ABSTRACT

To streamline parking management, various approaches, including traditional methods like employing wheel locks, are utilized to penalize vehicle owners for encroaching into designated No Parking zones. However, relying solely on such equipment proves inadequate in furnishing comprehensive real-time data on the wheel lock's status and daily usage log. The current system's design is unwieldly and lacks technological advancements. Introducing the proposed Anti-Theft Wheel Lock Tracking System, featuring an optimally efficient design tailored to meet contemporary requirements. When affixed to the wheel, this device functions as a stopper, triggering the electronic system to transmit the current geolocation to a central server. This system not only enhances the ability to monitor wheel lock activities but also enables more precise control over transactions. The identification of the problem statement and formulation of objectives preceded the development of the system design, with a detailed methodology outlined in the subsequent chapters.

Keywords: Geolocation Tracking, Anti-Theft System, Central Server, System Integration.

I. INTRODUCTION

This chapter provides a concise introduction to the project, offering insights into its inception and outlining the upcoming steps. In the realm of efficient transportation and logistics, cost reduction is achieved through real-time tracking of a vehicle's location, be it a truck or bus. The Anti-Theft Wheel Lock Tracking System emerges as a highly efficient tool for curbing unauthorized vehicle parking. The project's objective is to design and develop a GPS-based anti-theft wheel lock activity tracker, aiding in quantifying vehicles in no-parking zones and streamlining fund generation.

This innovative system, comprising a wheel lock device for inspecting parked cars, integrates hardware seamlessly to operate based on the lock or unlock state. The hardware, including GPS connectivity to the server, acts as a discreet unit, continuously sending location data to the monitoring unit. When the wheel lock is engaged, location data is transmitted to the specified server, keeping traffic police informed about the vehicle's actions. The status of the wheel lock provides valuable insights into its usage frequency, active duration, and location details.

However, employing a "car wheel jammer" or similar devices to interfere with a vehicle's operation entails significant disadvantages and legal consequences. Such actions are illegal in many countries, leading to potential criminal charges, fines, and imprisonment. Additionally, the safety risks associated with jamming a car's wheels can result in accidents, posing threats to the driver, passengers, and other road users. Furthermore, attempting to jam a vehicle's wheels may cause damage to its tires, brakes, or other critical components.

In the pursuit of enhancing transportation efficiency and reducing operational costs, real-time monitoring of vehicle locations, especially trucks and buses, becomes paramount. The Anti-Theft Wheel Lock Tracking System emerges as an indispensable tool for mitigating unauthorized parking, offering a forward-thinking solution. The project's central goal is the development of a GPS-based anti-theft wheel lock activity tracker, designed to quantify vehicles in no-parking zones and streamline the fund generation process. This innovative system not only serves as a deterrent for rule-breaking vehicles but also contributes to maintaining order in urban parking spaces.

The hardware intricacies of the system include a wheel lock device seamlessly integrated with GPS connectivity, forming a covert unit that continuously transmits location data to a monitoring unit. When the
wheel lock is engaged, the system sends GPS coordinates to a specified server, providing real-time updates to traffic police. The detailed tracking of the wheel lock’s lock or unlock state enables the identification of usage patterns, active durations, and specific locations. This multifaceted approach ensures a comprehensive understanding of parking violations, contributing to more effective urban traffic management. However, it is crucial to note that resorting to the use of a “car wheel jammer” or similar devices to disrupt a vehicle’s operation carries inherent risks and legal consequences, ranging from criminal charges and fines to potential imprisonment, thereby emphasizing the importance of responsible and legal interventions in traffic control.

II. METHODOLOGY

- **Hardware Overview:** Present the hardware components of the Trackable Wheel Jammer: Arduino Board (mention the specific model used), GPS Module, GSM Module, Wheel Lock Mechanism, Power Supply. Any additional sensors or components.

- **System Architecture:** Explain the system architecture, illustrating how each component interacts with one another. Use diagrams or schematics to provide a visual representation of the connections and data flow within the system.

- **Operation Walkthrough:** Demonstrate the step-by-step operation of the Trackable Wheel Jammer: a. Show how the device is attached to the wheel, engaging the lock mechanism. b. Explain how the Arduino reads data from the GPS module to determine the current location. c. Showcase the GSM module transmitting the location data to a central server or monitoring unit.

- **Arduino Code Explanation:** Briefly explain the key sections of the Arduino code responsible for: a. Reading GPS data b. Communicating with the GSM module c. Controlling the wheel lock mechanism d. Any additional logic implemented for tracking and security features.

- **Live Tracking Demo:** Conduct a live tracking demonstration: a. Move the vehicle with the Trackable Wheel Jammer attached to simulate unauthorized movement. b. Show real-time updates on a computer or mobile interface indicating the current location of the tracked vehicle.

- **Anti-Jamming Mechanism:** If applicable, discuss any anti-jamming features implemented in the system. Explain how the device resists tampering or unauthorized attempts to interfere with its operation.

III. MODELING AND ANALYSIS

![Figure 1: Architecture design of trackable wheel jammer](image)

The Trackable Wheel Jammer project is characterized by a well-defined system architecture, incorporating essential components for seamless functionality. The integration of a GPS module, wheel rotation sensors, microcontroller, communication module, and user interface forms a modular structure, enabling efficient data flow and control. The GPS module provides accurate location data, while wheel rotation sensors capture usage.
metrics. The microcontroller processes and manages this data, and the communication module facilitates secure data transfer to a central server or user interface.

The operational capabilities of the trackable wheel jammer integrating GPS tracking and daily usage monitoring provides a comprehensive overview of the device's operation, enhancing its utility for diverse applications. However, challenges may arise in maintaining consistent operational efficiency, particularly in areas.

data accuracy and precision through the use of GPS tracking for location data and wheel rotation sensors for reliable usage metrics. While these technologies contribute to robust data accuracy, potential environmental factors such as signal interference or sensor calibration issues.

The trackable wheel jammer real-time tracking capability facilitated by GPS technology. This feature allows for immediate response to deviations or unauthorized movements, enhancing the device's security and operational effectiveness.

IV. RESULTS AND DISCUSSION

Various approaches to integrating GPS tracking with wheel usage monitoring are observed, ranging from basic systems utilizing GPS modules and rotation sensors to more sophisticated setups incorporating advanced microcontrollers and communication modules.

Across the technologies surveyed, there is a consensus on the operational effectiveness of trackable wheel jammers. The incorporation of real-time tracking capabilities stands out as a common feature, demonstrating the practical utility of these devices in diverse applications. Industries such as logistics, security, and fleet management benefit from the enhanced operational visibility provided by these technologies. The importance placed on achieving high levels of data accuracy and precision. Technologies employ advanced sensors and algorithms to ensure reliable capture of location data and wheel usage metrics.

Ongoing trends in the integration of GPS tracking with advanced sensors and communication modules. The shift towards more sophisticated microcontroller systems indicates a growing emphasis on real-time data processing capabilities. Beyond traditional uses in fleet management, these technologies find applications in emerging areas such as e-commerce logistics, construction site monitoring, and security systems. This diversity underscores the adaptability of trackable wheel jammer solutions to a wide range of industries and scenarios.

The survey identifies several avenues for future exploration and improvement. Addressing challenges in data accuracy, optimizing power management strategies for prolonged operational life, and further refining security protocols are identified as areas for ongoing research and development. Additionally, exploring innovative applications and integrating emerging technologies such as artificial intelligence for enhanced data analysis represent promising future directions in the field of trackable wheel jammers.

V. CONCLUSION

In conclusion, the current methods of parking management, particularly the use of traditional wheel locks, are insufficient in providing comprehensive real-time data and efficient handling. The proposed Anti-Theft Wheel Lock Tracking System offers an innovative solution, utilizing an integrated design that enables continuous monitoring and tracking of wheel lock activities. By incorporating a stopper mechanism that triggers the electronic system and sends immediate geo-location data to a central server, this system significantly enhances transaction control and provides a more streamlined approach to parking management. The development of this system has the potential to revolutionize the way parking violations are managed, contributing to better enforcement and improved efficiency in urban traffic management.

VI. REFERENCES


