Third Eye: An Assistive Device for the Visually Impaired Using Ultrasonic Sensor, Buzzer, and Arduino Nano

OBJECTIVE

The objective of this project is to develop an assistive device, named Third Eye, utilizing ultrasonic sensor technology, a buzzer, and an Arduino Nano microcontroller to provide real-time auditory feedback to visually impaired individuals, enabling them to navigate their surroundings safely and independently.

ABSTRACT

Eyes helps us to see things and fortunately, most of us are blessed with two working eyes, but not everyone is. So, as an innovator, it's our responsibility to support and take care of those who are unable to sense things in front of them from far away as normal eyes do.

Third Eye is an innovative assistive device designed to enhance the mobility and safety of visually impaired individuals. Leveraging the capabilities of ultrasonic sensors, a buzzer, and an Arduino Nano microcontroller, Third Eye provides real-time auditory feedback to help users navigate their surroundings more effectively.

The device operates by utilizing an ultrasonic sensor to detect obstacles within the user's proximity. As the user moves, the sensor continuously measures distances to objects in front of them. When an obstacle is detected within a predefined range, the Arduino Nano processes this information and triggers the buzzer to emit a distinct sound pattern, alerting the user to the obstacle's presence.

The design of Third Eye prioritizes simplicity, reliability, and affordability, making it accessible to a wide range of users. The compact form factor of the Arduino Nano allows for seamless integration into wearable or handheld configurations, ensuring ease of use and portability.

This project aims to empower individuals with visual impairments by providing them with a reliable tool to navigate their surroundings independently and with greater confidence. Through ongoing development and user feedback, Third Eye has the potential to evolve into a versatile solution that enhances the quality of life for the visually impaired community

INTRODUCTION

In this project, we are going to make a third eye for the blind people which enables them to sense and detect walls, obstacles, or other people in front of them without the need of physical touch.

The Third Eye project aims to address this issue by developing an assistive device that leverages ultrasonic sensor technology, a buzzer, Arduino Nano microcontroller, and a 9V battery to provide real-time auditory feedback, aiding visually impaired individuals in obstacle detection and navigation.

SOFTWARE REQUIREMENT/DESCRIPTION

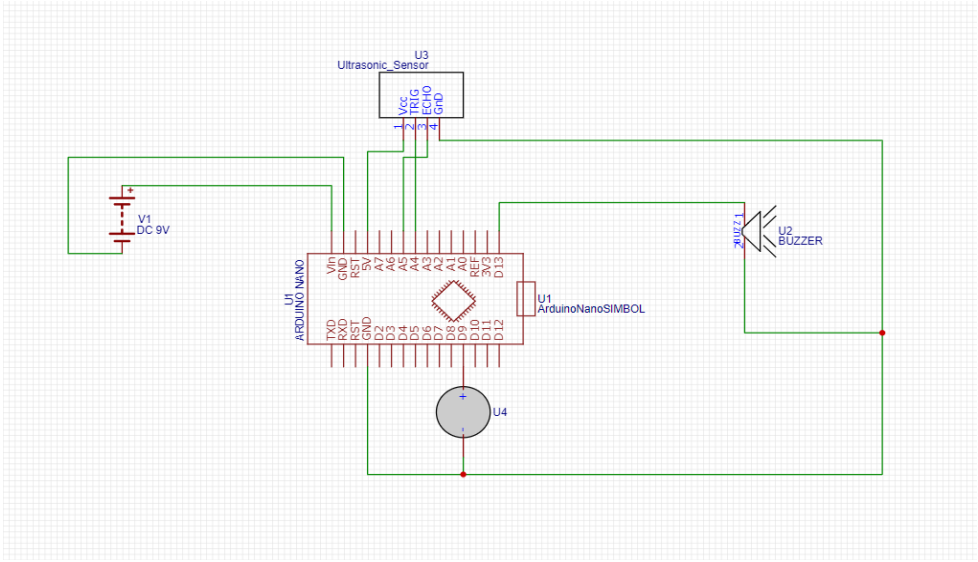
- Arduino nano with cable.
- HC-SR04 Ultrasonic Sensor
- Vibration Motor
- Buzzer
- Jumper Wires
- 9V DC Battery

CIRCUIT DIAGRAM AND DESCRIPTION

PIN CONNECTIONS OF ARDUINO NANO:

Arduino Nano	Ultrasonic Sensor
A4	Trig
A5	Echo
5V	Vcc
GND	GND
Arduino Nano	**Buzzer**
D13	+
GND	–
Arduino Nano	**Vibration Motor**
D9	+
GND	–
Arduino Nano	**Battery**
Vin	+
GND	–

PROJECT SCHEMATIC



Ultrasonic Sensor: The ultrasonic sensor serves as the primary component for detecting obstacles in the environment. It emits ultrasonic waves and measures the time it takes for the waves to bounce back, determining the distance to nearby objects. This information is crucial for identifying potential obstacles and ensuring the safety of visually impaired users as they move through their surroundings.

Buzzer: The buzzer acts as the auditory output device in the Third Eye system. When the ultrasonic sensor detects an obstacle within the user's proximity, the Arduino Nano triggers the buzzer to emit distinct sound patterns or alerts. This auditory feedback provides immediate and intuitive information to the user, alerting them to the presence of obstacles and enabling them to adjust their path accordingly.

Arduino Nano: The Arduino Nano serves as the central processing unit of the Third Eye device, responsible for interfacing with both the ultrasonic sensor and the buzzer. Its compact size, low power consumption, and versatility make it an ideal choice for this application. The Arduino Nano processes data from the ultrasonic sensor, interprets distance measurements, and controls the activation of the buzzer based on predefined criteria. Additionally, it facilitates the integration of the components into a user-friendly and portable device for the visually impaired.

9V Battery: The 9V battery serves as the power source for the Third Eye device, providing the necessary electrical energy to operate the Arduino Nano, ultrasonic sensor, and buzzer. Its compact size and portability

make it suitable for powering the device while ensuring mobility for the user. The 9V battery enables the Third Eye system to function independently of external power sources, enhancing its usability and convenience for visually impaired individuals navigating various environments.

PCB DESIGN RULES

1. Arrange components logically and consider their interconnections to minimize trace lengths.
2. Group components according to their functions to improve readability and troubleshooting.
3. Keep traces as short and direct as possible to minimize signal degradation and interference.
4. Maintain consistent trace widths to ensure uniform current distribution and impedance matching.
5. Ensure proper clearance between components to prevent shorts and facilitate soldering.
6. Include clear component designators and labels on the silkscreen layer for easy identification during assembly and troubleshooting.

DESIGN CONSTRAINTS

Size Optimization:

- The PCB layout has been meticulously crafted to fit within a compact form factor suitable for wearable or handheld configurations.
- Dimensions have been carefully optimized to ensure portability and ease of use for visually impaired individuals without compromising functionality.
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Efficient Power Management:

- The PCB design includes a robust power management circuitry to regulate power from the 9V battery.
- Measures have been implemented to maximize battery life while maintaining stable voltage levels for all components, ensuring prolonged usage without frequent battery changes.

Strategic Component Placement:

- Components such as the Arduino Nano, ultrasonic sensor, buzzer, and supporting circuitry have been strategically placed to minimize interference and optimize performance.
- Accessibility and ease of assembly have been prioritized, allowing for straightforward maintenance or replacement of components as needed.

RESULTS

The Third Eye assistive device, incorporating ultrasonic sensor technology, a buzzer, Arduino Nano microcontroller, and a 9V battery, was successfully developed to aid visually impaired individuals in navigating their surroundings safely and independently. The following are the key results and discussions from the project:

CONCLUSION

In conclusion, the Third Eye assistive device demonstrates significant potential to improve the mobility and safety of visually impaired individuals by providing them with a reliable tool for navigating their surroundings independently. Through rigorous testing, optimization, and user feedback, the device has been successfully developed to address the unique needs of its target users and lays the foundation for further advancements in assistive technology for the visually impaired community.