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Implementation of Multifunction Accident Detection and Prevention Vehicle

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Abstract: ***Driver fatigue is one of the leading causes of accidents worldwide. One of the most reliable methods of measuring driver fatigue is to detect the driver's drowsiness. Drowsiness and fatigue are two of the maximum not unusual causes of car accidents. The intention of the project is to create prototype drowsiness detection system. This system works by means of monitoring the driver's eyes and sounding an alarm if he/she will becomes drowsy. The priority is to enhance motive force safety without being intrusive. The driver's eyes blink and yawn is detected in this project. If the driver's eyes remain closed for an extended period of time, he/she took into consideration drowsy, and an alarm is sounded.***
Keywords: Raspberry-Pi, Accelerometer, GPS Module, GSM Module.

I. INTRODUCTION

The multifunction accident detection and prevention vehicles are designed to enhance road safety by utilizing advanced sensors and smart systems. This project aims to design and implement a smart system for vehicles that detects driver's drowsiness and obstacles to prevent accidents. The system will use a raspberry-pi to process data from a camera and sensors to take automatic preventive actions such as alerting the driver, stopping the vehicle and avoiding obstacles. In case of accidents, the system immediately alerts emergency services with real time location data, helping to reduce response time and improve overall safety on the road.

A driver drowsiness detection system is a technology that uses various sensors, algorithms to monitor the driver's behavior and detect signs of drowsiness or fatigue. The system can issue and alert to the driver through an audio warning or any other alert to prevent accidents before they occur.

The factors causing accidents are speeding, night driving, and drowsy driving:

1) Speeding: Majorly in highways car drivers ignore the speed limit. Speed kills and travelling above the speed limit is an easy way to cause accident.
2) Night driving: Driving in daylight can be hazardous, but driving at night nearly doubles the risk of accident when you can see what's ahead you don't know what to anticipate as you drive towards it.
3) Drowsy driving: Driver fatigue isn't talked about a lot, but how well we can expect anyone to drive when they are having trouble staying awake. A most of the car accident caused by drowsy driving occur at night.

II. BODY OF PAPER

The driver's drowsiness detection system is a technology that uses various sensors, algorithms to monitor the driver's behavior and detect signs of drowsiness of fatigue. The system can issue an alert to the driver through an audio warning or any other alert to prevent the accidents before they occur. In case the accident occurs the system immediately alerts emergency services with real time location data, helping to reduce response time and improve overall safety on the road.

III. LITERATURE REVIEW

1) *Driver Drowsiness Detection System and Techniques*

According to the experts it has been observed that when the drivers do not take break they tend to run a high risk of becoming drowsy. Study shows that accident occurs due to sleepy drivers in need of a rest, which means that road accidents occurs more due to drowsiness rather than drink-driving.

2) *Implementation of the driver drowsiness detection system*

This paper is about making cars more intelligent and interactive which may notify or resist user under unacceptable conditions, they may provide critical information of real time situations to rescue or emergency vehicle or family members. Driver fatigue resulting from sleep disorders is an important factor in the increasing number of accidents on today's road. In this paper, we describe a real time safety prototype that controls the vehicle speed under driver fatigue.

3) Detecting driver Drowsiness Based on Sensors

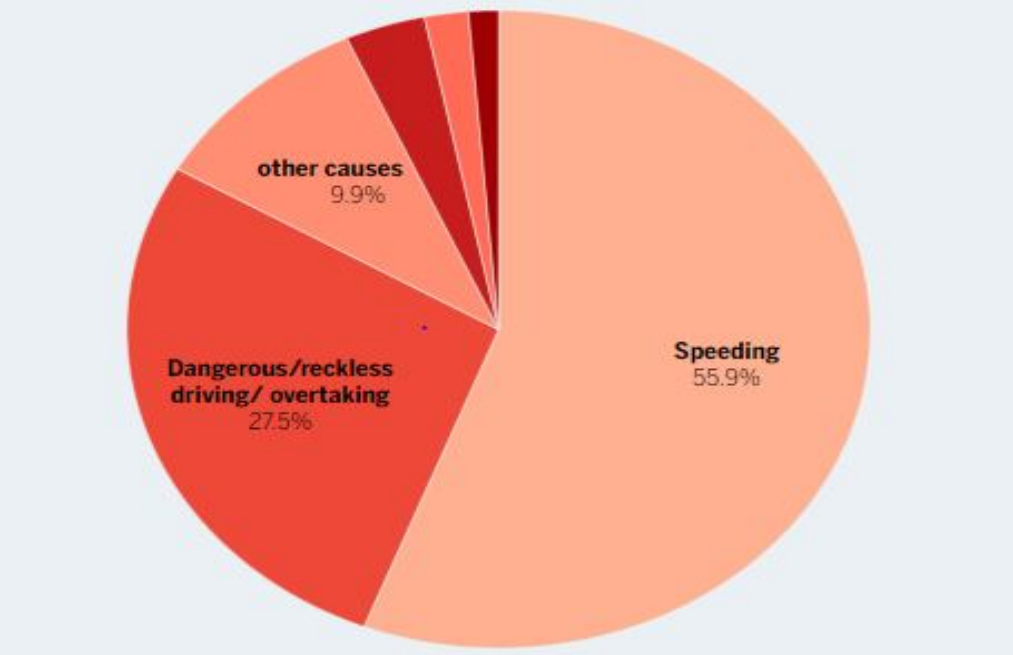
Researchers have attempted to determine driver drowsiness using the measures: vehicle based measures, behavioral measure and physiological measures. A detail review on this measures will provide inside on the present systems, issues associated with them and enhancements that need to be done to make a robust system this paper reviews the measure as to the sensors used and discuss the advantage and limitations of each.

4) This project represents a way of developing and interfaced detect driver drowsiness based on continuously monitoring eyes and DIP algorithms.

Micro sleeps are the short period of sleeps lasting 2 to 3 seconds, are good indicator of fatigue state by thus monitoring continuously the eyes of the driver by using camera one can detect the sleepy state of driver and timely warning is issued. Aim of the project is to develop the hardware which is very advanced product related to driver safety on the roads using raspberry pi and image processing. This product detects driver drowsiness and gives warning in the form alarm and it also decreases the speed of vehicles along with the drowsiness detection process there is continuous monitoring of the distance done by the ultrasonic sensor. The ultrasonic sensor detects the obstacles and accordingly warm the driver as well as decreases speed d of the vehicles.

IV. PROBLEM STATEMENT

With the increasing number of road accidents attributed to driver fatigue and inattention, there is a pressing need for innovative safety solutions in vehicles.



V. OBJECTIVES

1) To Develop a drowsiness detection system: Create a real time monitoring system using camera and image processing techniques to accurately detect signs of driver fatigue, such as eye closer and facial expressions.
2) To automate vehicle control: Design a control mechanism that automatically adjusts the vehicle's speed or stops it based on the detected level of driver drowsiness or the proximity of obstacles.
3) Accident detection: Utilize accelerometer data to recognize sudden impacts, indicating a possible collision or accident.
4) Emergency alerts: When accidents occurs it send automated SMS alerts with GPS location to designated contacts if accidents are detected.
5) Location tracking: Use a GPS module to pin points the vehicle's location, especially in emergencies such as ambulance and family members.

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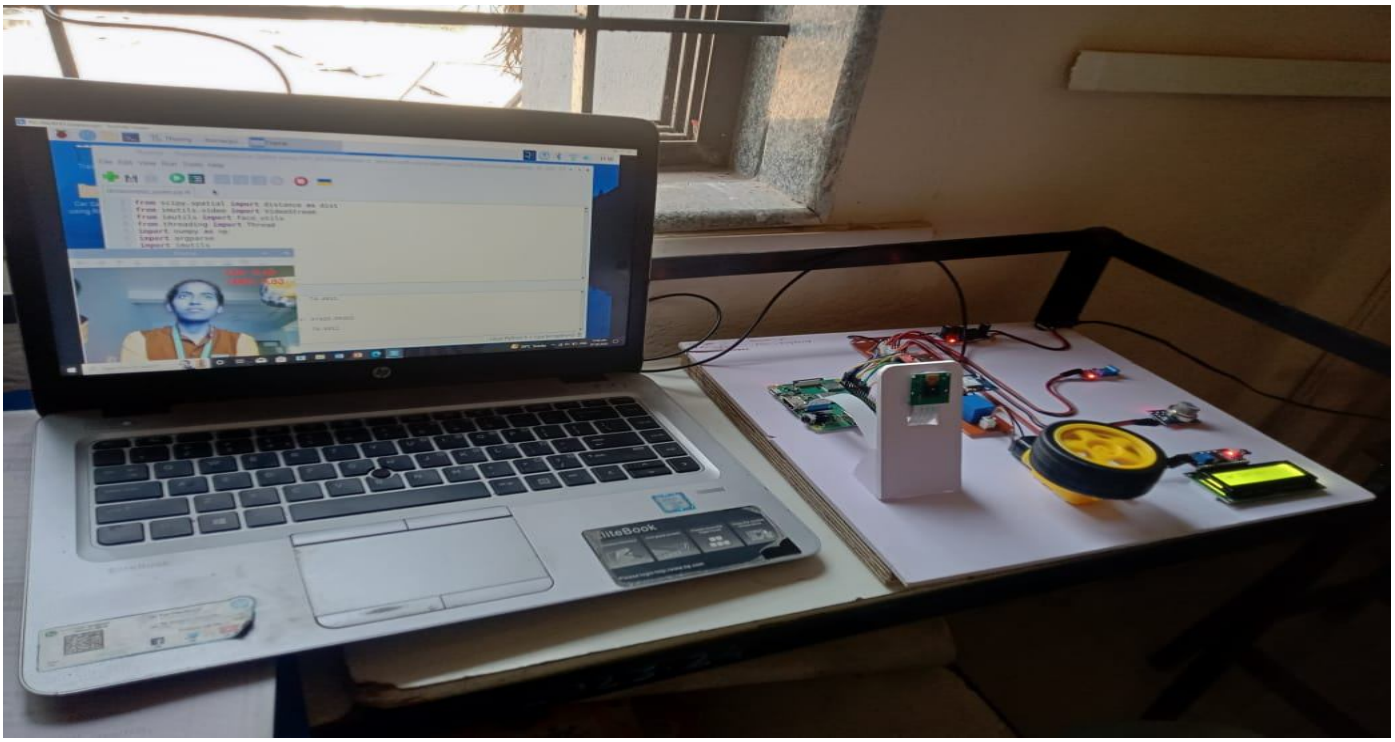
VI. RESULT

A. *Setup*



A multifunction accident detection and prevention vehicle is designed to improve road safety by detecting accidents and preventing collision using advanced sensors and communication systems. This setup integrates Raspberry-pi, R-pi camera, vibration sensor, GSM module, GPS module, alcohol and smoke sensor, LCD display and buzzer.

1) Raspberry Pi 3A+ (Central Controller): Acts as the main processing unit, handling input from sensors and controlling output devices. Runs the accident detection algorithm and triggers emergency responses.
2) Vibration Sensor: Detects sudden shocks or vibrations, indicating a possible accident or crash. Sends data to Raspberry Pi for accident analysis.
3) Buzzer: Provides an audio alert when an accident is detected. Can also be used for warning signals in case of obstacle detection.
4) Raspberry Pi Camera (R-pi Camera): Captures images or videos when an accident is detected. Can be used for real-time monitoring or post-accident analysis.
5) GSM Module (SIM800): Sends emergency SMS notifications to predefined contacts. Provides real-time communication for remote monitoring.
6) GPS Module (NEO7M): Provides location details of the vehicle in case of an accident. Sends GPS coordinates via GSM for emergency response.
7) Relay: Controls the DC motor (vehicle engine or safety mechanism). Can disable the vehicle in case of an emergency (e.g., if alcohol is detected or a crash occurs).
8) DC Motor: Represents the vehicle's engine or a safety actuator. Can be controlled based on accident detection or obstacle prevention logic.

VII. APPLICATION

1) Accident detection and emergency alert system detects the vehicle crashes using vibration sensor and sends emergency alerts with GPS location via GSM to predefined contact (police, ambulance, family).
2) Real-Time Vehicle Tracking System. Tracks vehicle movement using the GPS module. Helps in fleet management, stolen vehicle recovery, and route optimization.

3) Smart Vehicle Safety System. Uses a relay to stop the vehicle in emergency situations (e.g., if an accident is detected). Ensures driver safety by preventing engine restart until help arrives.

4) Automated Traffic Accident Reporting. Reduces response time for emergency services. Helps authorities analyze accident-prone areas using real-time data.

5) Anti-Theft System for Vehicles. Sends an alert if unauthorized movement or vibration is detected. Can disable the engine remotely using the relay and GSM module.

6) Driver Behavior Monitoring System. Records vehicle vibrations and movements to analyze reckless driving patterns. Helps in enforcing safe driving habits, especially for commercial fleets.

7) Smart Public Transport Safety System. Enhances safety in taxis, buses, and school vehicles by enabling accident detection and real-time tracking.

8) Industrial and Logistics Vehicle Monitoring. Ensures the safety of goods and vehicles in logistics and transportation industries. Prevents vehicle Misuse by tracking location and movement history.

VIII. CONCLUSION

This system effectively enhances road safety by detecting driver fatigue and preventing collisions using real-time monitoring and control. Power by raspberry-pi, it offers a cost effective and scalable solution that can help to reduce accidents caused by drowsiness and obstacles.

IX. ACKNOWLEDGEMENT

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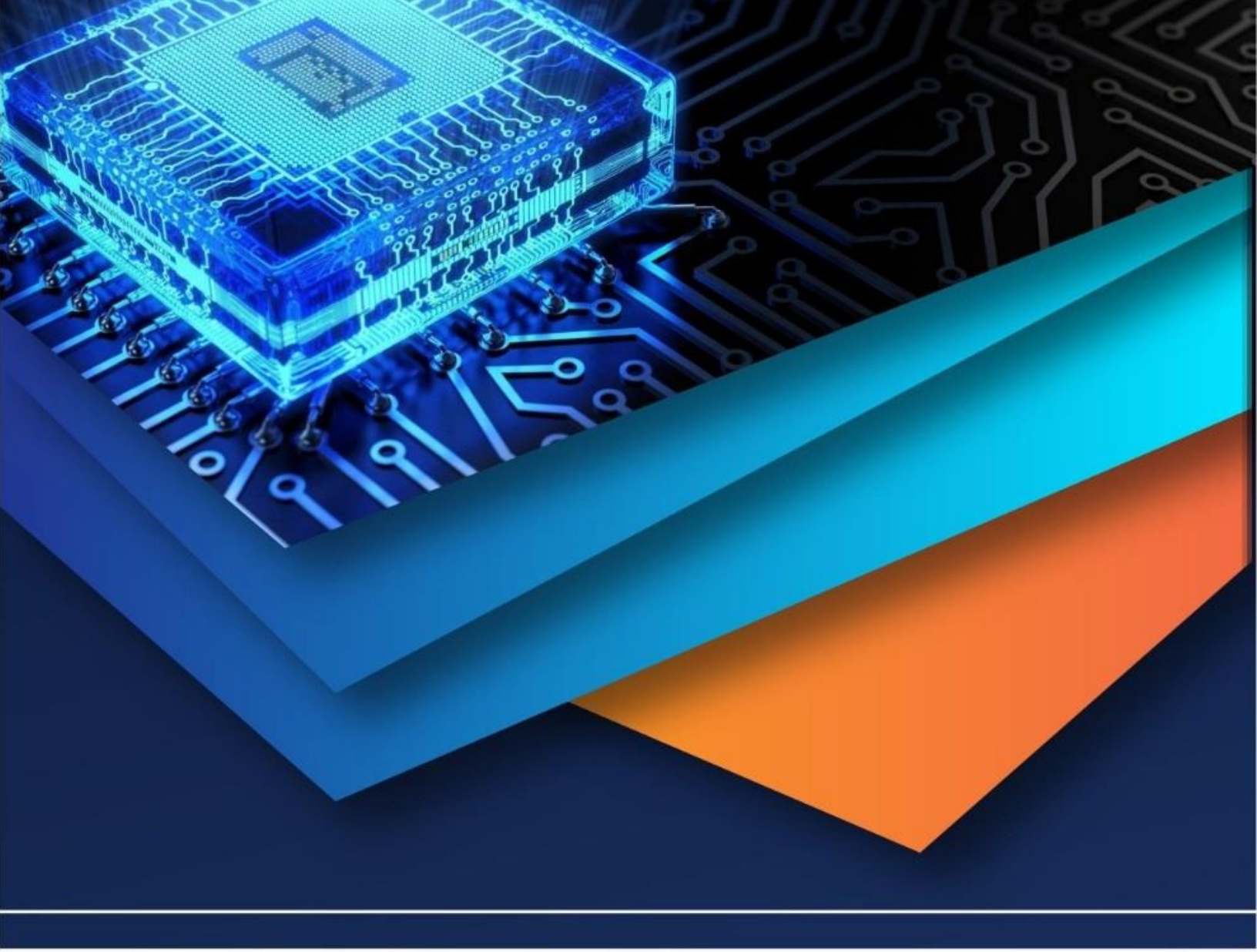

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