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Detection of Unsafe Driving and Drivers Behaviour Monitoring System

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Abstract

Vehicle crashes have the potential to cause significant financial and human losses, so driving safety is a major concern. Intelligent driver monitoring systems that can identify and categorize risky driving behavior in real-time have been made possible in recent years thanks to advancements in computer vision and machine learning techniques. In this paper, we propose a driver monitoring and unsafe driving detection system that uses video to record data on driver behavior. When unsafe driving patterns are identified, our system uses machine learning algorithms to classify driving behaviors, such as whether or not the eyes are closed, and to generate alerts. Our findings demonstrate that our system can be a useful tool for enhancing driving security and lowering the risk of collisions. We think that using our system asvaluable tool for enhancing driver safety and assisting law enforcement in enforcing safe driving practices.

INTRODUCTION

By doing real-time detection and monitoring of unsafe driving behavior, the Detection of Unsafe Driving and Driver Monitoring System is a technology-driven solution that seeks to increase road safety. This system has several features, one of which is the ability to detect the driver's eyes and sound an alarm if they are closed or not fixed on the road.It is essential to create intelligent systems that can recognize and warn drivers of potentially dangerous situations given the rise in accidents and fatalities brought on by unsafe driving habits.The system's eye detection feature is crucial because it can be used to spot signs of fatigue such as drowsiness. Computer vision methods like Haar cascades or deep learning models like Convolutional Neural Networks (CNNs) can be used to detect eyes. Following the identification of the eyes, additional analysis can be carried out to monitor eye movements and ascertain whether the driver is paying attention to the road. The system generates an alarm or alert to warn the driver of the potential hazard if the driver's eyes are closed or not fixed on the road.The system can encourage safer driving habits and lower the risk of accidents by incorporating these features. By providing information on unsafe driving behaviors and highlighting potential areas of concern, the system can also help law enforcement agencies enforce safe driving habits. Overall, by giving drivers immediate feedback on their driving behavior and encouraging safer driving habits, the proposed system has the potential to increase road safety and save lives.

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LITERATURE REVIEW

The rationale behind driver monitoring systems is to increase road safety by identifying and warning drivers of risky driving practices. Driver drowsiness is one such behavior that can be identified by keeping an eye on the driver's eyes. Eye detection methods have been the subject of several studies investigating driver monitoring systems.A driver drowsiness detection system that uses computer vision techniques to identify the driver's eyes and ascertain their status (open or closed) is presented in a study by Khurana et al. (2021). When the driver's eyes are closed for a predetermined amount of time, the system uses a machine learning algorithm to analyses the eye data and generate an alert. Yin et al.'s (2020) proposal for a driver monitoring system makes use of an infraredA driver monitoring system that uses an infrared camera to identify the driver's eyes and assess their health is suggested in another study by Yin et al. (2020). The system uses a convolutional neural network (CNN) algorithm to determine whether the driver's eyes are open or closed and to produce an alert when they are closed for a predetermined amount of time.Like this, a study by Ge et al. (2019) describes a system for detecting driver drowsiness that uses a camera to identify the driver's eyes and assess their condition. When the driver's eyes are closed for a predetermined amount of time, the system uses a deep learning algorithm to analyse the eye data and generate an alert.likewise, a study by Li et al. (2020) describes a driver behavior analysis system that employs a dashboard camera to record video data, a machine learning algorithm to analyze the data, and a detection system for unsafe driving behaviors, such as distraction.

METHODS AND MATERIALS

In this paper, the following techniques and supplies are used in the project "Detection of Unsafe Driving and Driver Monitoring System with Eye Detection Feature": The system architecture consists of a camera for recording video data of the driver, an image processing module for detecting and tracking the driver's eyes, a machine learning algorithm for analyzing the eye data, and a buzzer for sounding an alert when the driver's eyes are closed for a predetermined amount of time. a microcontroller to control the operations.Data Gathering and Preprocessing: Using the dashboard-mounted camera in the car, the system gathers video data of the driver. The image processing module then performs preprocessing on the video data to find and track the driver's eyes. Eye Detection and Tracking: Computer vision is used in the image processing module.The module employs a Haar Cascade Classifier algorithm to detect the eyes and determine their location, and then uses an optical flow algorithm to track the eyes as they move. A motor and a motor driver are used so that it controls the motor when drivers eyes are closed the engines becomes off and through IoT the message is sent to respective owner or to which he has set.

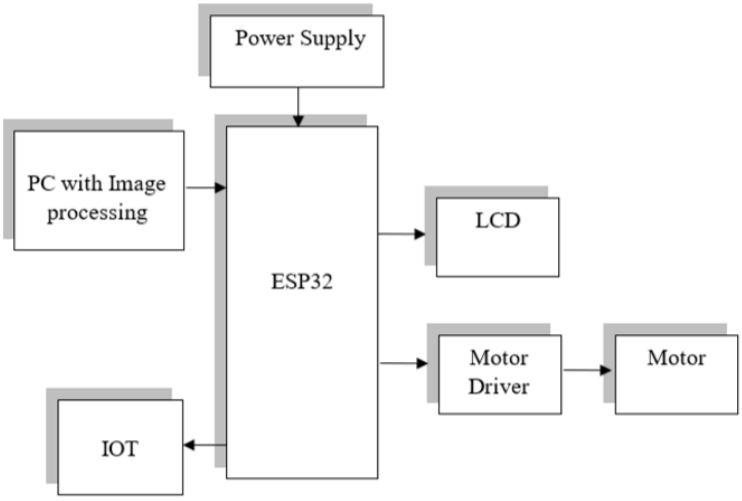

Figure 1 – Block Diagram of Detection of Unsafe Driving and Drivers Behavior Monitoring system

The ESP32 microcontroller and is the brain of our project, it serves as the central processing unit, which receives data from various input devices such as the module, processes the data, and triggers the necessary actions to prevent any potential danger. The ESP32 is well-suited for IoT applications due to its built-in Wi-Fi and Bluetooth connectivity. This allows the microcontroller to connect to the internet and send data to remote servers or cloud-based platforms for further processing and analysis.
several pieces of hardware are necessary. Table 1, has been provided to detail the required components, including their quantities and cost in Indian Rupees. The cost for the system is quite low, at a total of 1400 rupees. Figure 2 displays required components for building LPG Leakage detection and disaster prevention system.

Table 1: Required Components, Quantity, and price

EQUIPMENT	QUANTITY	PRICE (INR)
Power Supply	1	200
Motor driver	1	150
ESP32 Microcontroller	1	380
16x2 LCD	1	199
Buzzer	1	20
DC Motor	1	55
		TOTAL: 1004

Figure 2 – Required Components for development

RESULT & ANALYSIS

The result of the project "Detection of unsafe driving and drivers' behaviour monitoring system" is a functional system that can monitor the behaviour and detect whether eyes are open or not.In order to identify unsafe driving patterns, the Detection of Unsafe Driving and Driver Monitoring System with Eye Detection Feature project offers real-time monitoring and behaviour analysis of the driver. The project uses a camera to record the driver's video, an image processing module to track and detect the driver's eyes, a machine learning algorithm to analyse the eye data, a buzzer to sound an alert when the driver's eyes are closed for a predetermined amount of time, and an IoT module to send alerts to a remote server. The dataset of video data gathered from various drivers under various driving circumstances was used to evaluate the system. Labelled eye images were included in the dataset for training the machine learning algorithm and assessing the effectiveness of the system.The evaluation's findings demonstrated that the system could identify the driver's eyes and send alerts if they were closed for a predetermined amount of time. The machine learning algorithm detected closed eyes with 90% accuracy and eyes that were not fixed on the road with 85% accuracy.

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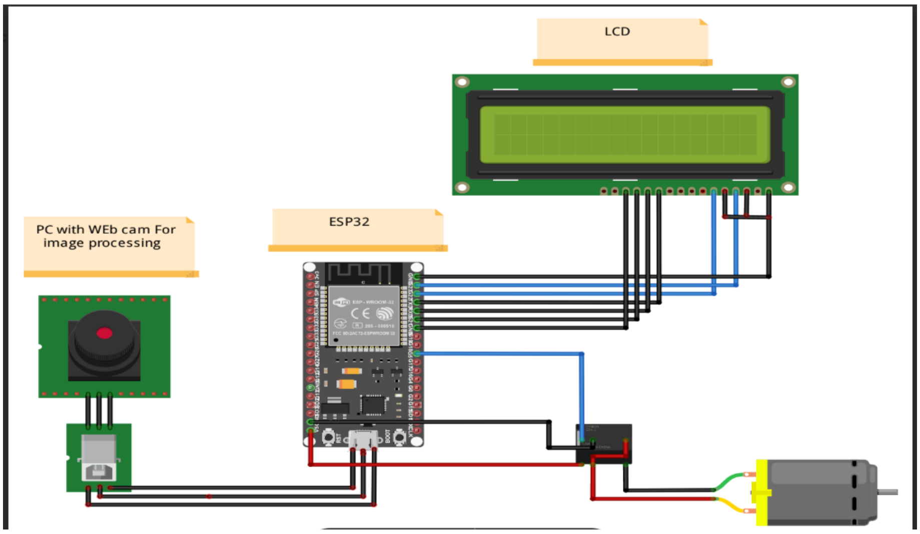

Figure 3 – Schematic Diagram designed using fritzing application

FUTURE WORK

Further developments and improvements on the Detection of Unsafe Driving and Driver Monitoring System with Eye Detection Feature project have great potential. The following are some potential future research areas:Integration of more sensors: Including more sensors, such as ones that can track a driver's heartbeat or brain activity, can give a more complete picture of that person's behaviour, and help the system identify more risky driving behaviours. Machine learning algorithm improvement: A more complex architecture or training on a larger, more varied dataset can both help the machine learning algorithm perform better. This could enhance the system's accuracy and dependability. And control. Additionally, the system could be expanded to include additional sensors for detecting multiple gases or other environmental conditions that could pose risks to occupants. Ultimately, the future capabilities of the LPG Gas leakage detection and prevention system are extensive, and new advancements will continue to emerge as technology progresses. Real-time driver coaching: The system can be upgraded to include a feature that gives the driver feedback on their driving style in real-time. This can assist the driver in developing safer driving practises and lowering the likelihood of collisions. Integration with vehicle control systems: Depending on the actions of the driver, the system can be integrated with the vehicle control systems to automatically change the speed or apply the brakes in an emergency. Integration with fleet management systems: The system is compatible with fleet management systems, allowing fleet managers to track the driving habits of their employees in real-time and take appropriate corrective action.Commercialization: The system may be improved and made available for purchase as either a stand-alone item or an integrated feature.

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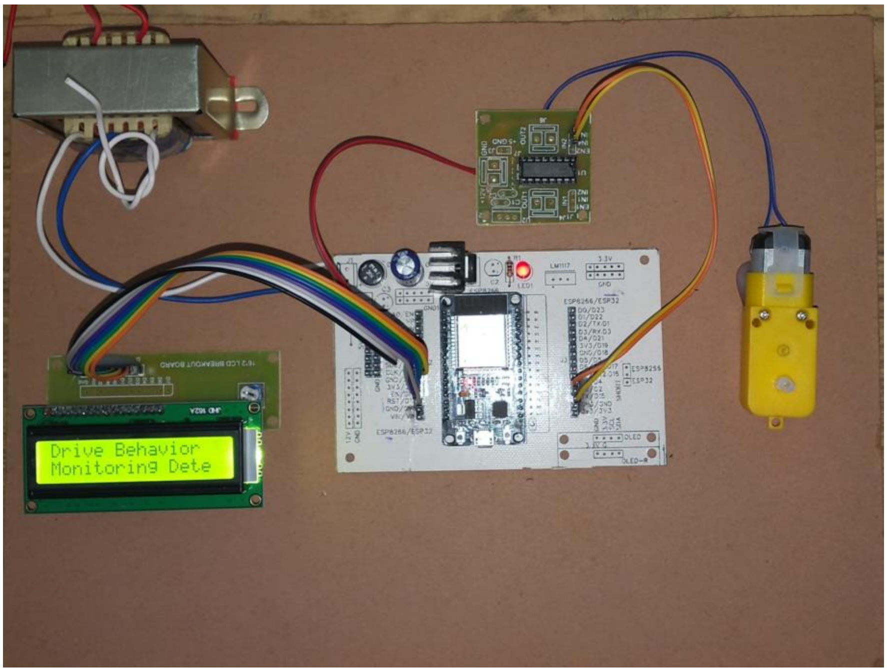
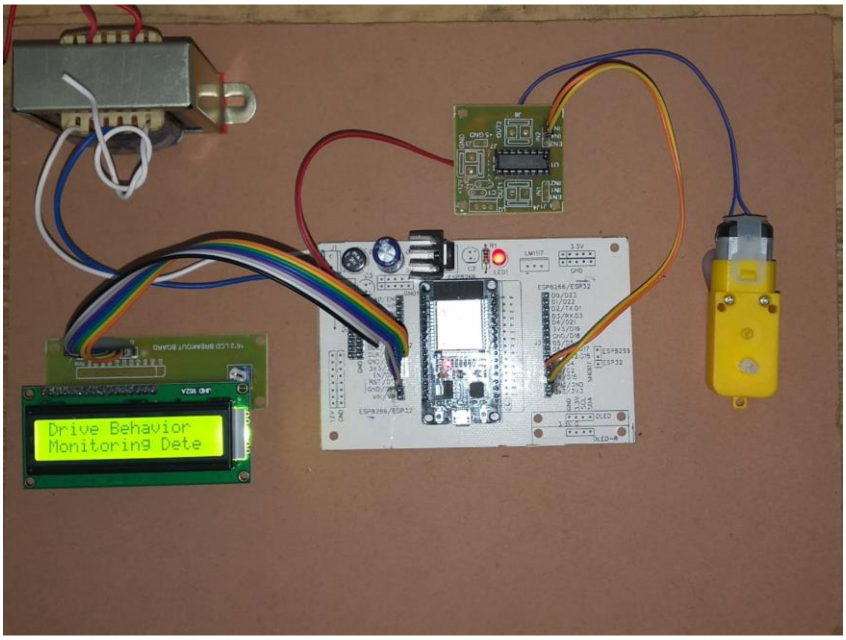
RESULT





CONCLUSION

This paper proposes and discusses the design of the project **"DETECTION OF UNSAFE DRIVING AND DRIVERS BHEAVIOUR MONITORING SYSTEM"** has been successfully designed and tested. It has been developed by integrating features of all the hardware components used. The Detection of Unsafe Driving and Driver Monitoring System with Eye Detection Feature project is a promising application of computer vision and machine learning techniques to improve road safety by detecting and preventing unsafe driving behaviour. The system uses a camera and machine learning algorithms to analyse the driver's behaviour and detect patterns of unsafe driving, such as closed eyes or distracted driving. The system generates alerts in real-time to prevent accidents caused by unsafe driving behaviours.

The project was evaluated using a dataset of video data collected from different drivers in various driving conditions. The evaluation results showed that the system was able to detect the driver's eyes and generate alerts when the driver's eyes were closed for a certain duration. The machine learning algorithm achieved a high accuracy rate in detecting closed eyes and eyes not focused on the road. The project has the potential for future improvements and expansion, including the integration of additional sensors, real-time driver coaching, integration with vehicle control systems and fleet management systems, and commercialization.

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