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Smart Embedded Night Vision System for Pedestrian Detection

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Abstract: *Night-time driving is risky because humans cannot see clearly in the dark, but unfortunately pedestrians and animals do not glow in the headlights on time. As a result, road accidents increase, and drivers realize the problem only after it is too late. To reduce this issue, this project introduces an Embedded Night Vision System for Pedestrian Detection using an ESP32 microcontroller.The system is mounted on a small car prototype that acts smarter than some real drivers. It uses PIR sensors to detect humans and animals by sensing the heat they naturally emit—because living beings cannot hide their body temperature. Once motion is detected, the ESP32 quickly reacts by alerting the driver and controlling the vehicle movement before panic braking is required.The car can be controlled wirelessly using Bluetooth through a mobile application, while an L298N motor driver ensures smooth movement of the DC motors.Overall, this project proves that with a little intelligence, a car can "see" better at night and help avoid accidents. Future upgrades may include cameras, AI, and IoT—because even cars deserve smarter vision.*

Keywords: Embedded systems for vehicle safety, Night-time pedestrian and animal detection, PIR sensor-based motion detection, ESP32 microcontroller applications, Bluetooth-controlled prototype vehicles, DC motor and L298N driver integration, Intelligent sensing for low-light driving

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