Driver Drowsiness Detection and Collision Avoidance System

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Abstract: *Road safety is a critical issue, with a significant number of accidents being caused by driver drowsiness and collisions. To tackle these concerns, this project introduces a "Drowsiness Detection and Collision Avoidance System" utilizing NodeMCU and Arduino UNO, which offers an integrated and automated solution to improve vehicle safety[1]. This system aims to monitor driver alertness in real-time and avoid potential collisions, ultimately reducing the risk of road accidents.*

For drowsiness detection, a camera is employed to continuously monitor the driver's eye movements. Image processing algorithms analyze these movements, and when signs of drowsiness, such as prolonged eye closure, are detected, an alert is triggered using an LED to warn the driver. This helps to ensure that the driver can take necessary precautions before fatigue causes dangerous situations. The collision avoidance feature is based on ultrasonic sensors placed at the front of the vehicle. These sensors detect obstacles in the vehicle's path and send data to the Arduino UNO, which processes the information and, through the L298N motor driver, controls the vehicle's steering system[6]. This allows the vehicle to autonomously avoid obstacles by adjusting its direction. Both the drowsiness detection and collision avoidance systems are powered by a 12V battery to ensure smooth and efficient operation. This project presents a cost- effective and scalable approach to addressing two major causes of accidents: driver fatigue and vehicle collisions.

By integrating readily available hardware and employing simple yet efficient algorithms, the system provides a practical solution for improving road safety[8]..

Keywords: Arduino Uno, Ultrasonic Sensor, L298N Motor Driver, Servo Motor, NodeMCU, LED, Haarcascade Algorithm