

Sense Step: An Innovative Smart Cane for Visually Impaired Individuals

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Abstract

Sense Step is an innovative smart cane designed to empower visually impaired individuals through advanced assistive technology. Traditional mobility aids lack critical features to ensure user safety and independence, leaving visually impaired people vulnerable to obstacles, health emergencies, and navigation difficulties. Sense Step addresses these challenges by integrating IoT sensors, AI-driven navigation, and real-time health monitoring into an intuitive, user-centric device. The cane utilizes ultrasonic sensors and LiDAR technology for accurate obstacle detection, while embedded health sensors monitor vital signs like heart rate and blood pressure. An accelerometer-based fall detection system automatically alerts emergency contacts if a sudden fall occurs, providing an added layer of security. To ensure uninterrupted functionality, the device features a solar-powered charging system and long-lasting battery life. The smart cane connects to a cloud-based platform via Wi-Fi and Bluetooth, enabling seamless data synchronization and remote monitoring through a dedicated mobile app. Developed using embedded systems (ESP32 microcontroller) and sensor fusion techniques, Sense Step delivers reliable performance in real-world conditions. Its ergonomic, waterproof design ensures durability and comfort for daily use. The result is a cost-effective, scalable solution that enhances mobility, reduces dependency on caregivers, and improves overall quality of life for visually impaired users. By combining cutting-edge technology with practical usability, Sense Step redefines assistive mobility, offering a safer, smarter alternative to traditional canes. With future potential for AI-powered navigation and smart city integration, the device represents a significant step toward inclusive, independent living for the visually impaired community.

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