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A Real Time Driver Safety for Preventing Drowsiness Using Ear Algorithm and Truck Load Monitoring Alcohol Detections & Alert System

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ABSTRACT

This study presents a real-time driver safety system that integrates drowsiness detection, alcohol impairment prevention, and truck load monitoring. The system employs an Eye Aspect Ratio (EAR) algorithm to detect driver fatigue by analyzing eye movement patterns, triggering alerts when drowsiness is detected. Additionally, an alcohol sensor prevents vehicle ignition if alcohol is detected, and load cell sensors monitor truck weight to prevent overloading. A GSM-based alert mechanism enhances communication by sending real-time alerts. The system aims to reduce road accidents by integrating these technologies into an intelligent safety framework. Experimental results demonstrate the effectiveness of the system in enhancing road safety.

Keywords: *Drowsiness Detection, EAR Algorithm, Alcohol Detection, Load Cell, GSM Alert System*

INTRODUCTION

Road accidents remain a global concern, contributing to thousands of fatalities and injuries annually. Among the primary causes of road accidents are driver fatigue, alcohol consumption, and vehicle overloading. Studies indicate that drowsiness significantly impairs cognitive function and reaction time, making it a leading factor in traffic collisions. Similarly, alcohol consumption compromises judgment and motor skills, increasing the likelihood of accidents. Overloading trucks also poses severe risks, leading to vehicle instability, increased braking distances, and road wear.

To address these challenges, a proactive and comprehensive driver safety system is essential. Existing safety mechanisms often operate independently, failing to provide a holistic approach. The proposed system integrates multiple technologies to create a unified safety framework. The EAR algorithm is utilized for drowsiness detection by monitoring eye movement patterns, ensuring early warning alerts. An alcohol sensor prevents vehicle ignition if traces of alcohol are detected, eliminating the risk of impaired driving. Additionally, load cell sensors continuously monitor truck weight, automatically stopping the vehicle if it exceeds safe load limits.

RELATED WORK

Previous research has investigated various techniques for detecting driver drowsiness, including iris recognition, mobile phone usage detection, and physiological monitoring. Landmark-based algorithms and machine learning models have been widely employed for this purpose. In parallel, alcohol detection systems and load monitoring solutions have been developed independently. However, a fully integrated system that combines these safety measures remains largely unexplored. For instance, alcohol sensors that prevent vehicle ignition upon detecting alcohol traces have proven effective in mitigating the risks associated with impaired driving.

PROPOSED SYSTEM

The proposed system integrates multiple safety measures into a single framework that enhances driver and road safety. The key components of the system include:

Drowsiness Detection Module: This module uses the Eye Aspect Ratio (EAR) algorithm to monitor eye movement patterns in real-time. When drowsiness is detected, the system triggers an alert mechanism, which includes an audible alarm and a visual warning to keep the driver awake and attentive.

Alcohol Detection System: A high-sensitivity MQ2 sensor is employed to detect the presence of alcohol in the driver's breath. If alcohol levels exceed a predefined threshold, the vehicle ignition is disabled, preventing impaired individuals from operating the truck.

Truck Load Monitoring System: Load cell sensors continuously measure the truck's weight. If an overload condition is detected, the vehicle is immobilized until the excess weight is removed, ensuring adherence to load regulations and preventing potential hazards.

GSM-Based Alert Mechanism: In case of drowsiness, alcohol detection, or overloading, the system sends real-time alerts via SMS or phone calls to predefined emergency contacts, including fleet managers or emergency response teams. This ensures rapid intervention when necessary.**Rear Red Light Signaling System:** When drowsiness is detected, the vehicle's rear red light is activated to signal other drivers about the potential hazard, reducing the likelihood of rear-end collisions.

This comprehensive approach not only addresses the risks associated with drowsiness, alcohol impairment, and vehicle overloading but also facilitates real-time intervention and enhances overall road safety. Implementing such an integrated system has the potential to substantially reduce accident rates and promote safer driving practices, especially within commercial and long-haul transportation sectors.

METHODOLOGY

Hardware Components

The hardware implementation of the system involves integrating a range of sensors and electronic modules within the vehicle to enable real-time monitoring and response. The primary hardware components include:

i. **Nano Microcontroller**: Serves as the central processing unit, interfacing with all sensors and executing detection algorithms.

ii. **LCD Display**: Presents system status updates and alerts to the driver.

iii. **Load Cell with HX711 Module**: Measures the vehicle's load and transmits the data to the microcontroller for overload detection.

iv. **MQ2 Sensor**: Detects the presence of alcohol in the driver's breath and triggers ignition disablement if necessary.

v. **Buzzer and LED Indicators**: Provide auditory and visual alerts to warn the driver of drowsiness or unsafe driving behavior.

vi. **GSM Module**: Enables real-time communication by sending SMS alerts and emergency notifications to designated contacts.

vii. **Camera Module**: Captures real-time video of the driver's face for eye movement analysis and drowsiness detection.

viii. **Power Management Unit**: Maintains a stable power supply to all system components to ensure consistent operation.

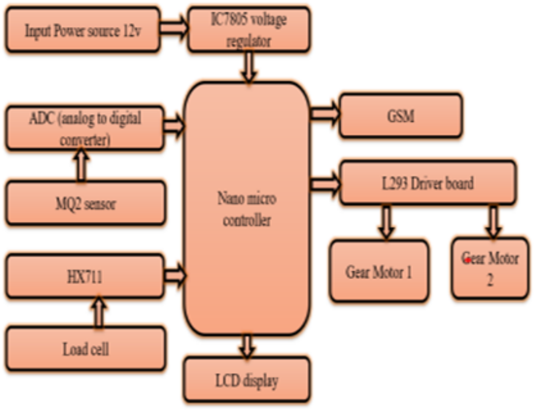

Figure-1 : Block Diagram of Proposed System

SOFTWARE IMPLEMENTATION

The software system is designed to process sensor inputs, apply detection algorithms, and generate appropriate responses. The primary software modules include:**Drowsiness Detection Algorithm:** Implemented using Python and OpenCV, this module processes real-time video input from a camera to compute the EAR values. If the EAR value falls below a predefined threshold for a specific duration, an alert is triggered.

Alcohol Detection System: The embedded C program running on the microcontroller processes signals from the MQ2 sensor. If alcohol concentration exceeds the set limit, the vehicle ignition system is disabled, and an alert is generated.

Load Monitoring System: The load cell data is continuously analyzed by the microcontroller. If the detected weight surpasses safe limits, the vehicle is immobilized until corrective actions are taken.

GSM Communication System: The GSM module is programmed to send SMS alerts to emergency contacts in case of any detected anomaly. The message includes details such as vehicle status and location.

Alert Mechanism: The software coordinates the activation of the buzzer, LED indicators, and rear red light signaling system based on detection results**Real-Time Data Logging:** The system maintains a log of drowsiness events, alcohol detection, and load status, allowing for post-analysis and performance improvement.

Remote Monitoring and Control: The system can be integrated with a cloud-based platform, allowing fleet managers to monitor vehicle status remotely in real-time.

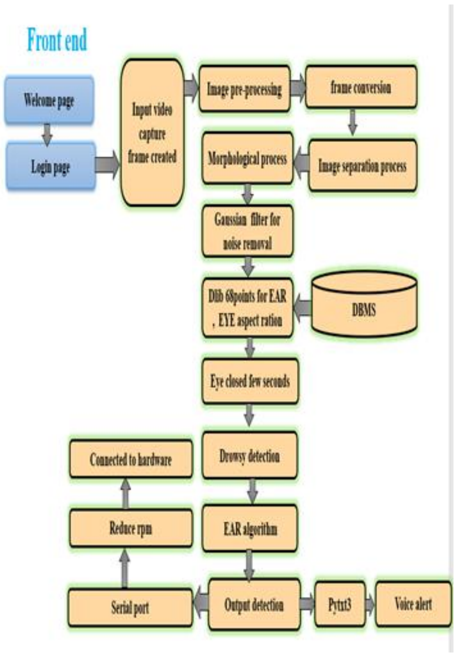

Figure 2 : Software Implementation

RESULTS AND DISCUSSION

The real-time driver safety system was successfully developed to detect drowsiness, monitor truck load, and sense alcohol presence. Using the EAR algorithm, the system accurately identified signs of driver fatigue and issued timely alerts. Load sensors effectively detected overloading, ensuring safe driving conditions. The alcohol detection unit reliably sensed alcohol vapors and prevented vehicle ignition if necessary. All components worked seamlessly together, responding within seconds to potential hazards. Overall, the system significantly enhanced driver safety and vehicle monitoring in real-time.

REFERENCES

[1] Basilio, J. A. M., et al. "Explicit image detection using the YCbCr color space model for skin detection." *Proceedings of the 2016 American Conference on Applied Mathematics and the 5th WSEAS International Conference on Computer Engineering and Applications*, IEEE ICCE, 2020.

[2] Choi, I.-H., Hong, S. K., and Kim, Y.-G. "Real-time categorization of driver's gaze zones using deep learning techniques." *Proceedings of the 2021 International Conference on Big Data and Smart Computing (BigComp)*, IEEE, 2021.

[3] Du, Y., et al. "Driver fatigue detection based on eye state analysis." *Proceedings of the 11th Joint Conference on Information Sciences*, 2022.

[4] Bradski, G., and Kaehler, A. *Learning OpenCV: Computer Vision with the OpenCV Library*. O'Reilly Media, Inc., 2021.

[5] Huang, G. B., Ramesh, M., Berg, T., and Learned-Miller, E. *Labeled Faces in the Wild: A Database for Studying Face Recognition in Unconstrained Environments*. University of Massachusetts, Amherst, Technical Report, October 2021.

