SMART STICK – MULTI-DIRECTION BLIND ASSISTANT

Mini Project Report

How It Is Working

The Smart Stick is designed to assist visually impaired people by detecting obstacles in multiple directions. It uses three ultrasonic sensors placed at different positions on the stick:

- Front sensor detects obstacles ahead of the user.
- Left sensor detects obstacles on the side.
- Down sensor detects pits, stairs, or uneven surfaces.

Each ultrasonic sensor sends ultrasonic waves and receives the reflected echo. The Arduino microcontroller calculates the distance using the echo time. Based on the detected direction, a vibration motor is activated with different vibration patterns:

- Continuous vibration for front obstacles
- Slow vibration for side obstacles
- Fast vibration for pit or stair detection

This allows the user to understand obstacle direction without using sound.

Components Required

- Arduino UNO / Arduino Nano
- Ultrasonic Sensor (HC-SR04) – 3 units
- Vibration Motor
- Transistor (BC547 / 2N2222)
- Resistors (1kΩ, 10kΩ)
- Rechargeable Battery / Power Supply
- Jumper Wires
- Walking Stick or PVC Pipe

Advantages

- Helps visually impaired people move independently
- Detects obstacles in multiple directions
- Different vibration patterns reduce confusion
- No sound disturbance
- Low cost and easy to implement
- Lightweight and portable

Disadvantages

- Limited detection range of ultrasonic sensors
- Cannot detect fast-moving objects
- Requires regular battery charging
- Performance may be affected in rain or uneven environments

Conclusion

The Smart Stick – Multi-Direction Blind Assistant is a practical and cost-effective assistive device. It improves safety, mobility, and confidence for visually impaired users. Due to its simplicity and real-world usability, it is suitable for academic projects and real-life applications.