In Campus Navigation Assistive System for Blind School Students

Breif Background

Visually impaired school students struggle to navigate educational campuses independently, relying on basic tools that cannot provide contextual awareness or dynamic guidance. While modern depth cameras and embedded AI technologies now make intelligent perception possible, no solution currently exists that is specifically designed for safe, real-time indoor and outdoor movement within school environments. This project is motivated by the need to empower blind students with situational awareness, obstacle detection, and guided navigation—allowing them to move confidently and independently within their campus using an affordable, portable assistive system

Application Sectors

- Assistive Technology for the Visually Impaired blind school students
- Educational and Special-Needs Infrastructure
- Autonomous and Intelligent Navigation Systems for blind persons

TRL  **4**

Tech/Prod. Summary

A smart, sensor-integrated campus navigation assistive system designed for blind school students. It utilizes stereo vision, multi-sensor fusion, and real-time path guidance through audio feedback.

Tech/ Product Description

This system is a portable assistive device that uses a Jetson-based embedded platform with a ZED 2i stereo camera, GNSS, and ultrasonic sensors to provide real-time navigation for visually impaired students. It utilizes RTAB-CUDA and CUDA-optimized ORB-SLAM under ROS2 for depth estimation, mapping, and localization within campus environments, while sensor fusion supports obstacle detection, distance estimation, and safe path prediction. Navigation instructions are delivered through an audio module, enabling real-time verbal guidance, and the modular design ensures scalability and affordability for blind school applications.

Impact - SDG:

SDG 4 – Quality Education and SDG 10 – Reduced Inequalities

SDG 9 – Industry, Innovation & Infrastructure

Market Potential

Global assistive technology market for vision impairment: ~USD 6-7 Billion in 2024 → ~USD 14-15 Billion by 2030 (CAGR ~14%)

Value Proposition

1. Feedback assisted High-efficient navigation tool
2. Transformed embedded vision into a real-world social impact technology.