

Vision Assist

Real-Time Hazard Awareness for Visually Impaired Users

Project Brief:

Website: visionassistai.com

GitHub: github.com/SudhaMsr/vision-assist-site

Developer: Sudha Rani Maddala

Introduction:

Vision Assist is a smartphone-based accessibility system designed to support visually impaired and low-vision users during everyday walking.

The system combines smartphone camera input, lightweight AI-based hazard detection, and voice-first alerts to improve real-time environmental awareness.

Unlike many stop-and-scan accessibility tools, Vision Assist is designed for continuous movement and practical everyday use.

Problem Statement:

Existing accessibility tools often solve only part of the mobility problem.

Many systems require users to stop, manually scan the environment, or switch between multiple applications.

This creates limitations in real-time movement support.

Users continue to face hazards such as:

- poles
- curbs
- stairs
- pedestrians
- parked vehicles
- low-hanging branches
- construction barriers

during everyday walking.

Proposed Solution

Vision Assist combines:

- smartphone camera input
- lightweight computer vision
- real-time hazard detection
- voice-first alerts

into a single accessibility-focused system.

The system aims to:

- detect nearby hazards
- provide spoken alerts
- support continuous movement
- reduce dependency on expensive hardware
- run on standard smartphones

Example alerts include:

- “Obstacle ahead”
- “Step down”
- “Pole on the left”
- “Person approaching”

System Workflow:

1. Smartphone camera captures the environment.
2. The AI model processes video frames.
3. Hazard detection identifies obstacles.
4. Alert filtering prioritises important hazards.
5. Text-to-speech generates spoken feedback.
6. Users receive real-time voice alerts.

Technical Architecture:

Core Components

Camera Input

Captures real-time environmental video.

Computer Vision Layer

Processes frames using lightweight object detection.

Hazard Detection Engine
Identifies hazards relevant to pedestrian movement.

Alert Prioritization
Filters unnecessary alerts to reduce overload.

Voice Feedback System
Converts alerts into short spoken guidance.

Prototype Overview:

Current prototype capabilities include:

- camera-based scene capture
- object detection integration
- real-time processing
- spoken alert generation
- simplified accessibility workflow

The prototype focuses on accessibility, usability, and affordability.

Key Features:

Real-Time Hazard Awareness
Detects nearby obstacles during movement.

Voice-First Interaction
Provides spoken alerts with minimal distraction.

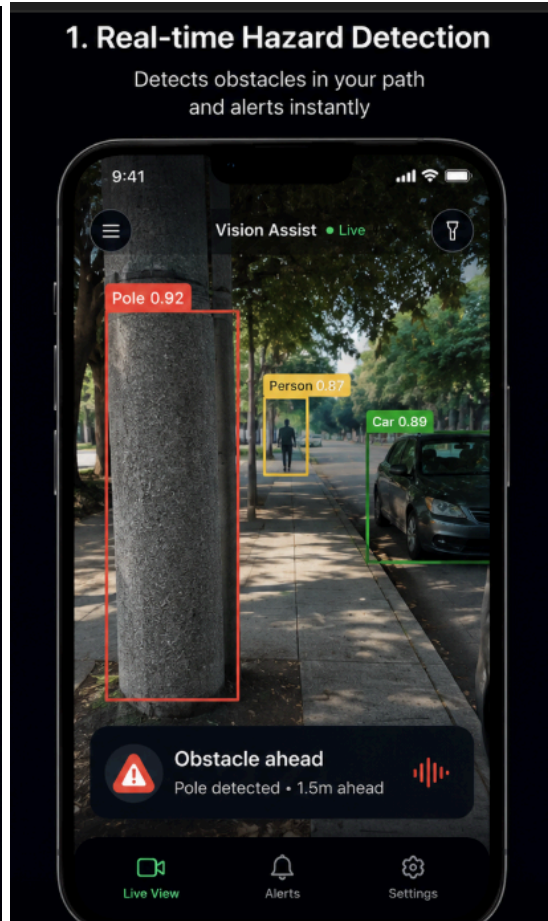
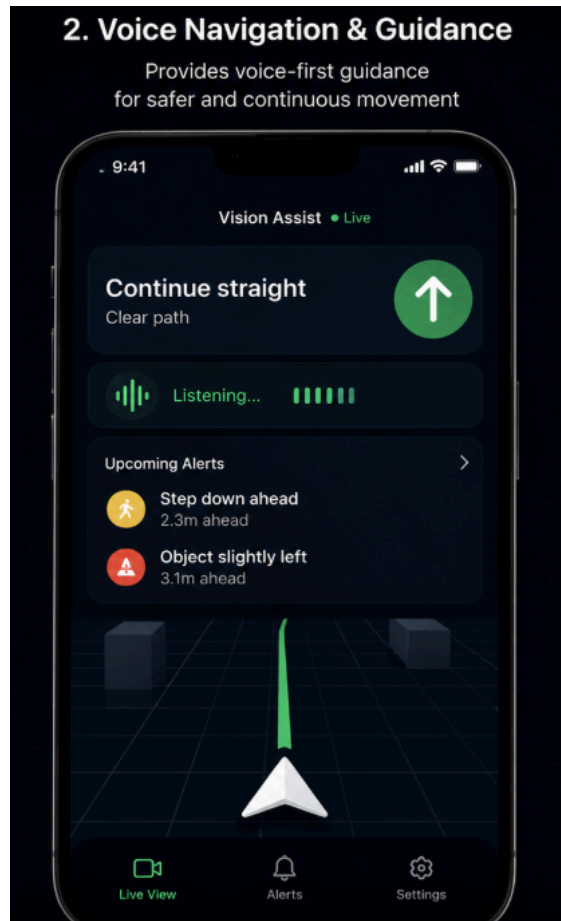
Smartphone-Based Deployment
Designed for standard smartphones without specialized hardware.

Lightweight AI Processing
Focuses on efficient real-time performance.

Prototype Screens:

Suggested visuals:

- hazard detection interface
- obstacle recognition example
- voice alert workflow
- application interface



Potential Impact:

Vision Assist aims to improve:

- independent mobility
- walking confidence
- environmental awareness
- affordable accessibility support

The long-term goal is to provide practical smartphone-based hazard awareness for visually impaired and low-vision users.

Future Improvements:

Potential future improvements include:

- depth estimation

- offline optimization
- multilingual alerts
- wearable integration
- low-light performance
- improved hazard prioritization

Conclusion:

Vision Assist is an accessibility-focused AI project designed to support safer and more confident movement for visually impaired users.

By combining smartphone cameras, lightweight AI, and voice-first interaction, the project aims to provide practical real-time hazard awareness using affordable and widely available hardware.

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