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REAL TIME VECHICLE TRACKING SYSTEM USING GSM & IOT

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ABSTRACT—

Vehicle tracking systems have evolved significantly over the years, transitioning from simple passive tracking devices to real-time monitoring systems that utilize global positioning system (GPS) and global system for mobile communications (GSM). These advancements have enabled more precise tracking, better communication capabilities, and enhanced control over vehicle operations. Despite these improvements, there remains a persistent need for systems that are not only reliable but also incorporate multiple layers of security to prevent unauthorized access and use. This research paper introduces GPS and GSM based tracking system designed to significantly enhance vehicle safety and provide real time location monitoring. The system utilizes an Arduino Uno as the primary control unit, interfaced with a GSM module (SIM800L) for communication and a GPS module (NEO-6M) for precise tracking of the vehicle's location. Key components include a relay-controlled ignition switch and a key lock system to manage vehicle startup. The entire system operates on a 9V power supply, with voltage regulation managed by an LM2596 step-down converter. This integration of hardware components ensures robust vehicle tracking, remote control capabilities, and heightened security measures, thereby offering an effective solution for personal vehicle safety and efficient fleet management.

I.INTRODUCTION

An innovative vehicle tracking system that employs GPS and GSM technologies to enhance vehicle safety and provide real-time location monitoring. Central to the system is an Arduino Uno, which functions as the main control unit. This Arduino interfaces with a GSM module (SIM800L) for communication purposes and a GPS module (NEO-6M) for accurate location tracking. Key components of the system include: Relay-Controlled Ignition Switch and Key Lock System: These components allow for the management of vehicle startup, facilitating remote ignition control and improving theft deterrence. Fingerprint Sensor: This advanced biometric authentication feature ensures that only authorized users can start the vehicle, adding an extra layer of security beyond traditional key-based methods. Buzzer Auditory Alerts: The system features a buzzer to provide immediate auditory alerts for various notifications, such as unauthorized access attempts or system issues, ensuring timely information for the vehicle owner. The system is powered by a 9V power supply, with voltage regulation handled by an LM2596 step-down converter, ensuring stable and efficient power distribution. The integration of these hardware elements results in a comprehensive vehicle tracking system that offers not only real-time monitoring but also enhanced security and control. This system is particularly useful for both personal vehicle security and efficient fleet management. By providing robust tracking and remote-control capabilities, it addresses modern vehicle security challenges effectively.

II.LITERATURE REVIEW

Real-time GPS Tracking System for IoT Enabled Connected Vehicles: It looks like you're interested in real-time GPS tracking for IoT-enabled connected vehicles! This technology integrates IoT, V2X communication, and VANET to enhance vehicle connectivity, enabling efficient tracking, data exchange, and decision-making. If you're looking for research papers or technical insights, you might find this academic paper useful. Additionally, GAO Tek provides an overview of a GPS IoT-enabled vehicle system that explores hardware architecture and deployment.

GPS based Efficient Real Time Vehicle Tracking and Monitoring System using Two Factor Authentication and Internet of Things (IoT): The GPS-based Efficient Real-Time Vehicle Tracking and Monitoring System integrates two-factor authentication and IoT to enhance security and

operational efficiency in transportation. By leveraging Arduino Uno, SIM800L GSM module, and NEO-6M GPS, the system ensures precise location tracking, allowing for real-time monitoring of vehicles via GSM communication. The integration of biometric authentication and relay-controlled ignition fortifies security, preventing unauthorized access. Furthermore, an alert system using buzzers and key-lock mechanisms enhances vehicle protection against potential threats. The system promotes energy efficiency through optimized hardware software interaction, making it ideal for fleet management, logistics, and sustainable transportation applications. With seamless data synchronization, intelligent tracking, and enhanced security protocols, this solution contributes to safer, more efficient, and environmentally friendly mobility.

Enhancing Vehicle Tracking through SMS: A Cost Effective Approach Integrating GPS and GSM: This approach leverages GPS and GSM technologies to provide a cost-effective vehicle tracking system using SMS-based communication. By integrating realtime location tracking with GSM messaging, users can receive instant updates on vehicle positions without requiring an internet connection. The system ensures efficient monitoring, making it ideal for fleet management, security applications, and logistics. Its affordability and wide accessibility make it a practical solution for enhancing vehicle tracking in regions with limited network infrastructure.

Development and Performance analysis of a GPS GSM Guided System for Vehicle Tracking: The development and performance analysis of a GPS-GSM guided system for vehicle tracking, addressing security and efficiency concerns in transportation. The system integrates Arduino, GPS, GSM, and vibration sensors, enabling realtime location tracking and remote monitoring via text messages. By leveraging GSM communication, users can receive vehicle coordinates directly, ensuring accessibility even in areas with limited internet connectivity. Performance tests confirm the system's reliability and cost-effectiveness, making it a viable solution for fleet management, theft prevention, and intelligent transportation systems.

III.EXISTING SYSTEM

A real-time vehicle tracking system built upon GPS and Internet of Things (IoT) technologies is a sophisticated solution designed for continuous monitoring and management of vehicles. It integrates various hardware and software components to acquire location data, transmit it, process it, and present it to users in an actionable format. The core principle involves equipping vehicles with tracking devices that report their position and status in real-time, enabling oversight and analysis from a remote location.

System Architecture

The typical architecture of such a system follows a distributed model, involving endpoints (vehicles with tracking devices), a communication layer, a central processing and storage hub (server/cloud), and user interfaces.

IV.PROPOSED SYSTEM

The proposed system is a real-time vehicle tracking solution that integrates GPS and IoT technologies to provide accurate, continuous location monitoring and enhanced vehicle security. It utilizes a GPS module to capture the vehicle's current coordinates and a GSM module to transmit this data to a cloud server or user's mobile application, allowing remote access through a user-friendly interface. The system features biometric authentication using a fingerprint sensor to ensure only authorized users can start the vehicle, addressing the issue of unauthorized access. A relay-controlled ignition switch allows remote engine control, offering theft prevention capabilities. Additionally, the system includes geo-fencing functionality that alerts users when the vehicle leaves a predefined area, and a buzzer for instant audio alerts in case of intrusions. All collected data is logged in the cloud, enabling historical route tracking and trip analysis. Powered by a regulated power supply for stable operation, this system is energy-efficient and suitable for both personal vehicles and commercial fleet management. By combining real-time tracking, IoT integration, and strong security features, the proposed system overcomes the limitations of traditional vehicle trackers and meets modern demands for smarter, safer mobility solutions.

In addition to location tracking and security, the proposed system enhances user interaction through a dedicated mobile application or web interface that allows real-time map visualization, control commands, and notifications. Users can remotely monitor parameters such as speed, engine status, and trip duration, making the system highly informative and interactive. The use of IoT enables automatic data logging and cloud storage, which not only supports historical analysis but also opens up possibilities for integrating predictive features such as route optimization and maintenance alerts. This level of connectivity provides better decision-making tools for both individual vehicle owners and fleet managers. Furthermore, by enabling features like emergency alerts and system health monitoring, the system ensures quick response in case of accidents or failures. With low-cost components and modular design, it is also scalable and customizable, allowing future integration of additional sensors and smart technologies. This makes the system not only practical and reliable but also adaptable to evolving transportation and security needs. The proposed system addresses key limitations found in conventional tracking setups by offering two-way communication between the user and the vehicle. This interactive capability allows users not only to receive location updates but also to send remote commands, such as disabling the ignition in case of theft or activating the buzzer for alert purposes. Unlike basic GPS trackers that rely solely on SMS-based communication, this IoT-based solution ensures seamless data transfer and real-time notifications through the internet, reducing delay and improving accuracy. The inclusion of biometric access further elevates the system's security standard, minimizing the risk of unauthorized vehicle usage.

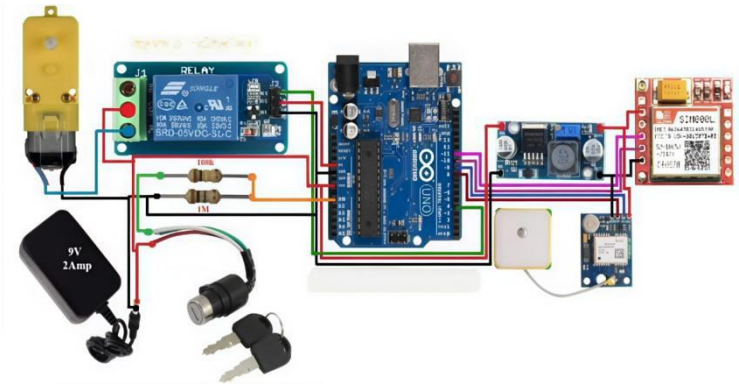

Fig.1.Block Diagram

A.Components Used:

1.Arduino Uno: Arduino Uno is a popular microcontroller board widely used in various electronics projects, prototyping, and hobbyist applications. Here's a detailedoverview of the Arduino Uno It is one of the most widely used boards in the Arduino family, knownfor its simplicity, versatility, and ease of use.

2. Gsm Module (SIM800L): Global System for Mobile Communication (GSM) is a standard used in cellularcommunication networks. Amongst all cell technologies in use nowadays, GSM isone of the most widespread. GSM modules offer connectivity along with wireless data communication transfer. The Global System for Mobile Communications (GSM) is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile devices such as mobile phones and tablets.

3. Neo-6m Gps Module: The Neo-6M GPS module is a highly reliable, compact GPS receiver designed for use in a wide range of embedded systems that require accurate geolocation capabilities. Built around the u-blox NEO-6M chip, the module supports satellite navigation systems and is capable of delivering precise positioning data such as latitude, longitude, altitude, speed, and Universal Time Coordinated (UTC).

4. 5V Single-Channel Relay Module: The 5V single-channel relay module is a commonly used component in automation, control, and microcontroller-based projects. It serves as an interface between low-voltage digital circuits and high-voltage electrical appliances. This module enables small controllers like Arduino, ESP8266, or Raspberry Pi to switch larger loads such as lights, fans, motors, or home appliances that operate at either AC or DC voltages.

5. Lm 22569 Dc Dc Bunk Converter: The *LM2596* is one of the most popular and widely used *DC-DC buck converters* designed for step-down (buck) voltage regulation. It is a compact and efficient power supply module that is capable of converting higher input voltages (from 4.5V to 40V) into a lower, regulated output voltage (from 1.23V to 37V), which makes it ideal for a variety of applications requiring stable and efficient voltage conversion. The LM2596 is designed to handle output currents up to 2 to 3A, depending on cooling and input/output conditions. As a switching regulator, it offers significant power efficiency, often exceeding 90%, compared to linear voltage regulators that dissipate excess power as heat.

6. Key Lock And Bo Motor & Wheel: A *key lock switch* is a mechanical switch operated by a physical key and is often used in security or control systems to enable or disable a device or system. It works similarly to a regular toggle or push-button switch but adds a layer of physical security by requiring a specific key to operate. In robotics and embedded systems, key lock switches are commonly used to provide controlled power access, ensuring only authorized users can turn on or off the system. They are typically panel-mounted and come with two or more electrical contacts normally open (NO) and normally closed (NC) that change state when the key is turned. This makes them suitable for use in access control systems, security robots, and project enclosures where tamper resistance is needed.

V.CONCLUSION

The Realtime GPS Tracking System presented in this paper demonstrates its effectiveness as a robust and accurate solution for real-time vehicle tracking. By utilizing Arduino Uno R3, SIM800L, NEO6M GPS, and integrating web applications with Socket and Firebase technologies, the system enables seamless data collection, analysis, and visualization. The incorporation of connected vehicle technology facilitates comprehensive monitoring of engine diagnostics, fuel consumption, and speed, providing users with valuable insights for enhancing efficiency, safety, and decision-making processes. The cloud-based deployment on Vercel, combined with Firebase integration, ensures scalability, security, and effective real-time data management. The successful testing and demonstration of the system validate its ability to accurately track connected vehicles, making it a reliable tool for various industries. Specifically, logistics, transportation, and emergency services can benefit from its potential to optimize fleet management and operations. Looking ahead, implementing recommended enhancements and expanding integration capabilities can further improve the functionality of the Realtime GPS Tracking System. By catering to the evolving needs of businesses and industries, it can continue to deliver data-driven optimizations, enhance operational efficiency, reduce costs, and improve overall fleet management.

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