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Review 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.

***Key Words*:** Raspberry-Pi, Accelerometer, GPS Module, GSM Module.

1. 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, slowing down 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:

1.1.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.

1.2. 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.

1.3.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.

2. 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.

2.1 Literature Review

2.1.1 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.

2.1.2 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.

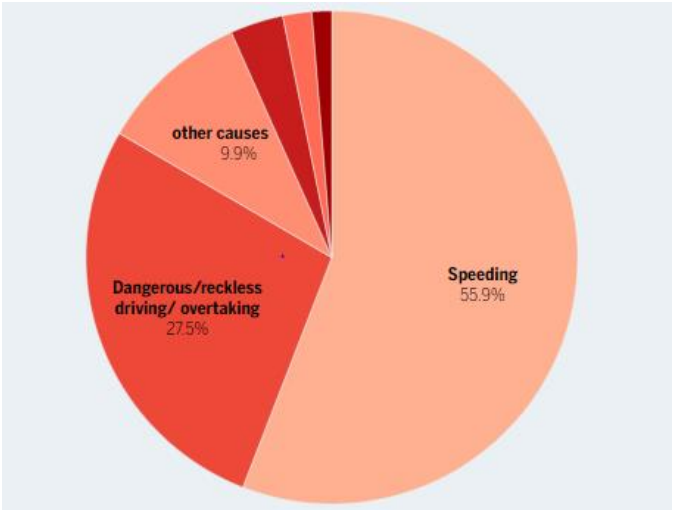
2.1.3 Detecting driver drowsiness based on sensors: Researchers have attempted to determine driver drowsiness using the measures: vehicle based measures, behavioral measure and physiological measures. A detail review on this measures will provide inside on the present systems, issues associated with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

to the sensors used and discuss the advantage and limitations of each.

2.1.4 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.

2.2. 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.



2.3. Objectives

2.3.1. 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.

2.3.2. 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.

2.3.3. Accident detection: Utilize accelerometer data to recognize sudden impacts, indicating a possible collision or accident.

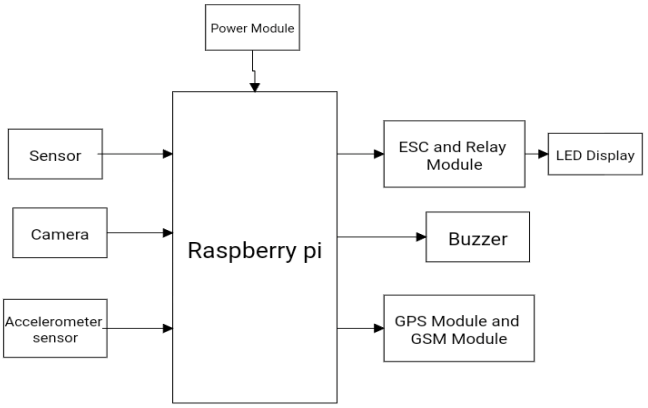
2.3.4. Emergency alerts: When accidents occurs it send automated SMS alerts with GPS location to designated contacts if accidents are detected.

2.3.5. Location tracking: Use a GPS module to pin points the vehicle's location, especially in emergencies such as ambulance and family members.

2.4. Proposed Block Diagram

Raspberry-pi: The raspberry-pi acts as the central controller that processes data from various input sources, including cameras and sensors.

Power supply: the system is powered on using a battery or a dedicated power source connected to the raspberry-pi and sensors.



Camera module: A camera module is positioned to capture the driver's face in real time and send input to the raspberry-pi to capture the image.

Speed control mechanism: the system interfaces with a relay module and an electronic speed controller (ESC) to manage the vehicle's speed.

Relay module control: The raspberry-pi sends control signals to a relay module based on inputs from camera and sensors.

LCD display: If implemented, an LCD display shows real time data such as the driver's drowsiness status, vehicle speed and alerts.

Buzzer: The buzzer in the project acts as vital feedback tool, providing immediate auditory alerts when the drowsiness is detected.

Accelerometer sensor: This sensor detects sudden changes in motion or impact. If the vehicle experiences a potential collision, the sensor senses a signal to the raspberry-pi to recognize that an accident has likely happened.

GPS module: The GPS stands for Global positioning system. The GPS module is used to track the vehicle's location in real time.

GSM module: The GSM stands for global system for mobile communication. The GSM module is used to enable communication with external devices or networks, primarily for sending alerts in case of an emergency.

2.5. Methodology

Hardware setup: Assemble the hardware components on the vehicle model or prototype. Connect the raspberry pi to the camera module, GPS, GSM, ultrasonic sensors, accelerometer, relay and buzzer for seamless integration.

Software development: develop the software to control all components, including python code to handle image processing, obstacle detection and communication with GSM and GPS modules.

Drowsiness detection algorithm: implement facial recognition and eye tracking algorithms using open CV to monitor driver alertness. Train the system to detect signs of drowsiness like prolonged eye closure or yawning.

Obstacle detection and speed control: program the ultrasonic sensors to measure distances to obstacles in the vehicles path. Set thresholds and use relay module to control vehicle speed or stop speed when obstacle are detected.

Accident detection logic: program the accelerometer to detect sudden deceleration or impact. Configure it to trigger alerts if the values exceed the certain threshold, indicating a potential accident.

GPS and GSM integration: configure the GPS module to acquire location coordinates and integrate the GSM module to send SMS alerts containing location information to emergency contacts in the event of an accident.

Testing and calibration: test each component separately and then as an integrated system. Calibrate the drowsiness detection algorithm, obstacle detection range and accident detection thresholds to ensure reliable performance.

System validation: conduct real world or simulated tests to verify the accuracy of drowsiness detection, obstacles avoidance and emergency alerts functionality, making adjustments as needed based on the results.

Final integration and documentation: integrate all components into a complete system, documenting the hardware setup, code, calibration setting and testing outcomes for future reference, scalability and development.

3. CONCLUSIONS

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.

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