

Foldable Smart Blind Stick with GPS, Distance Sensing, Water Detection, and Web- Based Alerts

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Abstract: Assistive technologies play a critical role in improving the quality of life for visually impaired individuals. The proposed Foldable Smart Blind Stick is an intelligent navigation aid designed to enhance mobility, safety, and independence for visually impaired users. The system integrates multiple sensors and communication technologies using an ESP32 microcontroller to provide real-time environmental awareness and emergency support. Ultrasonic sensing is used to detect obstacles in front of the user, while a soil moisture sensor identifies wet or slippery surfaces that could cause accidents. A GPS module enables real-time location tracking, allowing caregivers to monitor the user through a web-based interface. The device also includes a buzzer and vibration motor to provide tactile and audio alerts whenever obstacles or hazards are detected. An emergency push button allows the user to send instant alerts during critical situations. The ESP32 hosts a wireless monitoring dashboard through Wi-Fi, displaying parameters such as obstacle distance, surface condition, GPS coordinates, and device status. The foldable design ensures portability and ease of use. This integrated system demonstrates how embedded systems and IoT technologies can significantly improve navigation safety and situational awareness for visually impaired individuals.

Keywords: Smart Blind Stick, ESP32, Ultrasonic Sensor, GPS Tracking, Moisture Detection, IoT, Assistive Navigation.

