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Accident Prevention System.

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ABSTRACT:

The increasing speed of vehicle adoption in modern times has transformed road safety into a widespread concern because it causes more driving incidents and serious injuries and deaths on roads. The main contributors to road accidents are tired drivers and intoxicated motorists. An accident prevention system which incorporates eye blink sensor and alcohol sensor can be developed for effective and economical management of this issue. The device operates through an eye blink sensor that observes driver blinking activity for detecting drowsiness followed by an alcohol sensor which verifies the driver's intoxication state. Upon detecting drowsiness or intoxication both inside the vehicle the system notifies the driver before activating preventative measures that reduce speed. This system addresses two primary road accident causes to minimize human mistakes and improve driver alertness which results in saving lives on the road.

Keywords: APS, MCU, IR, GPS, ADC, PWM, LED, I2C, UART.

Introduction:

The Accident Prevention System (APS) represents a technological answer to identify potential hazards before occurrence which helps prevent accidents. These systems find widespread usage in transportation areas as well as industrial premises in addition to safety-relevant locations. Analysis of real-time data through sensors coupled with microcontrollers enables an accident prevention system to find unsafe conditions which let it automatically respond with corrective measures or notify human operators for intervention.

The vehicle accident prevention system employs ultrasonic sensors together with GPS technology and camera capabilities to track obstacles alongside other vehicles before it issues driver alerts or automatically engages brake functions to prevent collisions. APS systems in industrial spaces monitor equipment and personnel along with environmental conditions so accidents relating to both equipment flaws and exposure to hazardous materials and worker falls can be prevented.

Literature Survey:

The table below provides a comparative analysis of research papers focused on Accident Prevention System. It highlights the authors, titles, publication years, along with the advantages (pros) and limitations (cons) of the proposed methods and technologies in each study. This comparison aims to offer insights into the advancements and challenges in the domain of automated answer grading systems using artificial intelligence, natural language processing (NLP).

Table 1 – Comparative Analysis of Research

Sr. No.	AUTHOR	TITLE	YEAR	PROS	CONS
[1]	R. Kumar, S. Singh	Smart Vehicle Accident Detection and Prevention System	2020	Real-time monitoring, GPS integration, low cost	Dependent on internet connectivity
[2]	A. Sharma, B. Gupta	IoT Based Accident Prevention Using Alcohol Detection	2019	Alcohol sensor improves driver safety	False positives from alcohol detection
[3]	M. Joshi, L. Deshmukh	Accident Prevention System Using GSM and Sensor	2018	Quick alert via GSM, easy to implement	GSM signal may be unreliable in remote areas

		Technology			
[4]	S. Ramesh, K. Venkatesan	Vehicle Collision Avoidance System Using Ultrasonic Sensors	2021	Effective in short-range obstacle detection	Limited detection range, not useful at high speed
[5]	T. Patel, N. Rana	Road Accident Alert and Vehicle Tracking Using GPS and GSM	2017	Real-time location tracking, affordable	Accuracy depends on GPS and GSM availability
[6]	P. Roy, A. Das	Android-Based Accident Prevention and Detection System	2022	User-friendly mobile interface, easy accessibility	Requires smartphone integration

3. Block diagram & Flow chart of proposed system:

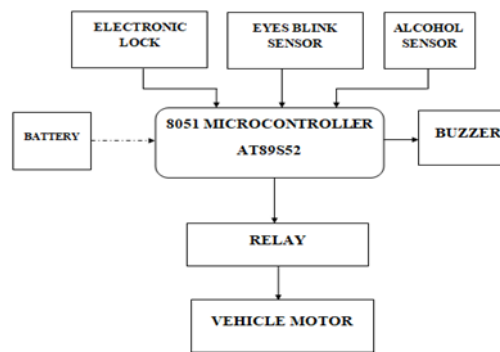


Fig. a) shows block diagram of proposed system

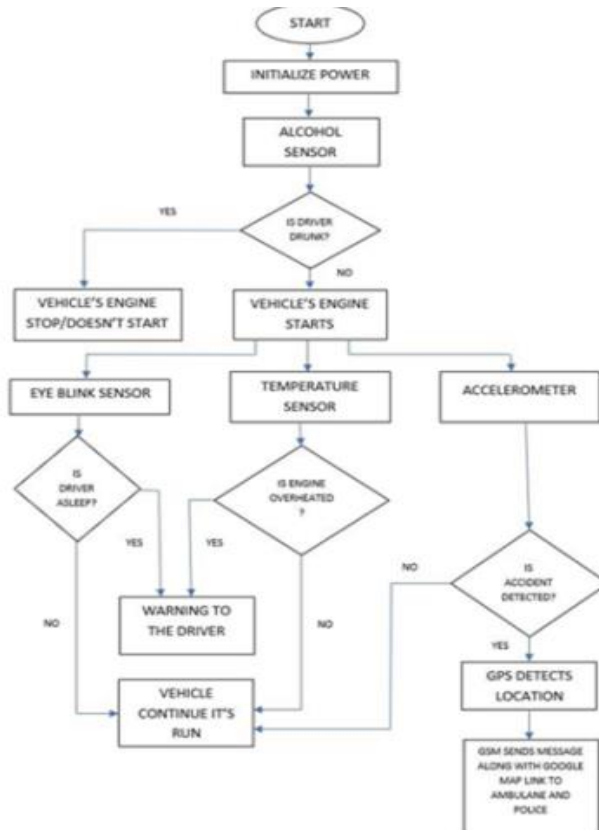


fig. b) shows flow chart of proposed system

4. Proposed methodology:

The proposed Accident Prevention System (APS) depends on ultrasonic sensors operating from the vehicle to detect road anomalies through precise measurement of changing road surface elevation.

The sensor information goes through a microcontroller that detects both the anomaly type and its level of severity. During the obstacle detection process the GPS module records both location and exact coordinates which get stored within a cloud-based database to offer wider accessibility.

Live warnings from the system reach drivers through both audio beeps and flashing Android application pop-up notices allowing them to take necessary steps such as slowing down.

The system contributes to driver safety on the roads while supplying important dataset logs that support road management planning initiatives.

The AT89S52 microcontroller receives data from multiple sensors before analyzing their readings for identifying possible threats that include dangers from obstacles and quick temperature shifts and unsecured distances. T

he testing regime checks three key elements which include sensor precision and actuator functioning alongside communication dependability.

The APS becomes operational following optimization to serve as a real-time automatic safety system which defends against accidents in both vehicles and industrial areas thus enhancing operational safe.

5. Modules and Their Functionalities:

1. The Sensors Module includes an eye blink sensor to detect if the driver is unconscious and an alcohol sensor to monitor alcohol levels, sending signals to the microcontroller.
2. The Energy Management Module features a charge controller and battery, regulating energy flow, preventing overcharging, and safely storing electricity.
3. The Microcontroller Module uses the AT89S52 microcontroller to process data, control outputs, and coordinate the entire system.
4. The User Feedback Module includes an LCD display and buzzer to provide real-time updates and alerts based on system activity.
5. The Relay Module enables the control of high-power devices using low-power signals, acting as an electronic switch.
6. The Energy Utilization Module makes use of the stored energy to power devices like LED bulbs, promoting sustainable energy use.
7. The Alerts and Notification Module activates alerts through the buzzer based on key events such as battery full or energy targets achieved.
8. The Data Logging and Analytics Module leverages the AT89S52 to handle multiple instructions, store performance data, and support system analysis for future development.

6. Software requirement specifications:

The accident prevention project needs the Arduino IDE to program ESP32 microcontrollers through C/C++ and a real-time embedded firmware for handling sensor information and communication standards. Python alongside a similar language together with additional software components serves for data logging visualization and cloud platform and local server communication. Web-based and mobile interfaces can be developed through use of frameworks consisting of Streamlit for web applications and Android Studio for mobile applications to show alerts and provide real-time feedback. The system will enable multiple sensors networking through integration of ultrasonic and alcohol and vibration and GPS and GSM modules while executing sensor data processing and initiating alerts followed by recording essential data points. The system needs to support I2C, UART or SPI protocol communication together with Wi-Fi and GSM-based modules to transmit emergency alerts or monitor real-time data transmission.

7. Conclusion:

Experimental results indicate that the bike ignition operates when a helmet is placed correctly. The system decreases both accident impacts and bike security risks through automatic functionality. The testing system effectively determines alcohol content in human blood while also measuring alcohol levels for Human beings with optimal efficiency. The dc motor functions halt when the threshold value gets exceeded. The bike can use this alcohol sensor as part of its installation. The system helps prevent both the driver's survival and protects all significance remaining passenger.

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