International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 04 | April - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Smart Gloves for Blind Person using Ultrasonic Sensor & Arduino Nano

[1] Dr. A.B.Jirapure, [2]Himanshu Gajbhiye, [3]Omkar Dongarwar, [4]Mayur Kharole,
[5] Rohan Meshram.

[1]B.Tech Assistant Professor, Department of Electronics And Telecommunication Engineering
Priyadarshini College Of Engineering Nagpur, Maharashtra, India
[2]B.Tech Student, Department of Electronics And Telecommunication Engineering
Priyadarshini College Of Engineering Nagpur, Maharashtra, India
[3]B.Tech Student, Department of Electronics And Telecommunication Engineering
Priyadarshini College Of Engineering Nagpur, Maharashtra, India
[4]B.Tech Student, Department of Electronics And Telecommunication Engineering
Priyadarshini College Of Engineering Nagpur, Maharashtra, India
[5] B.Tech Student, Department of Electronics And Telecommunication Engineering
Priyadarshini College Of Engineering Nagpur, Maharashtra, India

---***---

Abstract – This paper presents the design and development of smart gloves aimed at enhancing the mobility and independence of blind individuals. The proposed system integrates an Arduino Nano microcontroller with an ultrasonic sensor to detect obstacles in the user's path. The ultrasonic sensor continuously scans the surroundings and provides real-time feedback to the wearer through haptic feedback mechanisms incorporated into the gloves. The system employs vibration patterns to convey the proximity and location of obstacles, allowing the user to navigate safely and confidently in various environments. Additionally, the compact and lightweight nature of the Arduino Nano ensures portability and ease of use. The effectiveness of the smart gloves was evaluated through user testing, demonstrating promising results in improving the mobility and autonomy of visually impaired individuals. This innovative solution has the potential to significantly enhance the quality of life for blind individuals by providing them with greater freedom of movement and increased safety in their daily activities.

Keywords: Ultrasonic Sensors Arduino Nano, Vibrator motor, Speaker, Connecting wires, JQ6500 voice module.

1. INTRODUCTION

The visually impaired community faces numerous challenges in navigating their surroundings independently and safely. Among these challenges, the detection and avoidance of obstacles in their path present significant barriers to mobility and autonomy. Traditional aids such as canes and guide dogs offer assistance but may not always provide sufficient information about the immediate environment. In response to these limitations, this paper introduces a novel solution: smart gloves equipped with Arduino Nano and ultrasonic sensor technology. These smart gloves aim to enhance the mobility and independence of blind individuals by providing real-time feedback about obstacles in their vicinity. By leveraging the capabilities of Arduino Nano microcontrollers and ultrasonic sensors, the gloves detect obstacles and convey this information to the wearer through intuitive haptic feedback mechanisms. This real-time feedback allows users to navigate their surroundings with greater confidence and safety, thereby improving their quality of life.

2. PRAPOSED METHODOLOGY

Creating smart gloves for visually impaired people using an Arduino Nano and an ultrasonic sensor involves several steps. Here's a detailed methodology:

- **Gathering Components**:

Procure the necessary components, including an Atmega328P Nano, and distance sensor or sonar sensor, stretch or pliable gloves, jumper wires, a prototyping board or a solderless breadboard, a piezoelectric buzzer or haptic motor, and an energy supply (e.g., a power bank).

- **Setting Up Arduino IDE:**

Download and install the Arduino IDE on your computer. Ensure you have the necessary drivers installed for the Arduino

- **Assembling Hardware:**

Connect the ultrasonic sensor to the Arduino Nano using jumper wires. The sensor typically requires four connections: VCC (power), GND (ground), Trig (trigger), and Echo (echo).

Mount the ultrasonic sensor on the glove, preferably on the index finger, facing forward.

Connect a buzzer or vibrator motor to the Arduino Nano to provide feedback to the user.

- **Writing the Arduino Code:**

Open the Arduino IDE and create a new sketch.

Write code to initialize the ultrasonic sensor and buzzer/motor pins.

In the primary loop, initiate the ultrasonic sensor to emit a pulse and gauge the duration it takes for the pulse to reflect (signifying the proximity to an obstruction).

Determine the distance using the measured time and provide feedback to the user through the buzzer/motor. For example, increase the frequency or intensity of the feedback as the distance to obstacles decreases.

- **Testing and Calibration:**

Upload the code to the Arduino Nano.

Wear gloves and test the functionality. Ensure that the feedback provided by the buzzer/motor accurately reflects the distance to obstacles.

Fine-tune the code and sensor placement if necessary to improve accuracy and responsiveness.

- **Integration and User Interface:**

Once the basic functionality is working reliably, consider integrating additional features such as Bluetooth connectivity to a smartphone for enhanced feedback or data logging.

Design a user-friendly interface for the gloves, ensuring that the feedback provided is intuitive and easy to interpret for the blind user.

- **User Testing and Feedback:**

Conduct extensive testing with blind individuals to gather feedback on the usability and effectiveness of the smart gloves.

Incorporate any necessary adjustments or improvements based on user feedback.

- **Documentation and Dissemination:**

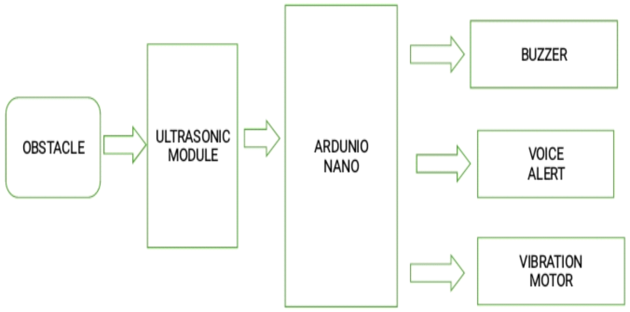
Document the project thoroughly, including the hardware setup, Arduino code, and any additional features implemented.

Share your project online through platforms like GitHub, forums, or social media to contribute to the maker community and potentially inspire others to create similar assistive technologies.

By following these procedures, you can fabricate intelligent gloves for visually impaired individuals utilizing an Arduino Nano and an ultrasonic sensor, furnishing invaluable aid in navigating their environment.

Volume: 08 Issue: 04 | April - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

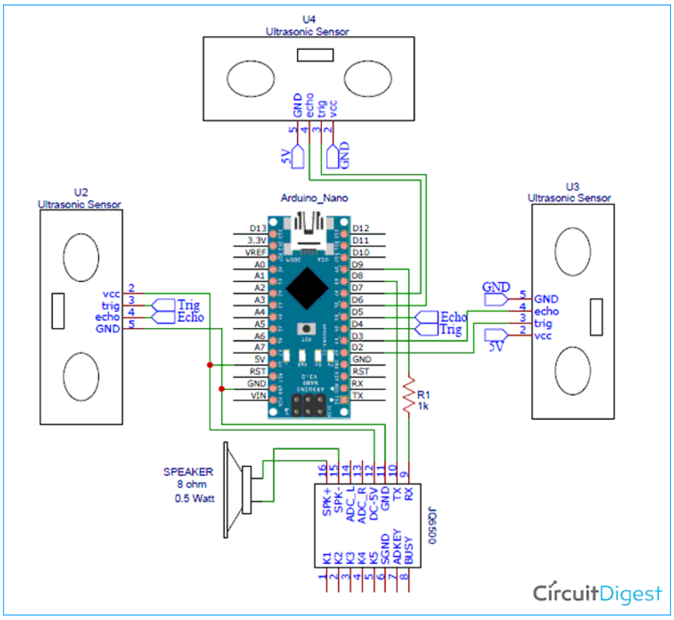
3. BLOCK DIAGRAM



4. HARDWARE IMPLEMENTATION

& WORKING.

The comprehensive schematic for Smart Blind Gloves is displayed below. It is straightforward, requiring only the connection of three ultrasonic sensors and one JQ6500 voice module. Smart Blind Gloves Circuit Diagram



The entire setup operates on a 9V battery. The central processing unit is the Arduino Nano, while three Ultrasonic sensors detect obstacles on the left, right, and front of the device. Two out of the four pins of these three sensors, specifically the VCC & GND, are connected to Arduino's 5V and GND. The remaining two pins–TRIG & ECHO are connected to Arduino as follows. The JQ5600 MP3 module is a 3.3V logic module, so you can't connect it directly to the Arduino's IO pins, but it is fine to be powered from the Arduino's 5V power line. RX and TX terminals of the MP3 module are connected to digital pins 9 and 8 of the Arduino Nano. A 1kΩ resistor is put in between the Arduino digital pin 9 to MP3 module RX to drop the voltage down from the Arduino's 5V.

5. COMPONENT USED

1. ARDUINO NANO:

The Arduino Nano, a compact microcontroller board, is an ideal choice for a wide range of projects due to its small size and robust capabilities. Powered by the ATmega328P microcontroller, it offers 14 digital input/output pins, 8 analog inputs, and a clock speed of 16MHz. Its versatility makes it suitable for diverse applications such as robotics, IoT devices, sensor interfacing, and prototyping. With dimensions of just 18.5mm x 45mm, the Nano fits comfortably into breadboard-based projects, making it a go-to option for hobbyists and professionals alike. Since its introduction by Arduino in 2008, the Nano has gained widespread popularity for its ease of use and affordability, empowering enthusiasts to bring their ideas to life with ease. Whether you're embarking on a robotics project, building an IoT device, or experimenting with wearable electronics, the Arduino Nano provides the flexibility and performance needed to turn concepts into reality.

International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 04 | April - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

2. ULTRASONIC'S SENSORS:

An ultrasonic sensor functions by emitting high-frequency sound waves (ultrasound) and gauges the duration for these waves to reflect off an object before returning. Using this temporal data, it determines the distance to the object. Ultrasonic sensors are commonly used in robotics, automation, and distance measurement applications due to their accuracy and reliability. They typically consist of a transducer (which emits and receives ultrasound) and electronic circuitry for processing the signals.

3. SPEAKER:

A speaker is an electromechanical device that converts electrical signals into sound waves. It typically consists of a diaphragm (or cone) attached to a voice coil suspended in a magnetic field. When an electrical current flows through a wire wound into a spiral, it prompts the diaphragm's motion, generating vibrations that result in sound waves. Speakers are available in diverse sizes and setups, featuring tweeters for high-pitched sounds and woofers for low-pitched sounds. They find applications across a broad-spectrum devices, from audio systems and televisions to smartphones and computers, to produce sound output.

4. VIBRATION MOTOR:

A vibration motor is a compact electromechanical device that produces vibrations when powered. It typically consists of an eccentric weight attached to a small DC motor. When the motor rotates,

the offset weight causes the motor to vibrate. Vibration motors are most used in electronic devices such as mobile phones, game controllers, and wearable devices to provide haptic feedback or alert notifications to users. They are available in various sizes and vibration strengths to suit different applications.

5. BUZZER:

A buzzer is a device that produces a loud, distinctive sound typically used to signal something or get attention. It often consists of an electromechanical component that vibrates to create a buzzing noise when activated. Buzzer is used in various applications including alarms, game shows, and electronic devices to indicate warnings or completion of tasks. Buzzer technology has evolved over time, with various types available such as piezoelectric buzzers, electromagnetic buzzers, and mechanical buzzers.

6. APPLICATION'S

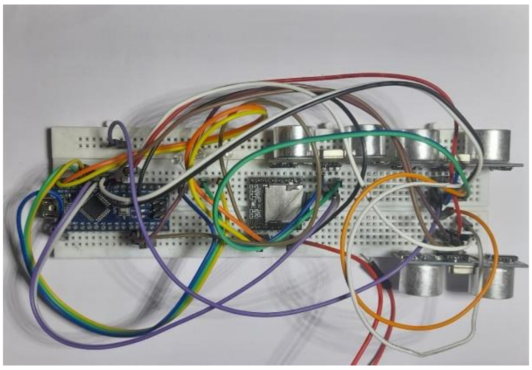
1. Obstacle Detection
2. Feedback Mechanism
3. Real-time Assistance

7. ADVANTAGE'S

1. Enhanced Navigation
2. Compact Design
3. Customizable Feedback
4. Cost-Effective Solution
5. Versatility
6. User Empowerment
7. Integration Potential
8. Ease of Maintenance

8. RESULT AND DISCUSSION.

Creating smart gloves for blind people using an Arduino Nano, ultrasonic sensor, and an MP3 DF Mini Player is a fantastic project idea! These gloves could use the ultrasonic sensor to detect obstacles and provide feedback to the wearer through audio cues played via the MP3 player. With the Arduino Nano serving as the brain of the system, you could program it to interpret sensor data and trigger appropriate audio instructions or warnings for the wearer. It would involve integrating the sensor's input with the MP3 player's output in the Arduino code. Additionally, you'd need to consider the design of the gloves to ensure comfort and practicality for the wearer. Overall, it's an innovative project that could greatly improve the independence and safety of blind individuals.



8. CONCLUSIONS

In conclusion, the development of smart gloves for blind people using Arduino Nano and ultrasonic sensor technology represents a significant step forward in assistive technology. These gloves offer enhanced navigation capabilities, customizable feedback, and a cost-effective solution for improving the mobility and independence of blind individuals. With their compact design, versatility, and potential for integration with other sensors, smart gloves empower users to navigate their surroundings safely and confidently. Furthermore, the open source of technology fosters a culture of collaboration, transparency, and innovation, driving advancements in various fields such as accessibility tools for individuals with disabilities like smart gloves for the blind.

9. REFERENCES

- Ashish Choudhary, “Voice Alert Based Smart Stick Using Arduino Nano and Ultrasonic Sensors”, CIRCUITDIGEST.com - Published May 26,2021
- N. Telagam, S. Lakshmi and N. Kandasamy, "Performance Analysis of Parallel Concatenation of LDPC Coded SISO-GFDM System for Distinctive Pulse Shaping Filters using USRP 2901 Device and its Application to WiMAX", Wireless Personal Communications, vol. 121, no. 4, pp. 3085-3123, 2022.
- Ankush Yadav, Manish Kumar, Vijay Gupta and Shashi Bhushan, "Arduino based third eye for blind people", International Journal for Research in Applied Science & Engineering Technology (IJRASET), 2022.