K.J.SOMAIYA INSTITUTE OF TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY
SUBJECT-INTERNET OF THINGS AND CLOUD COMPUTING

SMART NAVIGATION CANE

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ABSTRACT

- Smart cane designed to assist **visually impaired individuals**.
- Uses **ultrasonic sensors** to detect obstacles in the path.
- Provides **vibration feedback** to alert the user about obstacles.
- Equipped with **GPS module** for **real-time location tracking**.
- Ensures **safe navigation** and **independent mobility** for users.

Keywords: Ultrasonic sensor, Vibration feedback, GPS, Obstacle detection, Smart cane, Navigation.

INTRODUCTION

- Visually impaired individuals face challenges in detecting nearby obstacles.
- Traditional white canes provide limited feedback and range.
- The **Smart Navigation Cane** enhances safety using **ultrasonic sensors** and **GPS**.
- **Vibration feedback** helps users identify object distance and direction.
- The system promotes **independent and confident movement**.
- Designed to be **portable, affordable, and user-friendly**.

OBJECTIVES:

- To design a system that assists visually impaired individuals in safe and efficient navigation.
- To implement real-time obstacle detection and location tracking using IoT technology.
- To develop a low-cost, portable solution that enhances mobility and independence.

SYSTEM BLOCK DIAGRAM

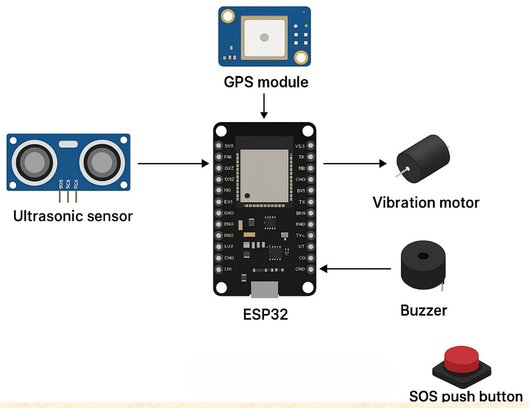


Fig 1 Circuit Diagram

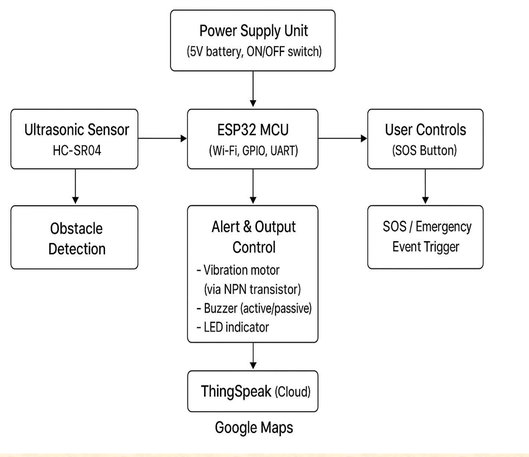


Fig 2 Block Diagram

Components:

1. **ESP32 Microcontroller** – Controls all sensors and modules while sending data to the cloud via Wi-Fi.
2. **Ultrasonic Sensor (HC-SR04)** – Detects obstacles by measuring the distance using ultrasonic waves.
3. **GPS Module (NEO-6M)** – Tracks and provides the user's real-time location coordinates.
4. **Vibration Motor** – Vibrates to alert the user about nearby obstacles.
5. **Buzzer** – Produces a sound alert when an obstacle or emergency is detected.
6. **SOS Push Button** – Sends an emergency alert with the current GPS location when pressed.
7. **LED Indicator** – Shows power status or alert indication visually.
8. **NPN Transistor (2N2222 / BC547)** – Acts as an electronic switch to control motor and buzzer.
9. **Power Supply (5V Battery)** – Provides necessary power to the ESP32 and other components.
10. **On/Off Switch** – Turns the device power on or off manually.

IMPLEMENTATION

Software Implementation

- The **ESP32 software interface** collects data from the ultrasonic sensor, GPS module, and SOS button.
- The ESP32 processes sensor readings and **sends data to ThingSpeak cloud** through Wi-Fi.
- The **ThingSpeak platform** stores and displays distance, location, and SOS alerts.
- The **web interface** visualizes real-time location on Google Maps and shows obstacle alerts.
- The system can **generate notifications and reports** on SOS events and movement patterns.

ALGORITHM

1. **Start the system** and initialize all sensors and Wi-Fi connection.
2. **Read distance** from the ultrasonic sensor (HC-SR04).
3. If **distance < threshold**, activate **vibration motor and buzzer** to alert the user.
4. **Fetch GPS coordinates** from the GPS module (NEO-6M).
5. **Check SOS button** status:
   - If pressed, send **SOS alert with GPS location** to ThingSpeak cloud.
6. **Send regular data** (distance, location, alert status) to ThingSpeak for monitoring.
7. **Display live location** and alerts on the **web interface / Google Maps**.
8. **Repeat steps 2–7** continuously for real-time operation.
9. **Stop the system** when power is turned off.

SOFTWARE RESULTS

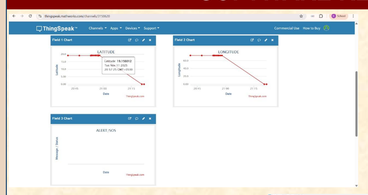
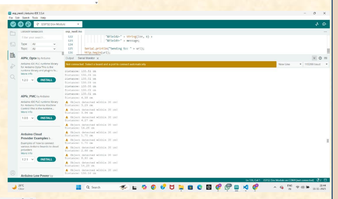


Fig 3 ThingSpeak Cloud Visualisation



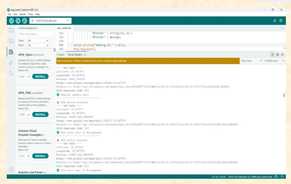


Fig 4 Ultrasonic Sensor and Obstacle Detection Output

Fig 5 GPS Module and Location Tracking Output

Other Applications

1. **Assistance for Visually Impaired Individuals**
2. **Obstacle Detection and Navigation Aid**
3. **Emergency Location Tracking System**
4. **Smart Mobility and Safety Device**

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