**A Project Report**

**On**

# "Smart alert system for a Blind Person"

**Submitted towards the Partial fulfillment of the requirements**

**of CIA of TY bachelor of technology in**

**Computer Engineering**

**By**


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**(TY B.Tech Computer Engineering )**


**UNDER THE GUIDANCE OF**

**Prof. Dr. A. B. Pawar**


**DEPARTMENT OF COMPUTER ENGINEERING**

**SANJIVANI RURAL EDUCATION SOCIETY'S**

**SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON**

**(An Autonomous Institute)**


**2022-23**


**SANJIVANI RURAL EDUCATION SOCIETY'S**

**SANJIVANI COLLEGE OF ENGINEERING, KOPARGAON**

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**Department of computer engineering**

# CERTIFICATE

**This is to certify that the Project Entitled**

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**is a bonafide work carried out by students under the supervision of Prof./Dr. Guide A.B.Pawar and it is submitted towards the partial fulfillment of the requirement of CIA of TY Bachelor of Technology (Computer Engineering). During the academic year 2022-23**

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# CIA APPROVAL SHEET

A CIA Project Report On

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is successfully completed by


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## Project Proposal

## Project Title:

## “Smart alert system for blind person”

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## Department of Computer Engineering

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# Chapter 1- Project Summary

The Smart Alert System for a Blind Person is an innovative project aimed at improving the quality of life for visually impaired individuals. The system is designed to help a blind person navigate their environment with greater ease and safety. The core of the system is a stick that includes sensors and a microcontroller. The device is designed to detect obstacles in the user's path and provide feedback through vibration alerts. Overall, the Smart Alert System for a Blind Person is an innovative and practical solution for improving the lives of visually impaired individuals. By providing real-time information and alerts, the system enables blind people to navigate their environment with greater ease, safety, and independence.

## 1.1 Background

Visual impairment is a limitation of the eye on the visual system. A person is called visually impaired if they have lost the ability and visual acuity to see objects as clearly as another healthy person, or if they are unable to see an area as large as another healthy person's health, or if he can't see the light or he has double vision problems. These visually impaired people face a myriad of problems such as the risk of accidents due to walking. In early days due to lack of technology and unavailability of resources many accidents were taking place. In unplanned cities and disorderly traffic lead to many accidents for the visually impaired, so taking this into consideration, this document proposes a system for the visually impaired that gives alert of obstacles. This will replace the baton remedy for the visually impaired.

## 1.2 Statement of the problem

The problem statement for a smart alert system for a blind person is to create a technology solution that can detect and alert a visually impaired person about their surroundings, potential obstacles, and other hazards in their environment. The system must use sensors, cameras, and other IoT devices to identify objects and activities, and then communicate this information to the blind person using audio or buzzer feedback. The system must also be easy to use, portable, and customizable to meet the specific needs and preferences of the user. The ultimate goal is to enhance

the independence, safety, and quality of life of visually impaired individuals by providing them with real-time information about their surroundings

## 1.3 Objectives

The smart alert system for a blind person is to guide the blind persons in their daily life safely.

There are some key objectives of a smart alert system.

**1.Obstacle detection:** The smart alert system should be able to detect obstacles coming in the blind person's path, such as walls and furniture.

**2.Navigation Assistance:** The smart alert system should provide guidance to the blind person to help them to reach their destination.

**3.Hazard Avoidance:** The smart alert system should be able to identify and alert the blind person to potential hazards, such as low hanging branches coming to their path.

**4.Ease of use:** The smart alert system should be easy to operate and have a long battery life so that it can be used comfortably and reliably by the user.

By achieving these objectives ,a smart alert system for a blind person can greatly enhance their mobility,independence,and overall quality of life.

## 1.4 Technology/ Research Gap (Length: Max 100 words)

The following are the technologies used in the project :

**1. IOT -**

Smart alert system for blind persons involves use of IOT technology which includes Ultrasonic Sensor, Arduino UNO, Buzzer, Battery, LED. Our proposed system consists of three main IOT units - Ultrasonic Sensor unit,Arduino unit and Voice command unit.

- Ultrasonic sensor will be used to determine the distance between the object and the user.
- Arduino will take input from obstacles and then it will be accepted by

- a tiny speaker(buzzer) which will give instructions to the user in the form of notification.

**2. Artificial Intelligence and Machine Learning -**

For detection of objects or obstacles coming in front of blind people we are using some algorithms of AL and ML. After detecting an obstacle, the notification will be given to the user by this algorithm.

**3. Arduino IDE -**

Arduino IDE is an open-source software program which is used to write and upload code to the arduino boards. Arduino IDE is used to get inputs from ultrasonic sensors and then it immediately alerts the user about obstacles with a vibration using a buzzer.

- **Application -**

Our system works as a navigation device for visually impaired person.The advantage of the system is that it is a very low cost solution for blind people worldwide. It aims to solve problems of blind people in their daily routine. System also ensures the safety of the user.

## 1.5 Deliverables

- The Smart alert system helps visually impaired people to live their life confidently and independently.
- The system will be very helpful for them to move anywhere safely
- As the system has low cost, low power consumption,light weight,fast response and can receive the alert from buzzer which is affordable to any blind person worldwide.
- It facilitates easier communication in case of emergency.
- The smart alert system is a feasible device and can be convenient for them to carry it anywhere.
- The alert feature makes the system different from previous existing systems.
- It intends to tackle the problems faced by the blind person.

## 1.6 Resources and Budget

For developing a smart alert system for a blind person, it requires a combination of hardware and software components, as well as testing and implementation costs. Here are some of the resources and budget plans that need to kept under consideration:

1. **Hardware components:**
    - Stick
    - Sensors (e.g., proximity, Ultrasonic Sensor)
    - Audio system (e.g., speaker or Buzzer)
    - Battery and charging system
    - Other necessary components (e.g., casing, wiring)

2. **Software components:**
    - Machine learning and AI algorithms for detecting and alerting the user for obstacles.
    - Arduino IDE for the purpose of code uploading

3. **Testing and implementation:**
    - User testing and feedback gathering
    - Iterative development and improvement of the system
    - Testing in real-world scenarios
    - Technical support and maintenance

## Budget considerations:

- Hardware costs: The price of Stick and sensors can vary widely depending on the quality and features required. A budget of ₹500 to ₹1,000 is a good starting point.
- Software costs: Depending on the complexity of the system and the coding required for the arduino, the software development costs can range from ₹500 to ₹5000.
- Testing and implementation costs: User testing and feedback gathering can be done in-house or outsourced to a third-party company. The cost for this phase can range from ₹1,000 to ₹5,000.
- Technical support and maintenance costs: Ongoing support and maintenance can be provided by the development team or outsourced to a third-party company. The cost for this phase can range from ₹1,000 to ₹5,000 per year.

In summary, the total budget for developing and deploying a smart alert system for a blind person can range from ₹1000 to ₹5,000, depending on the complexity of the system and the level of support required. It is essential to improve the system based on feedback.

## 1.7 Project Plan with Milestones

| **Sr. No.** | **Milestone** | **Activity** | **Duration in months** |
|---|---|---|---|
| 1 | Project Definition | To find out the proper project definition. | 6/03/2023 |
| 2 | Research Proposal | Dividation of work among the group | 13/03/2023 |

| | | | |
|---|---|---|---|
| | | members and gathering information on same | |
| 3 | Research Proposal Submission | Submit the final research proposal containing all the objectives, scope, resource and budget summary | 3/03/2023 |
| 4 | Acquire all the hardware material required for the project | Purchase all the necessary sensors required for the implementation | 10/03/2023 |
| 5 | Assembling all the sensors on a final product. | Install the sensors on a proper framework for smooth data collection from the sensors. | 17/03/2023 |
| 6 | Conduct Preliminary Tests | Gather and examine sensor data. Resolve the problems if found | 24/03/2023 |
| 7 | Preparing Final Product | After Successful testing preparation of a final product | 8/05/2023 |
| 8 | Final submission of product with documentation | Complete the final product with proper documentation for evaluation of the project | 15/03/2023 |

## 1.8 Category of New Technology/Product

| Sr.No. | Category | Details |
|---|---|---|
| 1 | New-to-the-world Products/Technology | IoT-enabled Assistive Technology refers to devices or systems that combine IoT technology with assistive technology to provide enhanced functionality, features, and benefits. The IoT technology enables the devices to communicate with other devices and systems, collect and analyze data, and provide real-time alerts and notifications. |
| 2 | New-to-the-firm Products/Technology (new Product Lines) | a new-to-the-firm smart alert system for blind people using IoT should be designed to be affordable, user-friendly, and effective in enhancing mobility, independence, and safety. By leveraging IoT technology, the system can provide real-time data and analytics to improve the user's experience and enable them to navigate their environment with confidence. |
| 3 | Additions to existing Product Lines | Voice assistant integration, Multi-device support, Emergency services integration, Customizable alerts Overall, these additions would enhance the functionality and usability of an existing product line for a smart alert system for blind people, providing additional features and benefits that would improve the user's experience and make the system more effective in providing alerts and navigation guidance. |
| 4 | Improvements and Revisions to existing Products | Improved sensor technology, Smaller and more lightweight devices, Improved navigation capabilities, Improved connectivity. Overall, these improvements and revisions would make the product line more effective and user-friendly, improving the user's experience and increasing the value of the product. |

| | | |
|---|---|---|
| 5 | Repositioning | Repositioning an existing smart alert system for blind people could involve targeting a different market segment or emphasizing different product benefits such as Emphasize convenience and ease of use, Focus on safety and security, Emphasize social and environmental impact. |
| 6 | Cost Reductions | Finally, cost reductions complete the six categories of new products. Cost reductions refer to new products that simply replace existing products in the line, providing the customer similar performance but at a lower cost |

# Chapter 2- Requirement Analysis

Requirement analysis for a smart alert system for a blind person involves the following considerations:

**1.User needs:** The system should cater to the specific needs of the blind person. The system should be designed to assist the user in navigating, detecting obstacles.

**2.Accessibility:** The system should be easy to use and accessible to the blind person. The system should use audio feedback to convey information to the user.

**3.Compatibility:** The system should be compatible with various assistive devices.

**4.Detection and Recognition:** The system should be able to detect and recognize obstacles,peoples. The system should use sensors to detect obstacles.

**5.Range and Accuracy:** The system should be able to detect and recognize objects at a reasonable range with a high degree of accuracy.

**6.Customization:** The system should be customizable to the user's preferences and needs. The user should be able to set the sensitivity of the system and choose the type of feedback they prefer.

**7.Durability:** The system should be designed to withstand the wear and tear of daily use.

**8.Portability:** The system should be portable and lightweight, allowing the user to carry it with them wherever they go.

**9.Battery Life:** The system should have a long battery life, ensuring that the user is not left without the system's assistance when they need it.

**10.Emergency alerts:** The system should have the capability to alert the user in case of an emergency situation.

By considering these factors, a smart alert system for a blind person can be designed to cater to their specific needs and provide them with the assistance they require to navigate the world safely and independently.

## 2.1 Hardware components:

- Stick
- Sensors (e.g., proximity, Ultrasonic Sensor)
- Audio system (e.g., speaker or Buzzer)
- Battery and charging system
- Other necessary components (e.g., casing, wiring)

## 2.2 Software components:

- Machine learning and AI algorithms for detecting and alerting the user for obstacles.
- Arduino IDE for the purpose of code uploading

## 2.3 Analysis Report

We all the group members visited a nearby Eye Hospital “RATHI HOSPITAL”. There we observed too many Patients who were suffering from different problems regarding the eye. There we also found some people who were totally blind. Then afterwards we have taken permission from Dr Rathi (Eye Specialist) to have communication with the patients. Dr allowed us to interact with one of the Lady, she was suffering from Cataract disorder. In which she was not able to see. By having a good interaction with the lady we came to know the problems that a blind person faces in his/her entire life. And at last we also had interaction with Dr and he also suggested some of the ways to help the blind person.

Hence, it is found that the Smart alert system for a blind person is a smart system applicable to all people who are blind.


**Figure 1 : Field Visit at Rathi Eye Hospital, Kopergaon**

# Chapter 3 - System Design and Analysis

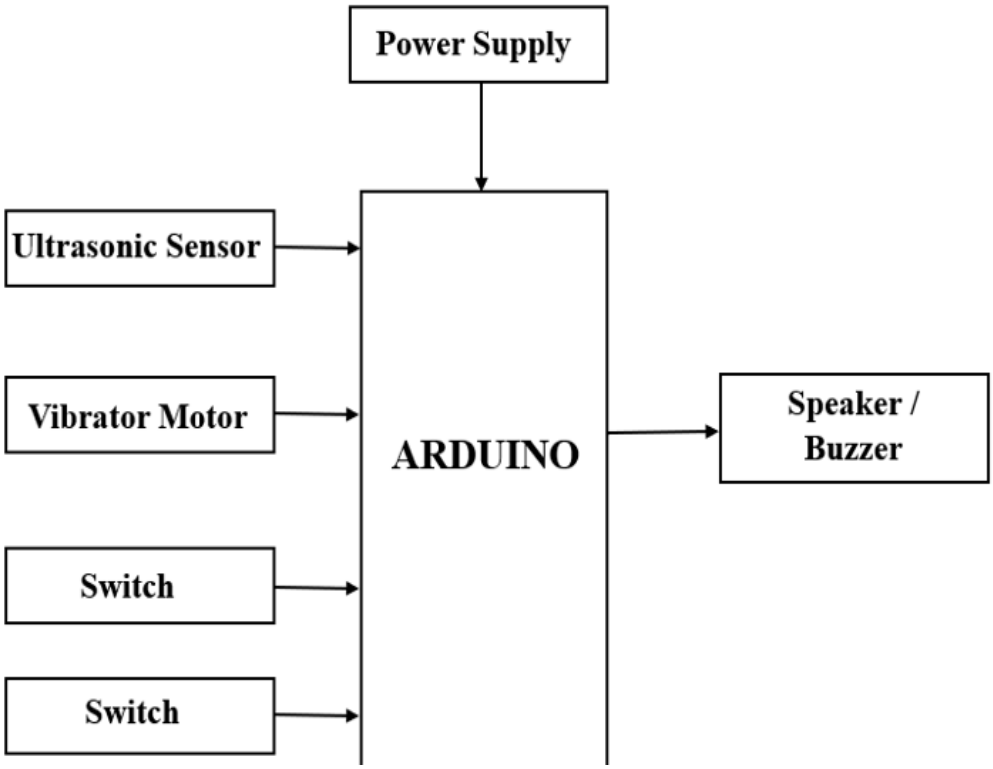


**Fig. 2 -** Block Diagram for Smart System for blind person

The detail explanation of each component in a block diagram is as follows:

**1.Power Supply** : The power supply is the primary component of the block diagram that provides power to all the components of the system.It can be a battery or a USB cable connected to a power source.

**2.Ultrasonic Sensor** : The ultrasonic sensor is the next component, which is used to detect obstacles in front of the blind person. It emits high-frequency sound waves and measures the time it takes for the waves to bounce back from an object to calculate the distance of the object from the sensor.

**3.Arduino Uno Board:** The Arduino Uno board is the control unit of the system, which receives input from the ultrasonic sensor and processes it to trigger the required actions. It is also responsible for interfacing with other components of the system.

**4. Vibrator Motor:** The vibrator motor is used to alert the blind person of the presence of an obstacle detected by the ultrasonic sensor. The motor is triggered by the Arduino board when an obstacle is detected within a specific range.

**5. Speaker:** The fifth component is the speaker, which is used in conjunction with a toggle switch to request assistance from those in the user's immediate vicinity. It repeats a pre-recorded message until the switch is turned off.

In summary, the block diagram for smart glasses for a blind person using an Arduino consists of a power supply, an ultrasonic sensor, an Arduino Uno board, a vibrator motor, and a speaker with a toggle switch. The ultrasonic sensor detects obstacles, the Arduino board processes the data, and the vibrator motor and speaker provide alerts and assistance to the wearer.

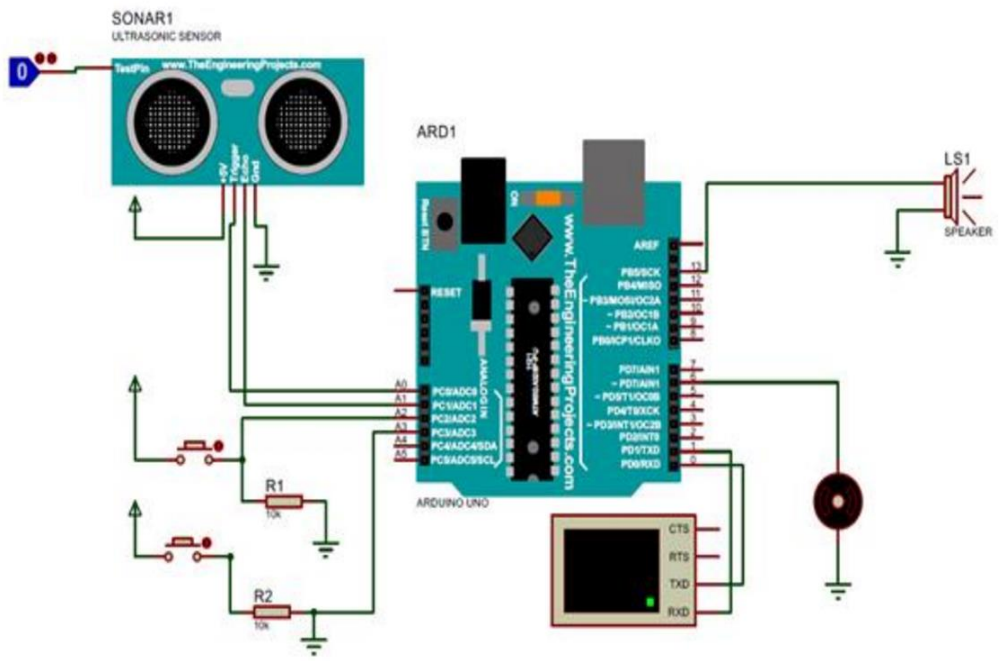


Fig. 3 - Circuit Diagram for Smart system for blind person

### 4.1 Working -

The system uses an ultrasonic sensor to detect obstacles in front of the blind person using sound waves within a specific range. The sensor acts as a transceiver, with both the transmitter and receiver inside. The time interval between the transmitted and received signal is calculated to determine the distance between the object and sensor. A customized Arduino Uno board serves as the controlling unit for this design, allowing for real-time sensing and object control. When the ultrasonic sensor detects an object, it sends a signal to the Arduino, which triggers a vibration motor to alert the visually impaired person. A toggle switch and speaker are also included for cases where the person is unable to speak and needs assistance. This device is intended to provide assistance to visually challenged individuals and improve their mobility and independence.

## 4.2 Implementation of smart alert system of blind person on tinkercad

Implementing a smart alert system for a blind person on Tinkercad involves using sensors to detect objects or obstacles in the person's path and trigger alerts through a buzzer or speaker. Here are the steps to implement such a system:

**1.Select the components:** Choose the electronic components needed for the project, such as a microcontroller board, sensors, LEDs, and a buzzer.

**2.Set up the circuit:** Connect the components on the breadboard or on customer PCB

**3.Code the microcontroller:** Use a programming language such as C++ or Python to write the code for the microcontroller. The code should include the logic for the smart alert system, such as checking sensor readings and triggering the buzzer and LED when certain conditions are met.

**4.Test the circuit:** Upload the code to the microcontroller and test the circuit to make sure the alert system works as intended.

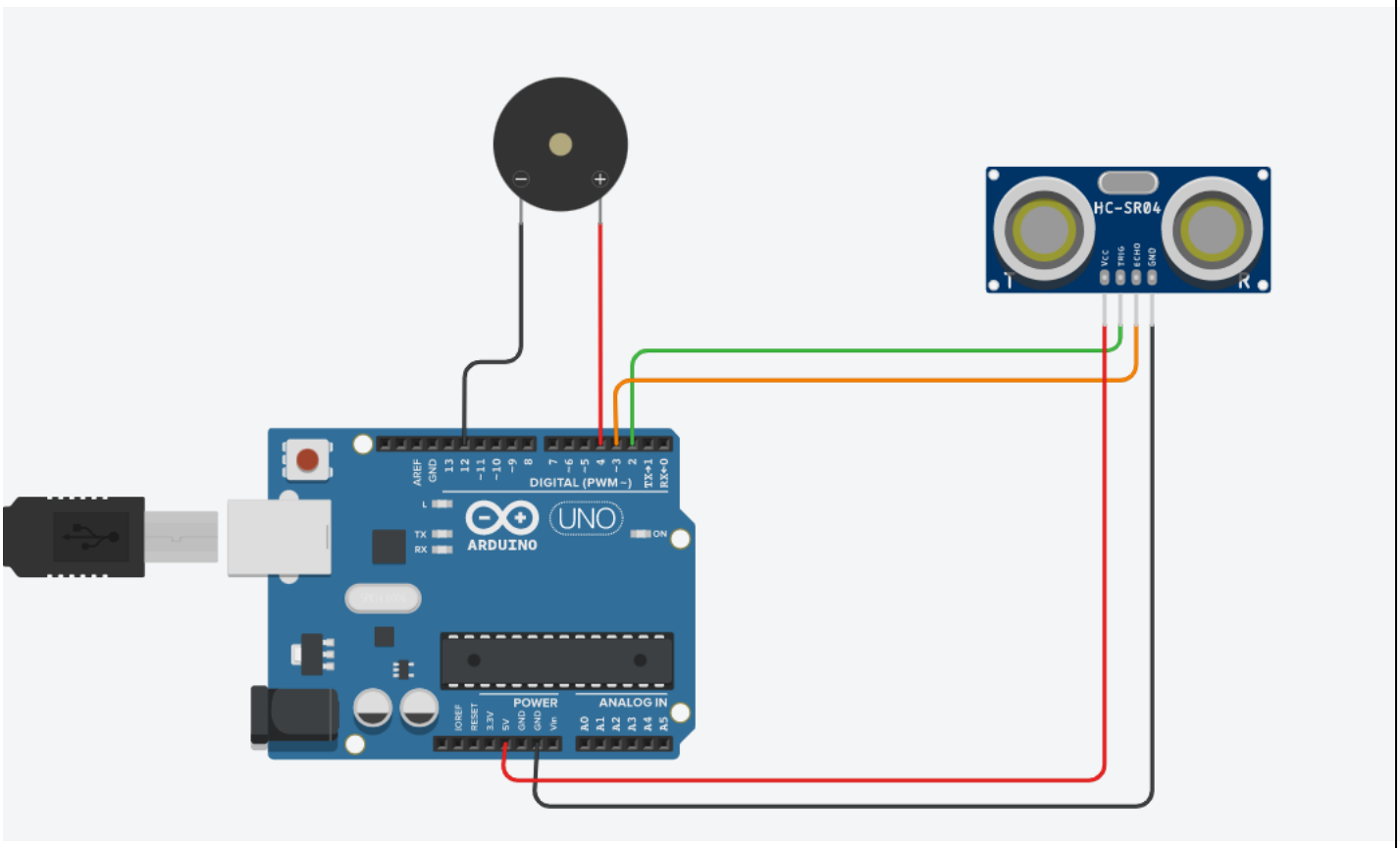


**Figure 4: System Diagram**

## 4.3Arduino IDE Code -

```
#define pingPin 2        //trig pin of sr04

#define echoPin 3


void setup() {

  Serial.begin(9600); // Starting Serial Terminal

  pinMode(pingPin,OUTPUT);

  pinMode(echoPin,INPUT);

  pinMode(12,OUTPUT);   //pin12 is used as GND pin  for buzzer since arduino nano has only two GND pins

  pinMode(4,OUTPUT);   //pin A3 provides the output on buzzer

}
```

```
void loop() {
  long duration, cm;
 digitalWrite(12, LOW);   //Buzzer GND is always low
  //send a signal at ping pin at an interval of 0.002 seconds to check for an object
  digitalWrite(pingPin, LOW);
  delayMicroseconds(2);
  digitalWrite(pingPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(pingPin, LOW);

  duration = pulseIn(echoPin, HIGH);  //check time using pulseIn function

  cm = microsecondsToCentimeters(duration);   //functin call to find distance

 /* Serial.print(cm);
  Serial.print("cm");
  Serial.println();
  delay(100);

  for debugging
  */
  if (cm<50&&cm>40)
                    {analogWrite(4,255);
                     delay(8000);
                     analogWrite(4,0);
                     delay(8000); }    //sound buzzer every second if obstacle distance is between 20-
30cm.
  else if (cm<40&&cm>30) {analogWrite(4,255);
```

```
                delay(600);
                analogWrite(4,0);
                delay(600); }   //sound buzzer every 0.5 seconds if obstacle distance is between 10-
20cm.
  else if (cm<30&&cm>20)  {analogWrite(4,255);
                delay(300);
                analogWrite(4,0);
                delay(300); }    //sound buzzer every 0.1 seconds if obstacle distance is between 0-
10cm.

  else if (cm<20&&cm>10)  {analogWrite(4,255);
                delay(200);
                analogWrite(4,0);
                delay(200); }    //sound buzzer every 0.1 seconds if obstacle distance is between 0-
10cm.

  else if (cm<10&&cm>0)  {analogWrite(4,255);
                delay(100);
                analogWrite(4,0);
                delay(100); }    //sound buzzer every 0.1 seconds if obstacle distance is between 0-
10cm.

  else                analogWrite(4,0); //do not sound the buzzer
}
//function to return distance in cm from microseconds
long microsecondsToCentimeters(long microseconds) {
  return microseconds / 29 / 2;
}
```

# Chapter 4 - Result Detail

Analyzing the results of a smart stick for a blind person involves assessing its effectiveness, functionality, and overall impact on the user's daily life. Here are some key aspects to consider in a result analysis:

**1. Object Detection:** One of the primary functions of a smart stick for the blind is to detect obstacles and aid in navigation. Evaluate how accurately the smart stick detects objects, including low-hanging obstacles, walls, and drop-offs. Assess its ability to provide real-time feedback and alerts to the user to ensure safe movement.

**2. Environmental Awareness:** Consider how well the smart stick detects and conveys information about the environment. This may include identifying landmarks, recognizing street signs, detecting intersections, or providing auditory cues about the surrounding area. The stick should enable the user to gather relevant information and make informed decisions.

**3. Ease of Use:** Evaluate the user experience and the stick's ease of use. Assess factors such as weight, ergonomics, and the simplicity of controls or interfaces. The stick should be intuitive and comfortable to hold, allowing the user to operate it with minimal effort.

**4. Battery Life and Durability:** Assess the smart stick's battery life and its ability to sustain regular usage throughout the day. Additionally, consider the stick's durability and its resistance to environmental factors such as rain, dust, or physical impacts. A reliable and long-lasting device is essential for continuous use.

**5. User Feedback and Satisfaction:** Gather feedback from blind individuals who have used the smart stick to understand their experiences and satisfaction levels. Assess the stick's impact on their daily lives, mobility, and overall independence. User feedback is invaluable for identifying areas of improvement and understanding the stick's real-world effectiveness.

**6. Cost and Accessibility:** Evaluate the cost of the smart stick, considering its affordability and accessibility to individuals with varying financial resources. A balance between cost-effectiveness and quality should be considered to ensure the device is widely accessible.

By conducting a comprehensive analysis of these factors, you can assess the effectiveness and usability of a smart stick for blind individuals. Such an evaluation helps identify areas for improvement, potential adjustments, and the overall impact of the technology on the lives of blind users.

# Chapter 5 - Future Scope

The future scope for the smart blind stick for blind individuals is promising, with several exciting possibilities on the horizon. Advancements in technology offer immense potential for further enhancing the capabilities of the smart blind stick. The smart blind stick can be integrated into a larger IoT ecosystem, enabling seamless connectivity with other smart devices and services. This integration can offer expanded functionalities such as accessing digital maps, receiving real-time information, connecting with smart home systems, and utilizing voice assistants for hands-free operation. AI algorithms can be leveraged to improve the smart blind stick's performance over time. By analyzing user data and patterns, the device can adapt and provide more accurate feedback, personalized assistance, and intuitive responses based on individual preferences. Improvements in voice recognition and natural language processing technologies can enhance the communication capabilities of the smart blind stick. Users can interact with the device using voice commands, and the device can provide more detailed auditory instructions and responses. In summary, the future scope for the smart blind stick is full of potential, with advancements in sensor technology, artificial intelligence, augmented reality, connectivity, and voice recognition set to further enhance the device's capabilities and improve the lives of blind individuals.

# Conclusion

In conclusion, the smart blind stick is an innovative and valuable device designed to assist blind individuals in navigating their surroundings with increased safety and independence. By incorporating advanced technologies such as sensors, GPS, the smart blind stick can detect obstacles, provide real-time feedback, and offer navigation guidance. This device not only enhances mobility but also promotes the overall well-being and quality of life for blind individuals, enabling them to participate more actively in society. With continuous advancements in technology, the smart blind stick holds great promise in further empowering the visually impaired community. The smart blind stick serves as a remarkable technological aid for blind individuals. Its combination of obstacle detection, GPS guidance, and additional features makes it a valuable tool for enhancing the quality of life for the blind community.

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