International Journal of Engineering & Extended Technologies Research (IJEETR)

|ISSN: 2322-0163| www.ijeetr.com | A Bimonthly, Peer Reviewed, Scholarly Indexed Journal |

| Volume 8, Issue 2, March - April 2026 |

DOI:10.15662/IJEETR.2026.0802372

A Smart Vehicle Safety Framework for Real-Time Driver Sobriety Monitoring and Engine Restriction

Ms. J.A. Sandhiya, Mr. K. Thamotharan, Mr. G. Thanappan, Mr.R. Veeraragavan

Assistant Professor, Department of Biomedical Engineering, Gnanamani College of Technology, Namakkal, Tamil Nadu, India

B.E, Student, Department of Biomedical Engineering, Gnanamani College of Technology, Namakkal, Tamil Nadu, India

B.E., Student, Department of Biomedical Engineering, Gnanamani College of Technology, Namakkal, Tamil Nadu, India

B.E, Student, Department of Biomedical Engineering, Gnanamani College of Technology, Namakkal, Tamil Nadu, India

Publication History: Received: 25.02.2026; Revised: 20.03.2026; Accepted: 25.03. 2026; Published: 28.03.2026.

ABSTRACT: Drunk driving is one of the major reasons for road accidents, injuries, and deaths worldwide. When a person consumes alcohol, it affects their thinking ability, reaction speed, and body coordination. As a result, the driver may lose control over the vehicle, increasing the chances of collisions. Even with strict rules and awareness programs, drunk driving continues to be a serious problem. Therefore, there is a need for an effective system that can actively prevent such incidents and improve overall road safety.

To overcome this issue, an intelligent alcohol detection–based engine locking system is proposed. The main objective of this system is to stop a vehicle from being operated if the driver is under the influence of alcohol. The system is designed to detect alcohol levels in the driver's breath either before starting the vehicle or during operation, ensuring continuous safety monitoring.

The system works by integrating an alcohol sensor, a microcontroller, and an engine control unit. When the driver tries to start the vehicle, the sensor checks the alcohol concentration in the surrounding breath. If the detected value is higher than the predefined safe limit, the sensor sends a signal to the microcontroller. The microcontroller then processes this information and activates a mechanism that disables the ignition system, preventing the engine from starting. At the same time, a warning alert such as a buzzer or indicator informs the driver about the detected alcohol level.

This intelligent safety system plays an important role in reducing accidents caused by drunk driving. By ensuring that intoxicated individuals cannot operate a vehicle, it improves safety for both drivers and the public. The system is designed to be simple, reliable, and cost-effective, making it suitable for integration into modern vehicles. Overall, it contributes to safer roads and promotes responsible driving behavior.

KEYWORDS -This project is centered on developing an alcohol detection system aimed at reducing incidents of drunk driving. It uses an MQ-3 alcohol sensor along with a microcontroller-based engine control mechanism to identify alcohol present in the driver's breath. When the detected alcohol level goes beyond the permitted limit, the system prevents the engine from starting, thereby enhancing vehicle safety**..**

I. INTRODUCTION

Road accidents caused by drunk driving remain a serious global issue, resulting in a large number of injuries and deaths every year. Alcohol consumption affects a driver's thinking ability, reaction speed, focus, and coordination. When a person drives under the influence, their ability to respond quickly to road situations is reduced, which increases the chances of accidents. Although strict laws, penalties, and roadside checking methods are in place, these measures are not sufficient to ensure continuous monitoring once the vehicle is in motion. Hence, there is a need for an automated system within the vehicle that can actively prevent drunk driving and enhance road safety.

To address this problem, this project presents an intelligent engine locking system based on alcohol detection using embedded system technology. The system is designed to stop the vehicle from being operated if the driver has consumed alcohol beyond a safe level. An alcohol sensor is positioned near the driver's seat or steering area to detect alcohol vapors in the breath. When the driver attempts to start the vehicle, the sensor measures the alcohol concentration and sends the information to a microcontroller. The controller then compares the detected value with a predefined limit. If the level exceeds the allowed threshold, the system automatically disables the ignition, preventing the engine from starting. This ensures that an intoxicated driver cannot operate the vehicle, thereby reducing accident risks.

Apart from alcohol detection, the system includes additional features to improve overall vehicle safety. Accident detection is achieved using vibration or impact sensors that can identify sudden collisions. When an accident is detected, the system automatically sends emergency alerts to predefined contacts or emergency services. A GPS module is used to provide the vehicle's location along with the alert, which helps in quick response and rescue operations.

The system also incorporates ultrasonic sensors for obstacle detection, helping to prevent collisions by warning the driver about nearby objects. Engine temperature monitoring is included to avoid overheating and maintain safe vehicle operation. In addition, emission monitoring helps track exhaust levels and supports environmental safety standards. By combining these features, the system offers a more complete approach to vehicle safety and monitoring.

Overall, this intelligent alcohol detection and engine locking system provides an effective solution to reduce drunk driving incidents. Through automation, real-time monitoring, and integrated safety features, it improves driver responsibility, minimizes accident risks, and contributes to safer and more reliable transportation systems.

II. PROBLEM STATEMENT

Drunk driving continues to be one of the major causes of road accidents, injuries, and deaths around the world. Even though governments enforce strict traffic rules, impose heavy penalties, and conduct regular awareness campaigns, many individuals still choose to drive after consuming alcohol. This careless behavior not only puts the driver in danger but also threatens the safety of passengers, pedestrians, and other road users.

Alcohol affects the central nervous system and reduces important driving abilities such as focus, coordination, decision-making, and reaction time. Even a small quantity of alcohol can slow down a driver's response and reduce their control over the vehicle. Because of this, drivers under the influence are more likely to make mistakes and fail to handle unexpected situations, leading to a higher risk of accidents compared to sober drivers.

Currently, most methods used to control drunk driving rely on manual checking, such as breathalyzer tests conducted by traffic police during roadside inspections. Although these methods can identify intoxicated drivers, they are not continuous and cannot monitor drivers throughout their entire journey. Once a driver passes a checkpoint, there is no assurance that they will remain sober afterward. This limitation allows some drivers to continue driving under the influence without being detected.

In addition, issues like lack of strict enforcement in certain areas, human negligence, and intentional violation of traffic rules make the situation worse. Some drivers knowingly take the risk of driving after drinking, assuming they will not get caught. Furthermore, many vehicles do not include built-in systems to detect alcohol consumption or prevent operation when the driver is intoxicated.

To address these challenges, there is a need for an automated and intelligent solution that can continuously monitor the driver's condition. An alcohol detection system integrated with the vehicle's ignition control can serve this purpose effectively. This system works by sensing alcohol levels in the driver's breath before allowing the engine to start.

If the detected alcohol concentration is higher than the allowed limit, the system automatically disables the ignition, preventing the vehicle from operating. In addition, alert mechanisms such as alarms or display messages can be used to warn the driver and nearby individuals about the unsafe condition.

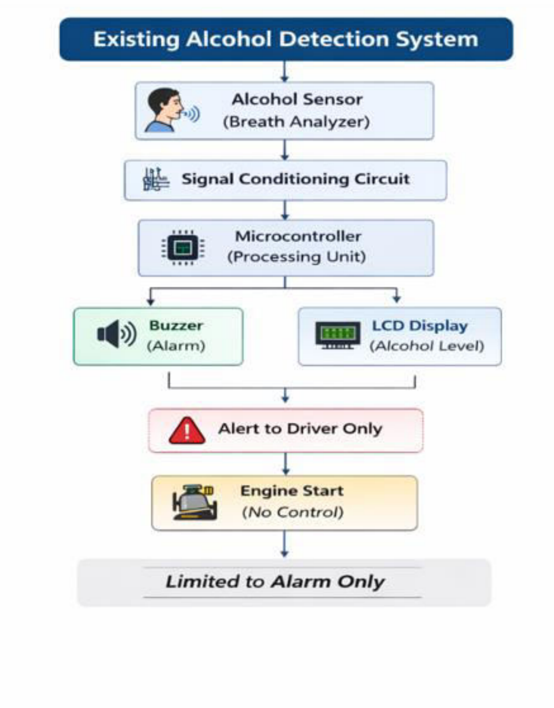
Overall, such a smart safety system plays a crucial role in reducing accidents caused by drunk driving. It encourages responsible behavior among drivers and enhances road safety. By incorporating this technology into modern vehicles, it is possible to protect lives and create a safer and more reliable transportation system.

International Journal of Engineering & Extended Technologies Research (IJEETR)

|ISSN: 2322-0163| www.ijeetr.com | A Bimonthly, Peer Reviewed, Scholarly Indexed Journal |

| Volume 8, Issue 2, March - April 2026 |

DOI:10.15662/IJEETR.2026.0802372



III. PROPOSED SYSTEM

A comprehensive vehicle safety and accident prevention system is designed to improve driver safety and minimize risks caused by impaired driving and unsafe vehicle conditions. This system combines multiple sensors and electronic modules, all coordinated through a central microcontroller that functions as the main control unit. By continuously observing parameters related to the driver, vehicle performance, and surrounding environment, the system can identify potential hazards at an early stage and take necessary actions automatically. This integrated mechanism enhances road safety and ensures reliable monitoring during vehicle operation.

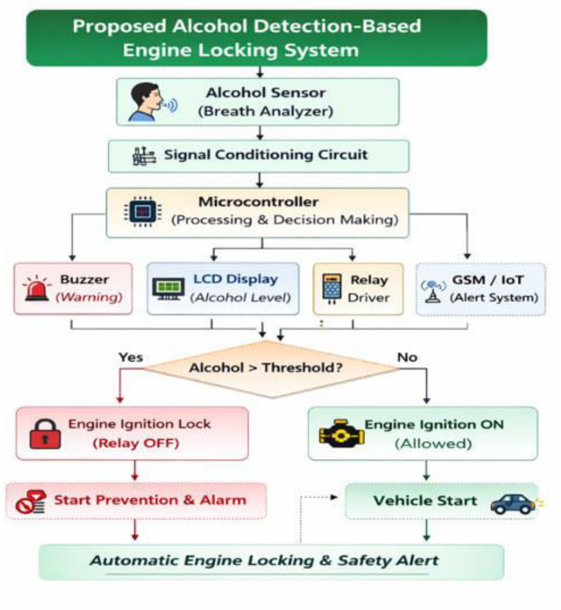
One of the primary elements of this system is the alcohol detection sensor, which identifies the presence of alcohol in the driver's breath. The sensor continuously measures the alcohol concentration and transmits the data to the microcontroller for processing. When the detected alcohol level exceeds the preset safe threshold, the microcontroller activates a relay mechanism that disables the vehicle's ignition or motor. As a result, the vehicle is prevented from starting or continuing operation, thereby reducing the likelihood of accidents caused by intoxicated driving.

International Journal of Engineering & Extended Technologies Research (IJEETR)

|ISSN: 2322-0163| www.ijeetr.com | A Bimonthly, Peer Reviewed, Scholarly Indexed Journal |

| Volume 8, Issue 2, March - April 2026 |

DOI:10.15662/IJEETR.2026.0802372



In addition, the system incorporates accident detection sensors capable of recognizing sudden shocks or collisions. When such an event is detected, the system immediately activates a buzzer and displays alert messages on an LCD screen to notify nearby individuals. Simultaneously, a GSM module sends instant SMS notifications to predefined emergency contacts or the vehicle owner, enabling faster response and assistance. To further ensure passenger safety, carbon monoxide (CO) sensors and temperature sensors are included to monitor harmful gas levels and abnormal temperature conditions inside the vehicle cabin. Moreover, the integration of GPS and IoT technologies allows real-time vehicle tracking and remote monitoring. Users can access live location data and system updates through connected platforms, improving control and awareness. Additional components such as limit switches, manual control switches, and a battery power supply contribute to the system's reliability and continuous operation. Overall, this integrated safety system provides effective monitoring, accident prevention, and proactive protection, significantly reducing risks associated with drunk driving and hazardous environmental conditions while promoting safer transportation.

IV. COMPARISON BETWEEN EXISTING AND PROPOSED SYSTEM

PARAMETER	EXISTING SYSTEM	PROPOSED SYSTEM
Alcohol Detection	Performs only basic alcohol sensing	Provides precise detection with enhanced processing logic.
Engine Control	May abruptly stop the engine	Safely restricts engine start before driving
Driver Identification	Unable to detect the actual driver	Detects alcohol specifically near the driver area
False Detection	Prone to errors from perfume or sanitizer	Minimizes false readings through filtering and calibration
Sensor Accuracy	Uses low-precision sensors	Utilizes high-accuracy sensors for better results
Environmental Effect	Easily influenced by surroundings	Includes compensation for environmental variations
Response Time	Slower reaction time	Offers quick, real-time response
Safety	Unsafe if activated during motion	Ensures safety by acting before vehicle movement
Bypass Possibility	Easy to bypass the system	Designed to prevent manipulation
Data Recording	No data storage capability	Supports data logging and alert transmission
User Convenience	Requires repeated manual testing	Fully automatic and user-friendly operation

International Journal of Engineering & Extended Technologies Research (IJEETR)
|ISSN: 2322-0163| www.ijeetr.com | A Bimonthly, Peer Reviewed, Scholarly Indexed Journal |
| Volume 8, Issue 2, March - April 2026 |
DOI:10.15662/IJEETR.2026.0802372

V. LITERATURE SURVEY

Sl.No	Reference (Author, Year)	Title / Research	Methodology / Technique Used	Findings / Contribution	Limitation
1	Kumar et al., 2019	Smart System for Preventing Drunk Driving	Arduino-based design using gas sensor and relay module	Demonstrated a basic working model to restrict drunk driving	Not tested effectively in real-time driving conditions
2	S. Jain & K. Sharma, 2020	Alcohol Detection Based Vehicle Safety System	Sensor integrated with vehicle ignition system	Capable of providing alerts and stopping engine ignition	Does not include GPS or GSM for emergency communication
3	P. Gupta et al., 2021	IoT-Enabled Alcohol Detection and Engine Control System	Combination of alcohol sensor with IoT technology	Enables remote monitoring and alert notifications	Relies on internet connectivity and increases system cost
4	N. Singh & D. Verma, 2022	Embedded Solution for Drunk Driving Prevention	Microcontroller with alcohol sensor and engine cut-off system	Successfully implemented a functional prototype	Does not support continuous monitoring of driver condition
5	L. Zhao et al., 2023	Intelligent Vehicle Alcohol Detection Using Machine Learning	Sensor fusion combined with machine learning algorithms	Improved detection accuracy and reduced false alarms	Requires complex hardware and higher computational resources
6	M. Reddy et al., 2024	Hybrid System for Alcohol and Fatigue Detection	Integration of alcohol sensor with eye-blink monitoring	Provides dual protection against drunk and drowsy driving	Increased complexity in system design and implementation

VI. METHODOLOGY

The proposed vehicle safety system is developed using a systematic approach that combines alcohol detection, data processing, vehicle control, accident monitoring, communication, and alert mechanisms. This integrated design enables early identification of unsafe driving conditions and supports real-time monitoring to enhance overall road safety.

A. Alcohol Detection and Data Collection

The process begins with detecting alcohol levels using a sensor positioned near the driver's seat or steering region. This sensor identifies alcohol vapors in the driver's breath and converts them into corresponding electrical signals. In addition to alcohol sensing, other sensors such as vibration sensors for impact detection, temperature sensors for monitoring engine conditions, and gas sensors for evaluating cabin air quality are used to gather important environmental and vehicle-related data.

B. Signal Conditioning

The signals obtained from sensors are often low in strength and may be affected by noise or environmental disturbances. To improve reliability, signal conditioning techniques such as amplification and filtering are applied. These processes enhance signal clarity and remove unwanted interference, ensuring that accurate data is passed to the next stage.

C. Analog-to-Digital Conversion and Data Processing

After conditioning, the analog signals are supplied to a microcontroller equipped with an analog-to-digital converter (ADC). The ADC transforms these signals into digital values, enabling the embedded system to process them effectively. The microcontroller continuously evaluates the incoming data to monitor alcohol levels, detect accidents, and assess overall vehicle conditions.

D. Decision-Making and Engine Control

A threshold-based logic is implemented within the microcontroller to make decisions. The system compares the detected alcohol level with a predefined safe limit. If the value exceeds this limit, a relay mechanism is triggered to disable the ignition system. This prevents the engine from starting, thereby ensuring that a driver under the influence of alcohol cannot operate the vehicle.

E. Accident Detection and Alert Mechanism

In case of a collision or sudden impact, the vibration sensor detects unusual movement and sends a signal to the controller. The system immediately responds by activating a buzzer and displaying warning messages on an LCD screen. At the same time, a GSM module transmits emergency SMS alerts to predefined contacts or emergency services, allowing quick assistance.

F. Communication and Vehicle Tracking

To enhance monitoring capabilities, the system incorporates GPS and IoT technologies. These modules enable real-time tracking of the vehicle's location and status. The collected information can be accessed through mobile applications or monitoring platforms, providing users with continuous updates.

G. Power Management

The system is powered by a regulated power supply supported by a rechargeable battery. Voltage regulation ensures consistent and stable operation of all components, including sensors, communication modules, and the microcontroller, while maintaining efficient energy usage.

VII. SYSTEM ADVANTAGES

The proposed vehicle safety system based on alcohol detection and engine locking offers multiple technical and practical benefits when compared to traditional road safety methods.

a. Prevention of Drunk Driving

The system identifies the presence of alcohol in the driver's breath before the vehicle is started. If the detected level exceeds the predefined safe limit, the ignition system is automatically disabled. This mechanism effectively prevents individuals under the influence of alcohol from driving, thereby reducing the risk of alcohol-related accidents.

b. Continuous Real-Time Monitoring

A network of integrated sensors continuously observes various parameters, including alcohol concentration, engine temperature, gas levels, and sudden impacts. This constant monitoring allows the system to quickly recognize unsafe conditions and take immediate preventive action.

c. Automatic Accident Detection

The inclusion of vibration or impact sensors enables the system to detect collisions instantly. Upon identifying an accident, the system activates warning signals and initiates emergency procedures, increasing the likelihood of timely assistance.

|ISSN: 2322-0163| www.ijeetr.com | A Bimonthly, Peer Reviewed, Scholarly Indexed Journal |
| Volume 8, Issue 2, March - April 2026 |
DOI:10.15662/IJEETR.2026.0802372

d. Emergency Communication System
With the help of a GSM module, the system sends instant alert messages to predefined contacts or the vehicle owner during emergencies. This ensures quick communication and supports faster emergency response.

e. Vehicle Tracking and Remote Access
By incorporating GPS and IoT technologies, the system allows real-time tracking of the vehicle's location. Users can also monitor system status remotely, improving both security and vehicle management.

f. Improved Passenger Safety
Sensors such as carbon monoxide (CO) and temperature sensors help monitor the internal environment of the vehicle. These components can detect harmful gas accumulation or abnormal temperature conditions, enhancing the safety of passengers.

g. Economical Implementation
The system is designed using cost-effective components like standard sensors, microcontrollers, and communication modules. This makes it a practical and affordable solution for real-world applications.

h. Simple and Automated Operation
The system functions automatically without requiring complex user input. Alerts provided through buzzers and display units make it easy for users to understand warnings and system conditions. In summary, the proposed system enhances road safety by preventing drunk driving, detecting accidents promptly, enabling rapid emergency communication, and offering continuous monitoring. These features contribute to safer and more efficient vehicle operation.

VIII. APPLICATIONS

The proposed vehicle safety system based on alcohol detection and engine locking can be effectively utilized in a wide range of transportation and safety-related applications to enhance road safety and ensure proper driver monitoring.

a. Prevention of Drunk Driving
This system can be integrated into personal vehicles to monitor the driver's alcohol level before ignition. If the detected value exceeds the safe threshold, the system restricts engine operation, thereby reducing accidents caused by impaired driving.

b. Public Transport Safety
The system can be implemented in public transportation such as buses, taxis, and vans to ensure that drivers are not under the influence of alcohol. This improves passenger safety and builds trust in public transport systems.

c. Commercial and Fleet Vehicles
It is highly beneficial for commercial vehicles, including trucks and delivery fleets, where driver discipline and safety are crucial. The system helps prevent accidents and supports efficient and responsible fleet operations.

d. Government and Official Vehicles
Government departments and law enforcement agencies can adopt this system in their vehicles to maintain strict safety regulations and avoid misuse by drivers under the influence of alcohol.

e. Accident Detection and Emergency Support
With built-in accident detection features, the system can automatically identify collisions and send alerts to emergency contacts. This ensures faster response and assistance during critical situations.

f. Vehicle Tracking and Fleet Monitoring
The integration of GPS and IoT technologies allows real-time tracking of vehicles. This feature is useful for fleet management, remote monitoring, and improving vehicle security.

g. Smart Transportation Systems
The system can be incorporated into modern intelligent transportation networks to support automated safety monitoring. This contributes to reducing accidents and improving efficiency in smart city environments. Overall, the proposed system plays a significant role in enhancing vehicle safety, preventing drunk driving, enabling quick emergency response, and

supporting advanced transportation systems. Its wide range of applications makes it a valuable solution for safer and more responsible mobility.

IX. RESULTS AND DISCUSSION

The proposed vehicle safety system based on alcohol detection and engine locking was developed and evaluated under controlled experimental conditions to assess its performance and reliability. The system integrates multiple sensors and communication modules, all coordinated by a central microcontroller to monitor driver behavior and vehicle safety parameters. The setup included an alcohol sensor for detecting breath alcohol concentration, a vibration sensor for impact detection, temperature and gas sensors for monitoring internal conditions, and GSM and GPS modules for communication and tracking.

During the testing phase, the alcohol sensor effectively identified the presence of alcohol in the driver's breath. When the measured value exceeded the predefined safety limit, the microcontroller processed the input and triggered a relay mechanism that disabled the vehicle's ignition system. This ensured that the engine could not be started, demonstrating the system's capability to prevent intoxicated driving. When the detected alcohol level remained within acceptable limits, the system allowed normal operation, confirming the accuracy and consistency of the detection process.

The accident detection functionality was verified by simulating sudden impacts and vibrations. The vibration sensor responded promptly to these conditions and transmitted signals to the microcontroller. Upon detecting a collision, the system activated an audible buzzer and displayed warning messages on the LCD screen. Simultaneously, the GSM module successfully sent emergency SMS notifications to predefined contacts, confirming effective communication during critical situations.

Additional testing was conducted for environmental monitoring sensors. The temperature sensor accurately identified abnormal heat conditions, while the gas sensor detected harmful gas levels within the vehicle cabin. In both cases, the system generated alerts through visual and audio indicators, thereby enhancing passenger safety and overall monitoring capability.

The GPS and IoT components were also evaluated for real-time tracking and remote monitoring. The system successfully transmitted location data, enabling continuous tracking of the vehicle. The power supply unit maintained stable operation throughout the testing process, ensuring uninterrupted functioning of all sensors and modules.

X. CONCLUSION

This work presents the design and development of an intelligent vehicle safety system based on alcohol detection and engine locking, with the objective of reducing drunk driving incidents and enhancing overall road safety. The system combines multiple components, including an alcohol sensor, accident detection unit, environmental monitoring sensors, and communication modules, all integrated within an embedded platform. The alcohol sensor detects the presence of alcohol in the driver's breath, and the microcontroller analyzes this data to check whether it exceeds a predefined safe limit. If the threshold is crossed, the system activates a relay mechanism to block the vehicle's ignition, thereby preventing the driver from operating the vehicle.

Along with alcohol detection, the system includes an accident detection feature using vibration sensors to identify sudden impacts or collisions. When such an event occurs, the system immediately generates alerts through a buzzer and an LCD display. At the same time, the GSM module sends emergency messages to preconfigured contacts, enabling quick assistance. The addition of GPS and IoT technologies allows real-time tracking of the vehicle and remote monitoring, which further strengthens safety and security.

The system also incorporates temperature and gas sensors to monitor engine conditions and cabin air quality, ensuring improved safety for passengers. The use of embedded control and efficient sensor integration enables fast response and reliable performance under different conditions.

XI. FUTURE SCOPE

Although the proposed vehicle safety system based on alcohol detection and engine locking has shown effective performance under controlled testing conditions, there is significant scope for further enhancement to improve its

|ISSN: 2322-0163| www.ijeetr.com | A Bimonthly, Peer Reviewed, Scholarly Indexed Journal |

| Volume 8, Issue 2, March - April 2026 |

DOI:10.15662/IJEETR.2026.0802372

efficiency, intelligence, and real-world usability. Future work can focus on large-scale deployment across different types of vehicles to evaluate long-term performance and reliability under actual traffic environments.

In upcoming developments, the integration of advanced technologies such as artificial intelligence and machine learning can significantly enhance system performance. Instead of depending solely on predefined threshold values, intelligent algorithms can analyze driver behavior, environmental factors, and sensor data to identify potential risks and provide early warnings before accidents occur.

The system can also be extended by connecting it to cloud-based platforms and mobile applications for better monitoring and data management. This would enable vehicle owners, fleet operators, and authorities to access real-time information such as vehicle location, alcohol detection status, and system alerts remotely. Such features can contribute to efficient fleet management and support the development of smart transportation systems.

Further improvements may include the incorporation of additional safety features such as driver fatigue monitoring using cameras, lane departure warning systems, and advanced collision avoidance technologies. These enhancements can help minimize accidents caused by human error and improve overall driving safety.

In addition, future designs can focus on reducing system size through miniaturization of electronic components and improving power efficiency. This will make the system more compact and suitable for integration into modern vehicles. The use of advanced wireless communication technologies, including enhanced IoT connectivity and next-generation networks, can further strengthen real-time monitoring and emergency communication capabilities.

REFERENCES

1. M. Farahi, A. Casals, O. Sarrafzadeh et al., "Beat-to-Beat Fetal Heart Rate Analysis Using Portable Medical Device and Wavelet Transformation Technique," arXiv:2103.01014, Mar. 2021.
2. "UCI Engineers Develop Wearable Fetal Monitoring Technology," UC Irvine, Nov. 23, 2022, in IEEE Sensors Letters.
3. Alim and M. H. Imtiaz, "Wearable Sensors for the Monitoring of Maternal Health—A Systematic Review," Sensors, vol. 23, no. 5, p. 2411, Feb. 22, 2023.
4. M. Qin, Y. Xu, Y. Liang, and T. Sun, "A Wearable Fetal Movement Detection System for Pregnant Women," Front. Med., vol. 10, p. 1160373, Jul. 2023.
5. H. Mohamed, S. Kathriarachchi, N. Kahatapitiya et al., "Early-Stage Prototype Assessment of a Wearable Home Fetal Movement and Distress Detection Device," Diagnostics, vol. 14, no. 17, p. 1938, 2024.
6. Y. Zhang, A. Gu, Z. Xiao et al., "Wearable Fetal ECG Monitoring System from Abdominal Electrocardiography Recording," Biosensors, 2022.
7. C. Wakefield, L. Yao, S. Self, and M. G. Frasch, "Wearable Technology for Health Monitoring During Pregnancy: An Observational Cross-Sectional Survey Study," Arch. Gynecol. Obstet., 2023.
8. C.Nagarajan and M.Madheswaran - 'Stability Analysis of Series Parallel Resonant Converter with Fuzzy Logic Controller Using State Space Techniques'- Taylor &Francis, Electric Power Components and Systems, Vol.39 (8), pp.780-793, May 2011. DOI: 10.1080/15325008.2010.541746
9. C.Nagarajan and M.Madheswaran - 'Experimental verification and stability state space analysis of CLL-T Series Parallel Resonant Converter' - Journal of Electrical Engineering, Vol.63 (6), pp.365-372, Dec.2012. DOI: 10.2478/v10187-012-0054-2
10. C.Nagarajan and M.Madheswaran - 'Performance Analysis of LCL-T Resonant Converter with Fuzzy/PID Using State Space Analysis'- Springer, Electrical Engineering, Vol.93 (3), pp.167-178, September 2011. DOI 10.1007/s00202-011-0203-9
11. S.Tamilselvi, R.Prakash, C.Nagarajan,"Solar System Integrated Smart Grid Utilizing Hybrid Coot-Genetic Algorithm Optimized ANN Controller" Iranian Journal Of Science And Technology-Transactions Of Electrical Engineering, DOI10.1007/s40998-025-00917-z,2025
12. S.Tamilselvi, R.Prakash, C.Nagarajan," Adaptive sliding mode control of multilevel grid-connected inverters using reinforcement learning for enhanced LVRT performance" Electric Power Systems Research 253 (2026) 112428, doi.org/10.1016/j.epsr.2025.112428
13. S.Thirunavukkarasu, C. Nagarajan, 2024, "Performance Investigation on OCF and SCF study in BLDC machine using FTANN Controller," Journal of Electrical Engineering And Technology, Volume 20, pages 2675–2688, (2025), doi.org/10.1007/s42835-024-02126-w

|ISSN: 2322-0163| www.ijeetr.com | A Bimonthly, Peer Reviewed, Scholarly Indexed Journal |

| Volume 8, Issue 2, March - April 2026 |

DOI:10.15662/IJEETR.2026.0802372

14. C. Nagarajan, M.Madheswaran and D.Ramasubramanian- 'Development of DSP based Robust Control Method for General Resonant Converter Topologies using Transfer Function Model'- Acta Electrotechnica et Informatica Journal , Vol.13 (2), pp.18-31,April-June.2013, DOI: 10.2478/aeei-2013-0025.
15. C.Nagarajan and M.Madheswaran - 'DSP Based Fuzzy Controller for Series Parallel Resonant converter'- Springer, Frontiers of Electrical and Electronic Engineering, Vol. 7(4), pp. 438-446, Dec.12. DOI 10.1007/s11460-012-0212-0.
16. C.Nagarajan and M.Madheswaran - 'Experimental Study and steady state stability analysis of CLL-T Series Parallel Resonant Converter with Fuzzy controller using State Space Analysis'- Iranian Journal of Electrical & Electronic Engineering, Vol.8 (3), pp.259-267, September 2012.
17. C.Nagarajan and M.Madheswaran, "Analysis and Simulation of LCL Series Resonant Full Bridge Converter Using PWM Technique with Load Independent Operation" has been presented in ICTES'08, a IEEE / IET International Conference organized by M.G.R.University, Chennai.Vol.no.1, pp.190-195, Dec.2007
18. Suganthi Mullainathan, Ramesh Natarajan, "An SPSS and CNN modelling based quality assessment using ceramic materials and membrane filtration techniques", Revista Materia (Rio J.) Vol. 30, 2025, DOI: https://doi.org/10.1590/1517-7076-RMAT-2024-0721
19. M Suganthi, N Ramesh, "Treatment of water using natural zeolite as membrane filter", Journal of Environmental Protection and Ecology, Volume 23, Issue 2, pp: 520-530,2022
20. M. R. Ahmed, S. Newby, P. Potluri, W. Mirihanage, and A. Fernando, "Emerging Paradigms in Fetal Heart Rate Monitoring: Evaluation of Innovative Textile-Based Wearables," Sensors, vol. 24, no. 18, p. 6066, Sep. 2024.
21. Gopinathan, V. R. (2024). Real-Time Fault-Tolerant Multi-Cloud Database Architectures for High Availability Applications. International Journal of Future Innovative Science and Technology (IJFIST), 7(4), 13148.
22. Chandra, S., Rengarajan, A., Sahoo, G. S., & Sharma, S. (2023, December). Identifying Neuronal Damage and Plasticity by Analyzing Changes in Diffusion Tensor Imaging. In International Conference on Data Science, Machine Learning and Applications (pp. 433-438). Singapore: Springer Nature Singapore.
23. Sugumar, R. (2025). Federated AI in Offline-First Mobile Health Architectures for Privacy-Preserving Clinical Intelligence. International Journal of Science, Research and Technology, 8(4), 14589-14600.
24. Murugeshwari, B., Rajalakshmi, S., & Sudharson, K. (2023). Hybrid Approach for Privacy Enhancement in Data Mining Using Arbitrariness and Perturbation. Computer Systems Science & Engineering, 44(3).
25. Pandey, V. K., Mishra, S., Rengarajan, A., Savita, & Roomi, M. M. (2024, March). Enhancing Weather Forecasting with Machine Learning Techniques. In International Conference on Renewable Power (pp. 147-156). Singapore: Springer Nature Singapore.
26. Soundappan, S. J. (2025). Next Generation AI Enabled Holistic Cognitive Platform for Secure Cloud Network Intelligence Enterprise Systems and Digital Trust Optimization. International Journal of Computer Technology and Electronics Communication, 8(5), 11534-11542.
27. Mathew, A. (2022). Leveraging Big Data Analytics to Power AI and ML (Machine Learning) Automation. Educational Research (IJMCER), 4(5), 131-134.
28. Sugumar, R. (2024). AI-Augmented Quality Engineering for Performance Optimization and Test Orchestration in Distributed Systems. International Journal of Science, Research and Technology, 7(5), 12835-12846.
29. Akila, R. (2024). A deep reinforcement learning approach for optimizing inventory management in the agri-food supply chain. J. Electrical Systems, 20(4s), 2238-2247.
30. Mahendran, M., Anbazhagan, K., Pavithran, G., Nivas, A., & Pandey, S. D. (2022). Earthquake Damage Prediction using Machine Learning. Grenze International Journal of Engineering & Technology (GIJET), 8(1).
31. Gopinathan, V. R. (2025). Enterprise AI Frameworks for Financial Data Engineering Behavioural Analytics and Intelligent Cloud Solutions. International Journal of Research Publications in Engineering, Technology and Management (IJRPETM), 8(4), 12499-12506.
32. Kondalsamy, P., & Kaliappan, K. (2025). An Optimal Prediction of Leaf Disease Based on Hybrid Deep Learnings and Metaheuristic Technique. Traitement du Signal, 42(1), 363.
33. Deivendran, P., Babu, P. S., Malathi, G., Anbazhagan, K., & Kumar, R. S. (2023). Emotion Recognition for Challenged People Facial Appearance in Social using Neural Network. arXiv preprint arXiv:2305.06842.
34. Sugumar, R. (2025). Unified AI Framework for Predictive Data Engineering and Real Time Prescription and Billing Systems. International Journal of Advanced Engineering Science and Information Technology (IJAESIT), 8(5), 17261.
35. Vekariya, V., Kumar, S., & Rengarajan, A. (2024). A distinctive and smart agricultural knowledge-based framework using ontology. In Sustainability in Digital Transformation Era: Driving Innovative & Growth (pp. 207-213). CRC Press.
36. Gopinathan, V. R. (2025). Software engineering practices for AI-driven systems: From development to deployment (MLOps perspective). International Journal of Science, Research and Technology, 8(1), 13493-13500.

|ISSN: 2322-0163| www.ijeetr.com | A Bimonthly, Peer Reviewed, Scholarly Indexed Journal |

| Volume 8, Issue 2, March - April 2026 |

DOI:10.15662/IJEETR.2026.0802372

37. Mathew, A. R. (2022). Threats and protection on E-sim: a prospective study. Novel Perspectives of Engineering Research, 8, 76-81.
38. Naveena, S., & Kavitha, K. (2025). Gossypium herbaceum: Folium disease identification and classification using Efficient Net-Coordinate Convolutional Neural Network (EcoNet). Engineering Applications of Artificial Intelligence, 152, 110701.
39. Rengarajan, A., Mishra, A., Kulhar, K. S., Shrivastava, V. P., & Alawneh, Y. J. J. (2024, March). Role of Deep Reinforcement Learning in Mitigating Cyber Security Issues: A Review. In International Conference on Renewable Power (pp. 37-48). Singapore: Springer Nature Singapore.
40. Achari, A. P. S. K., & Sugumar, R. (2024, November). Performance analysis and determination of accuracy using machine learning techniques for naive bayes and random forest. In AIP Conference Proceedings (Vol. 3193, No. 1, p. 020199). AIP Publishing LLC.
41. Mathew, A., & Alex, H. (2022). Detect & protect-medical device cybersecurity. Curr. Overview Sci. Technol. Res, 1, 60-68.
42. Sammy, F., Chettier, T., Boyina, V., Shingne, H., Saluja, K., Mali, M., ... & Shobana, A. (2025). Deep Learning-Driven Visual Analytics Framework for Next-Generation Environmental Monitoring. Journal of Applied Science and Technology Trends, 114-122.
43. Anbazhagan, K. (2024). Trustworthy and Adaptive AI Systems for Enterprise Analytics Cybersecurity and Decision Optimization Using API-First and Cloud-Native Architectures. International Journal of Technology, Management and Humanities, 10(03), 65-74.
44. Mathew, A. (2021). Deep reinforcement learning for cybersecurity applications. Int J Comput Sci Mob Compu, 10(12), 32-38.
45. Dhinakaran, D. (2022). Joe Prathap P. M, Selvaraj D, Arul Kumar D and Murugeshwari B," Mining Privacy-Preserving Association Rules based on Parallel Processing in Cloud Computing,". International Journal of Engineering Trends and Technology, 70(3), 284-294.
46. Karthika, K., Anusha, K., Kavitha, K., Harshadha, R., Dharshini, D. S., & Sundhar, N. A. (2025, April). Frequency Reconfigurable Antenna using Advanced Materials: A Study. In 2025 3rd International Conference on Advancements in Electrical, Electronics, Communication, Computing and Automation (ICAECA) (pp. 1-6). IEEE.
47. Thavamani, C., & Rengarajan, A. (2024). Clustering related behaviour of users by the use of partitioning and parallel transaction reduction algorithm. International Journal of Advanced Intelligence Paradigms, 29(2-3), 122-132.
48. Sugumar, R. (2025). Unified AI Framework for Predictive Data Engineering and Real Time Prescription and Billing Systems. International Journal of Advanced Engineering Science and Information Technology (IJAESIT), 8(5), 17261.
49. Soundappan, S. J., & Sugumar, R. (2016). Optimal knowledge extraction technique based on hybridisation of improved artificial bee colony algorithm and cuckoo search algorithm. International Journal of Business Intelligence and Data Mining, 11(4), 338-356.
50. SakthiPreetha, A., Kavitha, K., Karthika, K., & Manohari, R. G. (2025, April). A Novel Metasurface-Embedded Antenna for WBAN Communications. In 2025 3rd International Conference on Advancements in Electrical, Electronics, Communication, Computing and Automation (ICAECA) (pp. 1-4). IEEE.
51. Murugeshwari, B., Selvaraj, D., Sudharson, K., & Radhika, S. (2023). Data Mining with Privacy Protection Using Precise Elliptical Curve Cryptography. Intelligent Automation & Soft Computing, 35(1).
52. Gopinathan, V. R. (2025). Software engineering practices for AI-driven systems: From development to deployment (MLOps perspective). International Journal of Science, Research and Technology, 8(1), 13493-13500.
53. Anbazhagan, K., Kumar, R., Thilagavathy, R., & Anuradha, D. (2024, March). Shortest Job First with Gateway-based Resource Management Strategy for Fog Enabled Cloud Computing. In 2024 4th International Conference on Data Engineering and Communication Systems (ICDECS) (pp. 1-6). IEEE.
54. Kannadhasan, S., Vasuki, S., Kavitha, K., Karthikeyan, P., & Usha, S. G. A. (Eds.). (2025, April). Preface: Role of Artificial Intelligence and IoT in Engineering, Technology & Science [ICRAETS 2024]. In AIP Conference Proceedings (Vol. 3258, No. 1, p. 010001). AIP Publishing LLC.
55. Dhinakaran, D., Prathap, P. J., Selvaraj, D., Kumar, D. A., & Murugeshwari, B. (2022). Mining privacy-preserving association rules based on parallel processing in cloud computing. International Journal of Engineering Trends and Technology, 70(3), 284-294.