Project Title:

Smart Glasses for Blind Assistance with Accident Detection and SMS Alert

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1. Components Used:

- Arduino Nano:

Arduino Nano is the microcontroller used to manage all sensors and outputs in the project. Its small size and flexibility make it ideal for compact designs like this, and it's well-suited for processing sensor data to detect nearby objects.

- Ultrasonic Sensor (HC-SR04):

The ultrasonic sensor is a key component in this project for detecting obstacles. Using ultrasonic sound waves, it measures the distance to an object. This sensor has two main parts:

- **Trigger Pin:** Sends out ultrasonic waves.
- **Echo Pin:** Receives the reflected sound waves from nearby objects, calculating the distance based on the time delay. In this project, if an obstacle is detected within a specified range (between 45 inches and 12 inches), a buzzer will sound to alert the user. If the obstacle is closer than 12 inches, an SMS alert will be sent.

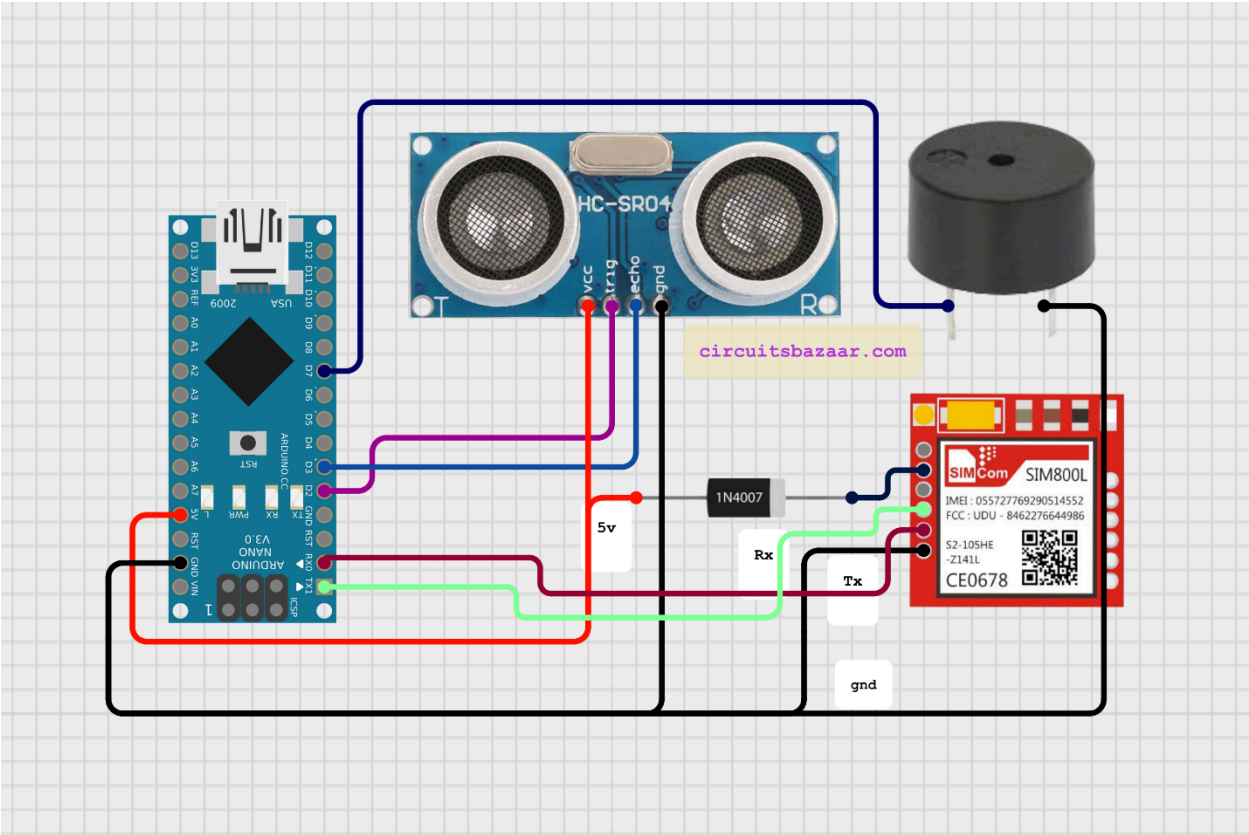
- Buzzer:

The buzzer is used as an audible feedback mechanism to alert the user to nearby obstacles. It's connected to the Arduino and set to trigger when the ultrasonic sensor detects an object within 45 to 12 inches.

- GSM Module (SIM800L):

This module sends an SMS alert when an obstacle is detected at a dangerously close range of below 12 inches. This serves as an emergency feature, allowing a notification to be sent to a pre-defined contact, indicating a potential accident or urgent situation.

2. Circuit Diagram



3. Software Used:

- Arduino IDE:

The Arduino IDE is used to program the Arduino Nano. It supports a wide range of libraries and allows easy uploading of code to the board. The code in this project uses basic serial communication to interact with the GSM module and ultrasonic sensor, simplifying SMS alert integration.

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3. Working of the Project:

1. **Object Detection via Ultrasonic Sensor:**
    - The ultrasonic sensor continually monitors the distance to nearby objects. When an obstacle comes within 45 to 12 inches, the Arduino triggers the buzzer to alert the user.
2. **SMS Alert for Emergency:**
    - If an obstacle is detected closer than 12 inches, the GSM module automatically sends an SMS alert to a pre-defined contact number. This SMS warns of a potential accident, alerting caregivers or emergency contacts for quick response.
3. **Distance Feedback for Enhanced Awareness:**

- By using varying buzzer and SMS alerts based on object distance, the device provides enhanced awareness for visually impaired users, offering audible warnings and notifying emergency contacts in close-proximity situations.

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4. Advantages:

- **Increased Safety:**
  The smart glasses provide immediate alerts to help the user avoid nearby obstacles and accidental impacts.
- **Emergency Contact Notification:**
  The automatic SMS feature notifies emergency contacts, enabling faster response in urgent situations.
- **Enhanced Awareness:**
  The system provides continuous monitoring of obstacles, helping visually impaired users navigate more safely.
- **Low Power and Compact:**
  Using Arduino Nano and compact modules ensures low power consumption and portability.

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5. Disadvantages:

- **Limited to Proximity Alerts:**
  This system only warns of obstacles within a certain range and does not provide full navigation guidance.
- **Reliance on GSM Signal:**
  The SMS feature requires a strong GSM network connection, which may not be available in all locations.
- **Sensor Limitation:**
  The ultrasonic sensor may struggle with certain materials or surfaces that absorb or deflect sound waves.

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6. Applications:

- **Assistance for Visually Impaired:**
  The project offers invaluable support to visually impaired users in everyday navigation, especially in areas with potential obstacles.
- **Personal Safety Device:**
  This system can also be adapted for general use as a safety alert device in confined or hazardous spaces.

- **Assistive Technology Development:**
  The project demonstrates the use of accessible technology to enhance the independence and safety of people with disabilities.

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7. Future Scope:

- **Integration with GPS for Location Tracking:**
  Future designs could incorporate GPS modules to track the user's location, allowing family members or caregivers to monitor real-time location in emergencies.
- **Obstacle Recognition Technology:**
  Adding AI-based obstacle recognition can help identify specific obstacles (e.g., stairs or doors), enhancing navigation support.
- **Battery Optimization and Power Management:**
  Using power-efficient components and advanced power management can make the system suitable for prolonged use without frequent recharging.
- **Voice Feedback System:**
  Incorporating a voice system can provide spoken alerts about the distance and direction of obstacles, further enhancing accessibility.
- **Enhanced Connectivity for Remote Monitoring:**
  Expanding connectivity options, like integrating IoT platforms, could allow remote monitoring of the user's environment and health status.