delayMicroseconds(10);   digitalWrite(trigPin,
LOW);// Calculate the duration of the pulse   long
duration = pulseIn(echoPin, HIGH);// Calculate the
distance (in cm)   long distance = duration * 0.034 / 2;
return distance;
}
```

CHAPTER 10

RESULTS

10.1. Outlook of Third Eye

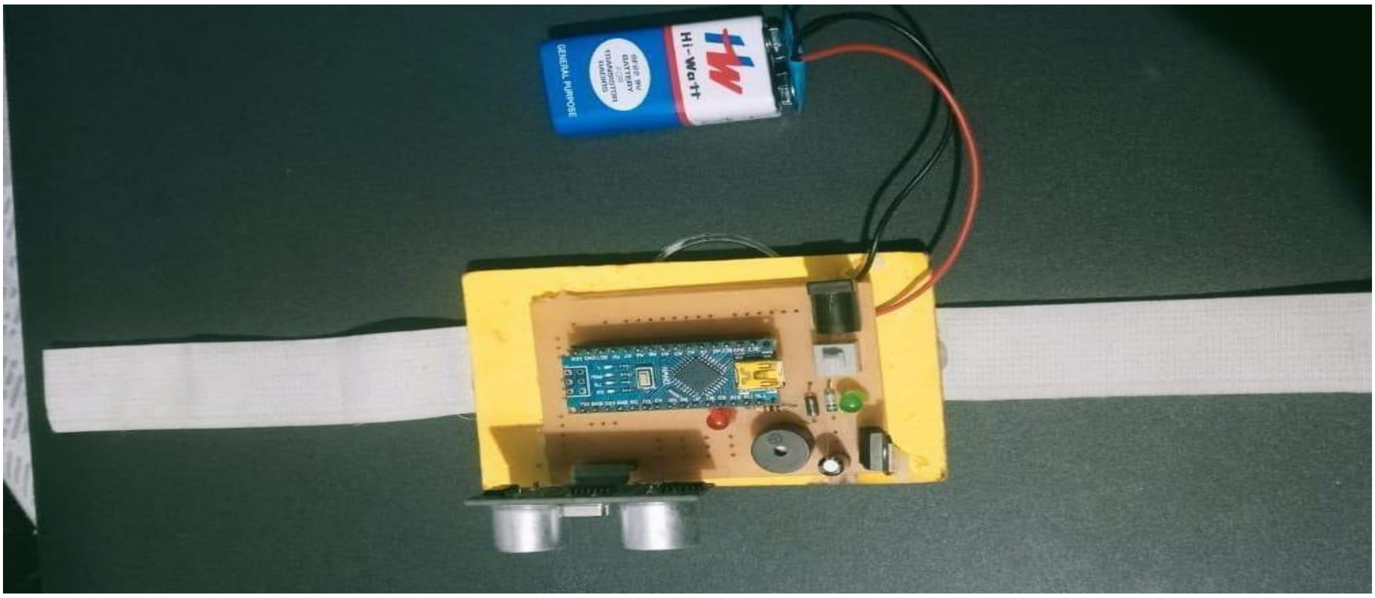


Fig 10.1. Outlook of Third eye

10.2. Components of Third Eye

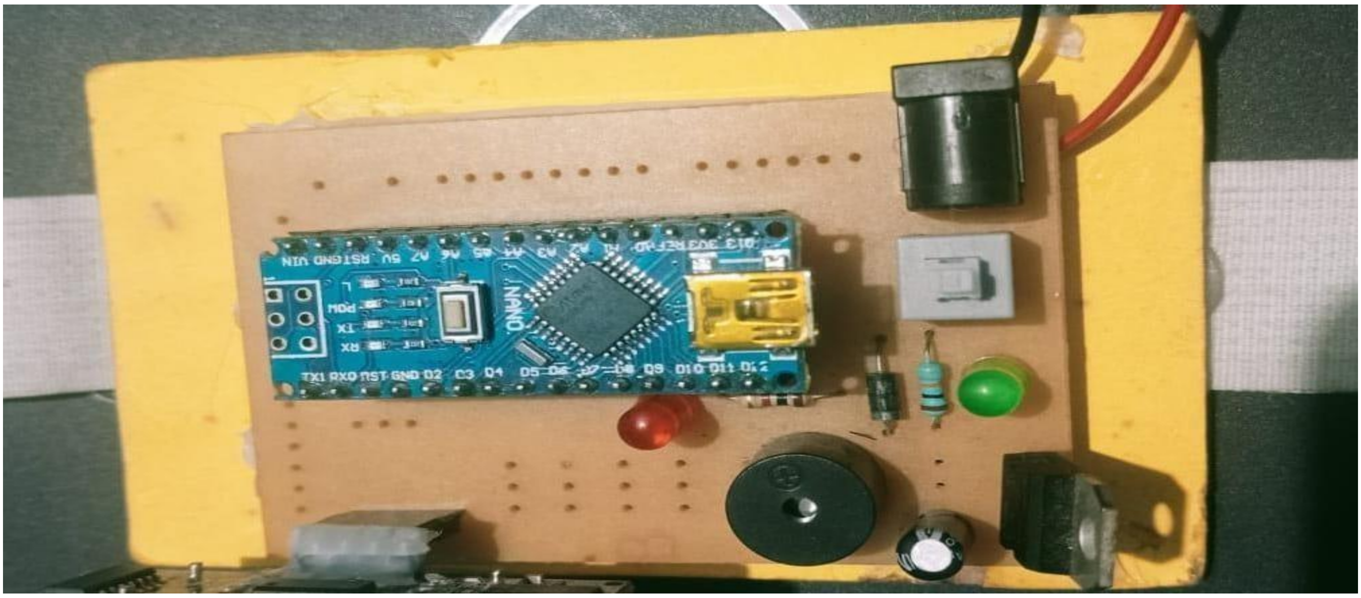
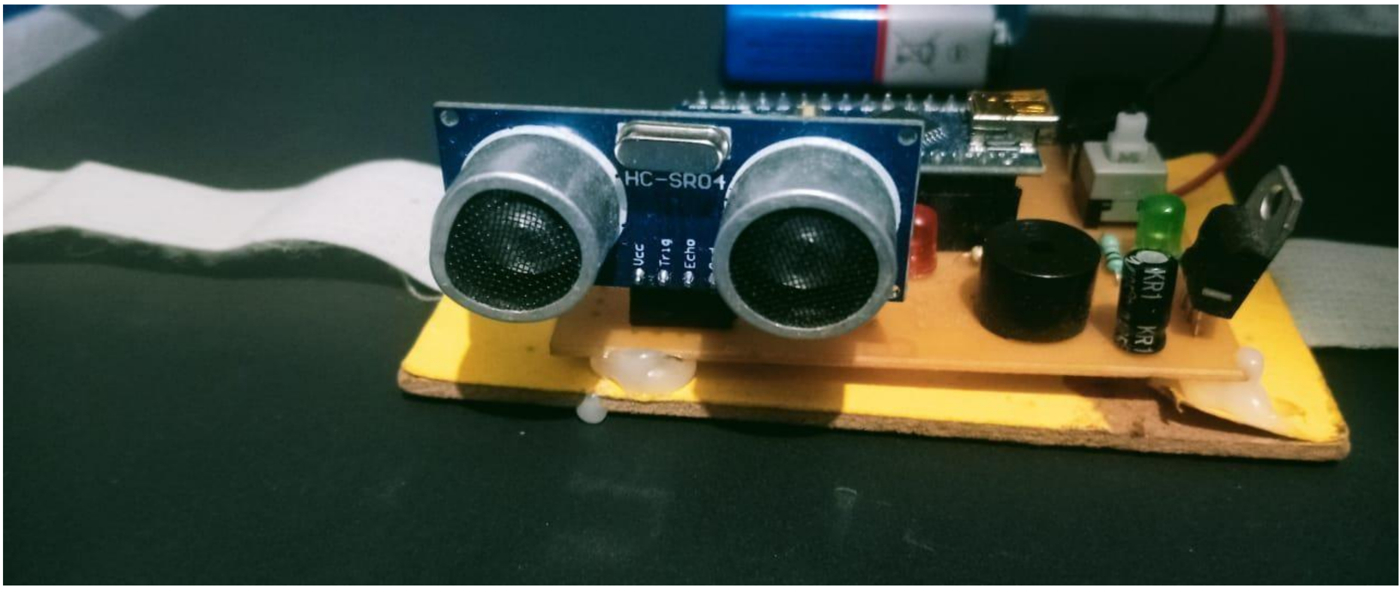


Fig 10.2. Components of Third Eye

10.3. Ultrasonic Sensor in Third Eye



10.3. Ultrasonic Sensor in Third Eye

10.4. Buzzer activation

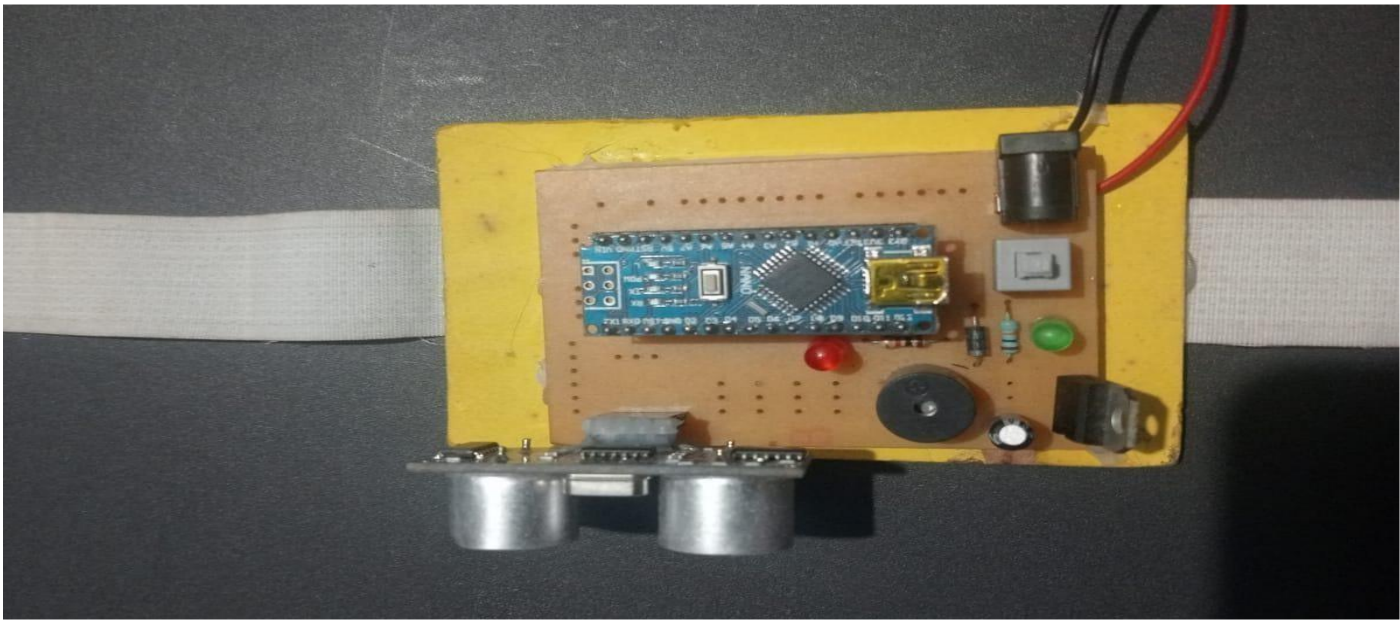


Fig 1.4. Buzzer Activation

CONCLUSION

The third eye for blind model represents a groundbreaking and innovative approach to enhancing the lives of visually impaired individuals by providing alternative means of perceiving the environment around them. This model leverages a combination of advanced technologies, such as ultrasonic sensors, infrared sensors, cameras, and haptic feedback systems, to help blind individuals navigate their surroundings with greater confidence and independence. By converting visual information into sensory data like sound, touch, or vibration, it allows users to gain awareness of obstacles, distances, and spatial layouts in real time. Technologies like Arduino and other microcontroller platforms enable the development of customizable, cost-effective, and easily modifiable devices that can be tailored to the unique needs of each user. The integration of these technologies into wearable devices, like vests, wristbands, or glasses, offers practical solutions to daily challenges, empowering blind individuals to move freely in various environments. The third eye model is not just about creating a functional device but about fostering inclusion, safety, and independence for those with visual impairments. As advancements continue, these systems are expected to become more precise, intuitive, and user-friendly, ensuring that the visually impaired can experience a greater degree of freedom and autonomy. With further development, the third eye for blind models has the potential to transform the way blind individuals interact with the world, making it more accessible, inclusive, and supportive for all.

FUTURE ENHANCEMENT

In the future, with the advancement of quicker response times and the use of top-notch sensors, the "third eye" model for blind individuals has the potential to become significantly more efficient and practical. The integration of high-performance sensors could allow for faster and more accurate detection of obstacles, ensuring real-time feedback with minimal delay. Additionally, the modules currently worn as bracelets or other small devices can evolve into more comfortable and practical wearable clothing, such as a specialized coat, which would allow for better integration into daily life. This transformation would make the device more discreet, comfortable, and suitable for long-term wear, enhancing the user's experience. Moreover, future advancements could involve the incorporation of piezoelectric plates in the shoes of the user. These plates would harness energy generated from walking to power the modules, creating a self-sustaining system. By converting mechanical energy into electrical power, this innovation could eliminate the need for external power sources, making the device even more autonomous and convenient. As technology continues to evolve, these improvements could lead to a more integrated and efficient solution, offering greater mobility and independence for blind individuals, while also reducing the reliance on traditional power sources.

BIBLIOGRAPHY

[1]Batool, Azra & Naz, Shaheen. (2023)." THIRD EYE FOR BLIND". ASIAN JOURNAL OF CONVERGENCE IN TECHNOLOGY. 7. 1-4, 10.33130/AJCT.2021v07102.001.

[2]S. B. Totade, P. V. Raut, S. Kurekar, and A. Lone, "Arduino Based Third Eye for the Blind Person," International Journal of Research Publication and Reviews, vol., no. 12, pp. 1781- 1782, Dec. 2022.

[3]45S_BE_1135, "THIRD EYE," Gandhi Institute of Technology and Management GITAM Off Campus, Bengaluru, Department of Electronics and Communication Engineering, Dr. M. Arun Kumar Feb.2021

[4]A. Prajapati, A. Prajapati, A. Singh, A. Kumar, and M. Pandey, "THIRD EYE FOR BLIND," vol. 9, p. 501, 2024, Accessed: Oct. 25, 2024.

[5]R. K. Kamat, R. Singh, and Faraz Chisti, "Third Eye for Blind Person (Smart Gloves)." International Journal of Innovative Research in Technology, vol. 8, пo. 1, pp. 1115 1120, Jun. 2021, Accessed: Oct. 25, 2024.