

ABSTRACT

Accident prevention on hilly roads is a critical concern due to sharp turns, limited visibility, and unpredictable vehicle movement. These challenges are especially dangerous in regions with blind curves where traditional static signboards fail to provide real-time warnings. This paper presents an IoT-based vehicle detection and warning system, named **S-Track Assistant**, designed specifically for such terrains. The proposed system utilizes ultrasonic sensors interfaced with an ESP8266 microcontroller in the prototype to monitor vehicle presence at key points on the road. Alerts are triggered when vehicles are detected within predefined danger zones, activating LED indicators and an overhead display system to warn drivers.

While the prototype relies on Wi-Fi-controlled ESP8266 and ultrasonic sensors, the real-time implementation is designed to incorporate **radar sensors** for long-range and high-precision vehicle detection, as well as **fog monitoring** to dynamically adjust LED display brightness during low visibility conditions. **RF modules** are used in place of Wi-Fi for robust, offline communication across the system components. This approach ensures uninterrupted functionality in remote or infrastructure-deficient areas. The system enhances driver awareness and road safety by providing timely, location-specific alerts, allowing drivers to slow down and avoid collisions on blind turns. It also offers scalability and reliability, making it a practical solution for smart traffic management in hilly and rural regions.