SMART STICK – Multi-Directional Blind Assistant

Arduino Program Code

Academic Year: 2025–2026

1. Introduction

This section presents the Arduino program used in the Smart Stick – Multi-Directional Blind Assistant. The system uses ultrasonic sensors to detect obstacles in different directions and provides vibration feedback to assist visually impaired users.

2. Pin Configuration

- Front Ultrasonic Sensor: Trig – 2, Echo – 3
- Left Ultrasonic Sensor: Trig – 4, Echo – 5
- Right Ultrasonic Sensor: Trig – 6, Echo – 7
- Down Ultrasonic Sensor: Trig – 8, Echo – 9
- Vibration Motor: Pin 10

3. Arduino Program Code

```
/*
 SMART STICK     Multi-Directional Blind Assistant
 Compatible with Arduino Uno / Nano
*/

#define TRIG_FRONT 2
#define ECHO_FRONT 3

#define TRIG_LEFT 4
#define ECHO_LEFT 5

#define TRIG_RIGHT 6
#define ECHO_RIGHT 7

#define TRIG_DOWN 8
#define ECHO_DOWN 9

#define VIBRATION 10
#define THRESHOLD 30   // Distance in cm

long getDistance(int trigPin, int echoPin) {
  digitalWrite(trigPin, LOW);
```

```
  delayMicroseconds(2);

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

  long duration = pulseIn(echoPin, HIGH, 30000);
  long distance = duration * 0.034 / 2;

  return distance;
}

void setup() {
  pinMode(TRIG_FRONT, OUTPUT);
  pinMode(ECHO_FRONT, INPUT);

  pinMode(TRIG_LEFT, OUTPUT);
  pinMode(ECHO_LEFT, INPUT);

  pinMode(TRIG_RIGHT, OUTPUT);
  pinMode(ECHO_RIGHT, INPUT);

  pinMode(TRIG_DOWN, OUTPUT);
  pinMode(ECHO_DOWN, INPUT);

  pinMode(VIBRATION, OUTPUT);
}

void loop() {
  long frontDist = getDistance(TRIG_FRONT, ECHO_FRONT);
  long leftDist  = getDistance(TRIG_LEFT, ECHO_LEFT);
  long rightDist = getDistance(TRIG_RIGHT, ECHO_RIGHT);
  long downDist  = getDistance(TRIG_DOWN, ECHO_DOWN);

  // Pit or stair detection (fast vibration)
  if (downDist > THRESHOLD && downDist < 200) {
    digitalWrite(VIBRATION, HIGH);
    delay(100);
    digitalWrite(VIBRATION, LOW);
    delay(100);
  }
  // Front obstacle detection (continuous vibration)
  else if (frontDist > 0 && frontDist < THRESHOLD) {
    digitalWrite(VIBRATION, HIGH);
  }
  // Side obstacle detection (slow vibration)
  else if ((leftDist > 0 && leftDist < THRESHOLD) ||
           (rightDist > 0 && rightDist < THRESHOLD)) {
    digitalWrite(VIBRATION, HIGH);
    delay(400);
    digitalWrite(VIBRATION, LOW);
```

```
    delay(400);
  }
  // No obstacle
  else {
    digitalWrite(VIBRATION, LOW);
  }

  delay(50);
}
```

Listing 1: Arduino Code for Smart Stick

4. Conclusion

The above Arduino program enables real-time obstacle detection in multiple directions and provides distinct vibration feedback patterns, ensuring safety and ease of use for visually impaired users.