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Smart Blind Stick Using Arduino Uno

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Introduction: Empowering Navigation with the Smart Blind Stick

Vision impairment presents significant challenges in navigating daily life. Traditional white canes offer basic obstacle detection, but lack the ability to provide real-time information about surroundings. This project introduces the Smart Blind Stick, an assistive device built with Arduino Uno that enhances mobility and independence for visually impaired individuals. Blind and visually impaired individuals face many challenges in navigating their environments. Traditional walking sticks provide limited information about obstacles, often requiring physical contact to detect them. This project aims to develop a Smart Blind Stick using Arduino Uno that provides enhanced navigational assistance by detecting obstacles and alerting the user through various means such as vibrations and sound.

Objectives

The main objectives of this project are:

- To design and build a Smart Blind Stick that can detect obstacles up to a certain range.
- To alert the user of obstacles through vibrations and sound signals.
- To ensure the system is portable, lightweight, and easy to use.

Components Required

The components required for this project are:

- Arduino Uno
- Ultrasonic sensor (HC-SR04)
- LED
- Buzzer
- Battery pack
- Switch
- Wires

Arduino Uno

Ultrasonic sensor

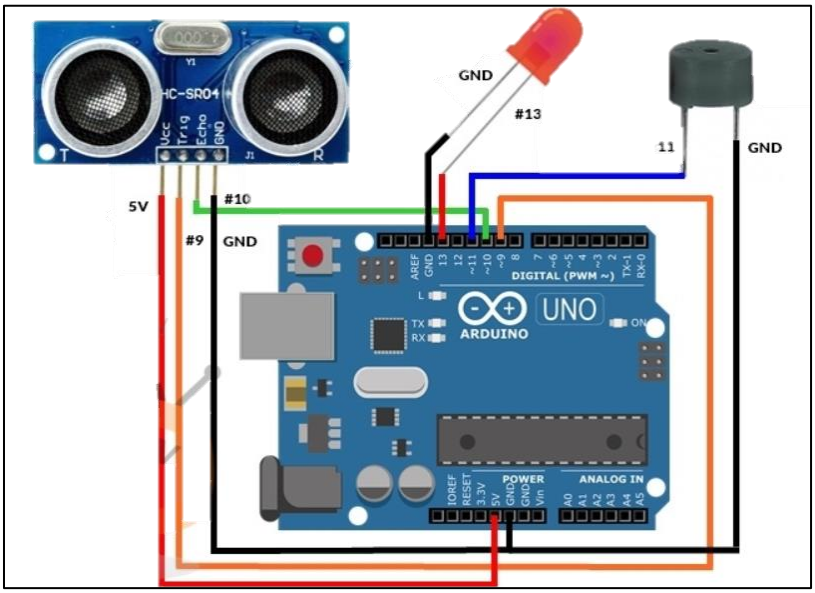
(HC-SR04)

Buzzer

L.E.D

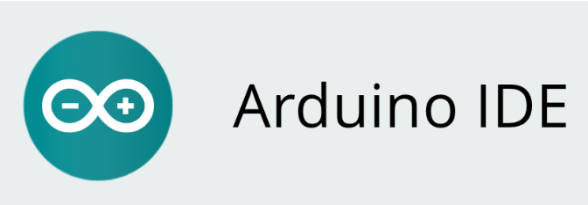
Circuit Diagram

- Below is a basic representation of the circuit connections:
- **Ultrasonic Sensor (HC-SR04):**
  - VCC to 5V on Arduino
  - GND to GND on Arduino
  - Trig to digital pin 9 on Arduino
  - Echo to digital pin 10 on Arduino
- **Buzzer:**
  - Positive terminal to digital pin 11 on Arduino
  - Negative terminal to GND
- **Push Button:**
  - One terminal to digital pin 2 on Arduino
  - Other terminal to GND



Software Requirements

- Arduino IDE



Design and Implementation

Hardware Setup:

- Connect the ultrasonic sensor to the Arduino as per the circuit diagram.
- Connect the buzzer to the designated digital pins.
- Attach the switch for system activation.
- Assemble all components.
- Secure the components onto the walking stick.

Software Programming

Below is the Arduino code for the Smart Blind Stick:

```
const int trigPin = 9;
const int echoPin = 10;
const int buzzer =11;
const int ledPin =13;

long duration;
int distance;
int safetyDistance=50;

void setup() {

  // put your setup code here, to run once:
  pinMode (trigPin, OUTPUT);
  pinMode (echoPin, INPUT);
  pinMode (buzzer, OUTPUT);
  pinMode (ledPin, OUTPUT);
  Serial.begin(9600);
}

void loop() {
  // put your main code here, to run repeatedly:
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);

  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);

  duration = pulseIn(echoPin, HIGH);

  distance = duration*0.034/2;

  if (distance <= safetyDistance) {
    int blinkDelay;
    if (distance < 5) {
      blinkDelay = 10;
      digitalWrite(buzzer, HIGH);
```

```
      digitalWrite(ledPin, HIGH);
      delay(blinkDelay);
      digitalWrite(buzzer, LOW);
      digitalWrite(ledPin, LOW);
      delay(blinkDelay);
    }
    else if (distance <= safetyDistance / 2) {
      blinkDelay = map(distance, 5, safetyDistance / 2, 10, 500);
      digitalWrite(buzzer, HIGH);
      digitalWrite(ledPin, HIGH);
      delay(blinkDelay);
      digitalWrite(buzzer, LOW);
      digitalWrite(ledPin, LOW);
      delay(blinkDelay);
    }
    else {
    blinkDelay = map(distance, safetyDistance / 2, safetyDistance, 500, 1000);


    //int  blinkDelay =map(distance, 0 ,safetyDistance, 15, 1000);
    digitalWrite(buzzer, HIGH);
    digitalWrite(ledPin, HIGH);
    delay(blinkDelay);
    //digitalWrite(buzzer, LOW);
    //digitalWrite(ledPin, LOW);
    //delay(blinkDelay);
    }
  }
  else{
    digitalWrite(buzzer, LOW);
    digitalWrite(ledPin, LOW);
  }

  Serial.print("Distance: ");
  Serial.println(distance);
  delay(100);

}
```

Testing and Results

- Power on the Arduino and press the push button to activate the system.
- Move the stick towards obstacles and observe the buzzer responses.
- Measure the response time and accuracy of the obstacle detection.

Conclusion

The Smart Blind Stick successfully detected obstacles and alerted the user through sound. The system proved to be effective in assisting visually impaired individuals in navigating their environment safely.

Future Improvements

- Adding GPS and GSM modules for location tracking and emergency alerts.
- Incorporating more sensors to detect different types of obstacles.
- Enhancing the design to be more ergonomic and user-friendly.

References

- Arduino Documentation: https://www.arduino.cc/en/Guide/Introduction
- Ultrasonic Sensor Datasheet: HC-SR0