International Journal of Advance Research in Science and Engineering
Volume No. 14, Issue No. 03, March 2025
www.ijarse.com
IJARSE
ISSN 2319 - 8354

Smart and secured vehicle system for transportation on Indian roads

Pramod V Patil[1], Apoorva B Ambiger[2], Soumya B Koujalagi[3], Chandrika R Pokali[4], Sadiya M Nesargi[5]

[1]*Assistant Professor, Department of Electronics Engineering, Hirasugar Institute of Technology, Nidasoshi, India*

[2,3,4,5]*Department of Electronics Engineering, Hirasugar Institute of Technology, Nidasoshi, India*

pramodpatil.ece@hsit.ac.in, apurvambiger09@gmail.com, koujalagisoumya1@gmail.com, chandrika.pokali@gmail.com, sadiyanesargi786@gmail.com

ABSTRACT

The Smart & Secured Vehicle System for Transportation on Indian Roads enhances vehicle safety, driver accountability, and road security by addressing accidents, drunk driving, seat belt enforcement, speed regulation, and unauthorized access. Integrating GPS, GSM, RFID, alcohol and smoke sensors, and an LCD display, the system ensures safe and controlled vehicle operation.

Crash sensors detect accidents and send GPS-based emergency alerts via GSM for rapid response. Seat belt enforcement prevents ignition unless fastened, while alcohol sensors disable the vehicle if intoxication is detected. Smoke sensors halt operation upon detecting hazardous fumes. RFID-based speed control regulates speed in school and hospital zones, and RFID authentication ensures only authorized drivers can operate the vehicle. A 16x2 LCD Display provides real-time alerts, enhancing driver awareness.

This integrated solution minimizes risks, promotes responsible driving, and strengthens transportation security, offering a scalable and efficient approach to road safety on Indian roads.

Keywords**—***Smart and secured vehicle system for transportation, leveraging cutting-edge technologies such as GPS, GSM, RFID, alcohol sensors, smoke sensors, and LCD displays.*

I. INTRODUCTION

The *Smart & Secured Vehicle System for Transportation on Indian Roads* is an innovative approach to enhancing vehicle safety, security, and driver control through the integration of advanced sensors, communication systems, and intelligent algorithms. This system addresses critical road safety concerns, including accidents, drunk driving, seat belt enforcement, speed regulation, and unauthorized vehicle access. By combining cutting-edge technologies such as **GPS**, **GSM**, **RFID**, **smoke sensors**, **alcohol sensors**, and more, the system creates a safer and more controlled driving environment.

International Journal of Advance Research in Science and Engineering
Volume No. 14, Issue No. 03, March 2025
www.ijarse.com
IJARSE
ISSN 2319 - 8354

II. KEY FEATURES

- *Accident Occurred Intimation System:* The system uses a crash sensor (limit switch) to detect accidents, triggering an alert with the vehicle's GPS location sent to emergency contacts via SMS through a GSM module.
- *Seat Belt Safety Feature:* Ensures that the vehicle will not start if the driver fails to wear the seat belt, thus enforcing seat belt usage for increased safety.
- *Drunk Driving Detection***:** The vehicle employs an alcohol sensor to detect the driver's alcohol level. If the driver is intoxicated, the vehicle will not start, preventing drunk driving accidents.
- *Smoke Detection:* The system uses a smoke sensor to identify hazardous levels of smoke (from a fire or gas leak), preventing the vehicle from starting under potentially dangerous conditions.
- *RFID-Based Speed Control:* Using an RFID card system, the vehicle can automatically adjust its speed when approaching sensitive areas such as schools or hospitals, ensuring the driver complies with speed regulations.
- *Driver Access Control (RFID-based):* The vehicle will only start if the driver presents a valid RFID card, ensuring that only authorized individuals can operate the vehicle.
- *LCD 16x2 Display with I2C Module:* An LCD screen provides real-time feedback on the system's status, showing information such as the seat belt status, alcohol detection, and emergency alerts.

III. SYSTEM FLOW DIAGRAM

- *Vehicle Start***:** The system checks seat belt, alcohol level, and driver access (RFID).
- *Sensor Monitoring:* Continuous monitoring of crash sensor, smoke, alcohol, and RFID tags.
- *Safety Check:* If all conditions are met (seat belt fastened, alcohol level safe, no smoke, valid RFID), the vehicle starts.
- *Speed Control:* The RFID-based speed control system reduces speed near sensitive zones.
- *Real-Time Updates:* The LCD displays relevant information about the vehicle's current safety status.

A. *Block Diagram*

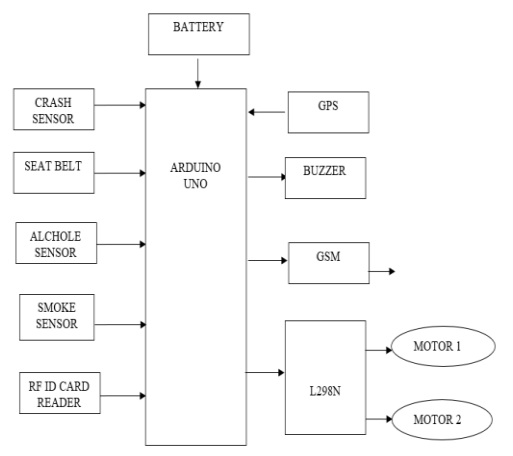

Fig1: System Flow Diagram

IV. WORKING/METEROLOGY

A. Accident Occurred Intimation System

- Hardware:
  - Crash Sensor (Limit Switch): A limit switch or crash sensor is integrated into the vehicle's system. It detects sudden impact or collision.
  - GPS Module: A GPS module is used to record the exact location of the accident.
  - GSM Module: A GSM module is used to send an SMS alert to the concerned person or emergency contact.
- Procedure:
  - The crash sensor is continuously monitored for any sudden impact.
  - When the sensor is triggered, the GPS module fetches the vehicle's location.
  - The GSM module sends an SMS containing the location details to pre-programmed emergency contacts.
- Outcome**:** The system instantly alerts the concerned persons about the accident, allowing quicker response times for assistance.

B. Seat Belt Safety Feature

- Hardware:
  - Seat Belt Sensor**:** A sensor detects whether the seat belt is fastened.
  - Microcontroller (e.g., Arduino or Raspberry Pi): Used to control the logic of the system and vehicle startup.
- Procedure:
  - When the driver attempts to start the vehicle, the seat belt sensor checks if the seat belt is fastened.
  - If the seat belt is not detected, the system prevents the vehicle from starting.
  - An LED indicator or buzzer may activate to notify the driver.
- Outcome: The system ensures the driver wears the seat belt before starting the vehicle, promoting safer driving.

C. Drunk Driving Detection

- Hardware:
  - Alcohol Sensor: A breathalyzer or alcohol sensor detects the alcohol concentration in the driver's breath.
- Procedure:
  - The driver must blow into the alcohol sensor before starting the vehicle.
  - If the alcohol level exceeds a pre-set threshold, the system prevents the vehicle from starting.
  - If the alcohol concentration is within the safe limit, the vehicle starts as usual.
- Outcome: This system prevents drunk driving by ensuring the driver is sober before starting the vehicle.

D. Smoke Detection System

- Hardware**:**
  - Smoke Sensor (MQ Series or similar): Used to detect the presence of smoke inside or near the vehicle.
- Procedure:
  - The smoke sensor continuously monitors the air quality around the vehicle.
  - When the sensor detects a high concentration of smoke, the system disables the vehicle's ignition to prevent starting.

- Outcome: The system helps prevent the vehicle from starting in hazardous environments, such as during a fire or gas leak, ensuring the driver's safety.

E. RFID-Based Speed Control Near Schools and Hospitals

- Hardware:
  - RFID Reader and RFID Cards: RFID tags are placed at specific locations (school zones, hospitals), and an RFID reader on the vehicle detects them.
- Procedure:
  - When the vehicle approaches an RFID-tagged zone (e.g., school or hospital area), the RFID reader detects the presence of the tag.
  - The vehicle's speed is automatically reduced to a pre-set limit when the RFID signal is detected, ensuring compliance with local speed regulations.

  Outcome**:** This feature ensures safer driving near sensitive areas by automatically controlling the vehicle's speed.

F. RFID-Based Driver Access Control

- Hardware:
  - RFID Reader: The RFID reader scans the driver's RFID card to authenticate access.
- Procedure:
  - The driver must present an authorized RFID card (e.g., a driver's license with an embedded RFID tag) to the vehicle's reader.
  - If the RFID card is valid, the system enables the vehicle to start.
  - If the card is invalid or missing, the vehicle will not start.
- Outcome: This system ensures that only authorized drivers can operate the vehicle, improving security and reducing the risk of theft or unauthorized use.

G. *LCD 16x2 Display with I2C Module*

- Hardware:
  - 16x2 LCD Display (with I2C Module): Used to display real-time data from the system, such as seat belt status, alcohol detection, accident alerts, and more.
- Procedure:
  - The microcontroller (e.g., Arduino) fetches real-time data from the sensors (seat belt, alcohol, smoke, RFID, etc.).
  - The 16x2 LCD display shows relevant information such as "Seat Belt Not Fastened," "Alcohol Level: Safe," or "Accident Detected."
- Outcome**:** The LCD provides constant feedback to the driver, allowing them to monitor the vehicle's status and the system's safety features.

V. COMMUNICATION AND INTEGRATION

- Communication Between Components:

- Microcontroller (e.g., Arduino or Raspberry Pi): Acts as the central unit that processes the data from various sensors and takes actions such as sending alerts, controlling the ignition, and displaying information.
- Wireless Communication (GSM): For accident notifications, the GSM module is used to send SMS alerts in real-time.
- Real-Time Data Display (LCD): Information is displayed on the LCD to ensure the driver is always aware of the system's status.
- System Testing: Each component is tested individually to ensure correct functionality before the entire system is integrated and tested as a whole.

ACKNOWLEDGMENT

We extend our sincere gratitude to all those who contributed to the development of the *Smart & Secured Vehicle System for Transportation on Indian Roads*. Special thanks to our mentors, institutions, and peers for their guidance and support. Their insights and encouragement were invaluable in addressing critical road safety challenges.

REFERENCES

[1] Kai-Tai Song, Chih-Chieh Yang, of National Chiao Tung University, Taiwan, "Front Vehicle Tracking Using Scene Analysis", Proceedings of the IEEE International Conference on Mechatronics & Automation 2005.

[2] Vikram Kulkarni & Viswaprakash Babu, "embedded smart car security system on face detection', special issue of IJCCT, ISSN(Online):2231-0371, ISSN(Print):0975-7449,volume-3, issue-1.

[3] V.Ramya, B. Palaniappan, K. Karthick, "Embedded Controller for Vehicle In-Front Obstacle Detection and Cabin Safety Alert System", International Journal of Computer Science & Information Technology (IJCSIT) Vol 4, No 2, April 2012.

[4] Aburva Poongundran.A and Jeevabharathi.M, "Vehicular Monitoring and Tracking Using RASPBERRY PI", International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET). Vol. 4, Issue 2, Feb. 2015.

[5] V.Sagar Reddy, Dr.L.Padma Sree and V. Naveen Kumar, " Design and Development of accelerometer based System for driver safety", International Journal of Science, Engineering and Technology Research (IJSETR), Vol. 3, Issue 12, Dec. 2014.