

Smart Obstacle Detection Aid for Visually Impaired

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Abstract: *This project presents a real-time obstacle detection, classification, and safety aid system for visually challenged individuals using Raspberry Pi. An ultrasonic sensor senses obstacles, activating a camera to take the scene, which is then processed by a lightweight YOLO model to pinpoint and classify objects. The detected object label and its position (left, right, or center) are converted into speech to guide the user. Additionally, the system integrates face recognition using OpenCV to identify familiar individuals, enhancing personal safety and social interaction. Safety features include an accelerometer for fall detection, which automatically sends an email alert with GPS location to a caretaker, and a panic button for manual emergency assistance. A moisture sensor detects water-filled potholes, and an LDR determines day or night conditions for context-aware alerts. The system also incorporates a custom lightweight hack module for real-time optimization of notifications and recognition. This multifunctional system significantly enhances mobility, situational awareness, and personal safety for visually impaired users in real-world environments.*

Keywords: ultrasonic sensor

