IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

VEHICLE TRACKING SYSTEM

[1] Kaviyaprabha KM, [2] Om Selvaprakash M , [3] Dr.J.Arunarasi

[1] Student- Department of Electronics and Communication Engineering ,Sri Sai Ram Engineering College, West Tambaram, Chennai, India

[2] Student- Department of Electronics and Communication Engineering, Sri Sai Ram Engineering College, West Tambaram, Chennai, India,

[3] Associate professor-Department of Electronics and Communication Engineering, Sri Sai Ram Engineering College, West Tambaram, Chennai, India

[1]Electronics and Communication Engineering,

[1] Sri Sai Ram Engineering College, West Tambaram, Chennai, India

Abstract: The increasing frequency of car theft in today's society presents serious difficulties for both car owners and law enforcement. This study offers a novel car tracking and anti-theft system that seamlessly incorporates GPS and GSM technologies into an Internet of Things (IoT) architecture, effectively addressing these challenges. This all-inclusive system provides a comprehensive solution to improve vehicle security by combining remote control functions, emergency alarm functionality, and real-time tracking capabilities.This system's primary function is to provide precise vehicle position tracking and effective communication between the vehicle and a central monitoring station by utilizing both GSM and GPS technology. The GPS module that is installed in the car records its exact location on a regular basis, and the GSM modem makes it easier to send this information to the monitoring station. A robust 32-bit ARM7 LPC2148 microcontroller, which effectively controls the data transmission methods, such as General Packet Radio Service (GPRS) or Short Message Service (SMS), based on network availability, is what makes this connection possible.This system's capacity to deliver real-time vehicle location data analysis and visualization is one of its unique selling points. Through integration with widely used mapping services like Google Earth, users can effortlessly monitor the movement of the car and detect any questionable actions or detours from the prearranged routes. This improves the tracking of the vehicle's location and makes it easier to respond quickly in the event of theft or unauthorized use.The vehicle's engine can be turned on or off remotely, and an alert system with a buzzer and an alert light can be turned on. This reduces possible losses related to car theft by enabling consumers to act quickly in the case of a security breach.To strengthen security measures even further, the system includes an emergency alarm mechanism in addition to proactive tracking and management functions. Activated through the Blynk application, the GSM module uses the Arduino UNO microcontroller's ability to identify possible theft scenarios and trigger an automatic call to a pre-programmed emergency contact number. Thorough performance testing is done to assess the system's efficacy, showing its dependability and efficiency in deterring car theft and aiding in recovery operations. All things considered, the incorporation of IoT technology into this anti-theft and vehicle tracking system presents a complete answer to improve vehicle security and give car owners peace of mind.

Keywords: GSM, GPS, IoT, Vehicle Tracking, Anti-Theft System, NodeMCU ESP8266, NEO-6M Module, Blynk Application, Arduino UNO, Performance Evaluation.

I. INTRODUCTION

The integration of Global System for Mobile Communication (GSM) and Global Positioning System (GPS) technologies has revolutionized vehicle location and tracking systems, offering a comprehensive solution for ensuring the safety, security, and efficiency of vehicles across various applications. At its core, the GPS-based vehicle tracking system harnesses the power of GPS satellites to accurately pinpoint the location of vehicles in real-time. By continuously retrieving latitude and longitude coordinates, this system provides precise and reliable location data, facilitating seamless monitoring and tracking capabilities. The inclusion of GSM modules equipped with SIM cards enables bi-directional communication between the vehicle and a central monitoring station. Through SMS notifications or data transmission, pertinent information regarding the vehicle's location, status, and movement can be relayed to authorized personnel, allowing for timely intervention in case of emergencies or suspicious activities. The system architecture typically consists of two main components: the On-Board Module installed within the vehicle and the Base Station responsible for monitoring and managing data from multiple vehicles. The On-Board Module incorporates sophisticated hardware such as GPS receivers, GSM modems, and microcontrollers, which work in tandem to collect, process, and transmit relevant data efficiently. One of the primary benefits of GPS-based vehicle tracking systems is their ability to enhance security measures. By serving as a theft prevention and recovery mechanism, these systems act as a deterrent to potential thieves and provide law enforcement agencies with valuable tools for locating and recovering stolen vehicles. Additionally, the system's ability to log historical location data enables thorough investigations and evidence collection in case of theft or unauthorized use. Beyond security applications, GPS-based vehicle tracking systems offer numerous benefits for fleet management operations. Fleet operators can leverage real-time tracking capabilities to optimize route planning, monitor vehicle performance, and enhance operational efficiency. By identifying and addressing inefficiencies in fleet operations, organizations can reduce fuel consumption, maintenance costs, and overall environmental impact. Moreover, the adoption of vehicle tracking systems extends beyond commercial fleets to individual consumers, who benefit from added peace of mind and security for their personal vehicles. Whether used as a theft prevention measure or for monitoring driving behaviour, these systems empower vehicle owners with greater control and oversight over their assets.

In recent years, there has been a notable advancement in the development of mobile devices in terms of memory capacities, increased transfer speeds, and sophisticated computing capability are only a few performance metrics. One of the most entertaining, user-friendly, and practical functions accessible today is navigation and placement. Cell phones now come with these functionalities. Combining positioning, localization, and telecommunications technology creates the foundation for a number of potential real-time applications.

II. WORKING PROCEDURE AND DESIGN

The proposed vehicle tracking system comprises several components integrated to enhance security and facilitate recovery in case of theft. A 16*2 LCD display is incorporated to provide real-time status updates, indicating whether the vehicle is safe or not. Additionally, an IoT-based engine control interface using a NodeMCU and Blynk app enables remote engine ON/OFF functionality.In the event of theft, emergency measures are activated. An interface with a GSM SIM900A module linked to an Arduino Uno triggers automatic calls to predefined numbers stored in the microcontroller's code. Moreover, emergency lights and a buzzer are activated remotely through a mobile application to alert nearby individuals, facilitating swift recovery.To streamline location tracking, WiFi and GPRS technologies are utilized. Longitude and latitude data are continuously monitored and transmitted to a web interface hosted on ThingSpeak. This platform, facilitated by APIs and a private channel number, enables seamless data exchange between the microcontroller and the web server. Data transfer occurs securely through HTTPS protocols.By integrating these technologies, the proposed system offers robust vehicle tracking capabilities, ensuring prompt notification of theft and enabling swift recovery through coordinated efforts of both technology and community involvement.

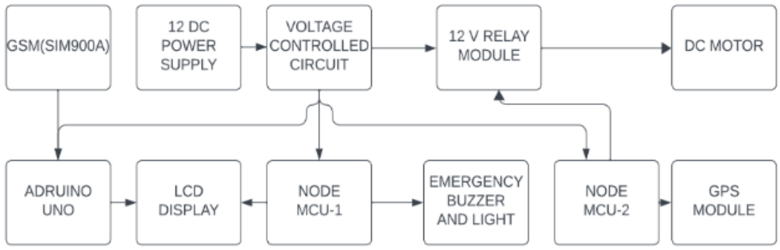

Fig 1:Block Diagram

The block diagram integrates an extensive array of components to ensure robust security and effective monitoring capabilities. At the heart of the system lies the incorporation of a 16*2 LCD display, serving as the primary interface for providing real-time status updates regarding the vehicle's safety and operational conditions. This display acts as a visual indicator, offering instant insights into the vehicle's status to users.Complementing the LCD display is the utilization of a NodeMCU microcontroller seamlessly interfaced with a GPS module (6M), enabling precise and accurate tracking of the vehicle's location in real-time. This integration allows for the continuous monitoring of the vehicle's whereabouts, facilitating efficient fleet management and theft prevention.

The system's functionality is further augmented by an IoT-based engine control mechanism, which enables remote monitoring and control of the vehicle's engine status via smartphone applications. This feature provides users with the ability to remotely start or stop the vehicle's engine, enhancing convenience and security.In the unfortunate event of theft or unauthorized access, the system is equipped with emergency measures, including the activation of emergency lights and a buzzer. These components serve as immediate alerts to nearby individuals, notifying them of potential security breaches and prompting swift action to mitigate risks.

Additionally, a GSM SIM900A module is seamlessly integrated into the system to automatically initiate call alerts to predefined numbers in the event of suspicious activities. This enhances the system's security measures by providing an additional layer of notification and communication.To ensure optimal performance and compatibility across all interconnected components, a 12V variable power module is incorporated into the system. This module enables adjustable voltage levels, allowing for precise control over power distribution and enhancing the overall efficiency of the system.Furthermore, a 12V relay module facilitates the control of high-power devices, such as emergency lights, ensuring reliable operation and responsiveness during emergency situations.The system also features a 5V DC motor, which simulates engine functions and provides a tangible representation of the vehicle's operational status. This enhances the practicality and realism of the system, allowing users to monitor the vehicle's engine activity effectively.

The seamless integration of these components, the proposed vehicle tracking system offers a comprehensive solution for monitoring, security, and theft prevention. It empowers users with real-time insights into the vehicle's status and enables prompt response to potential security threats, ultimately enhancing safety and peace of mind for vehicle owners.

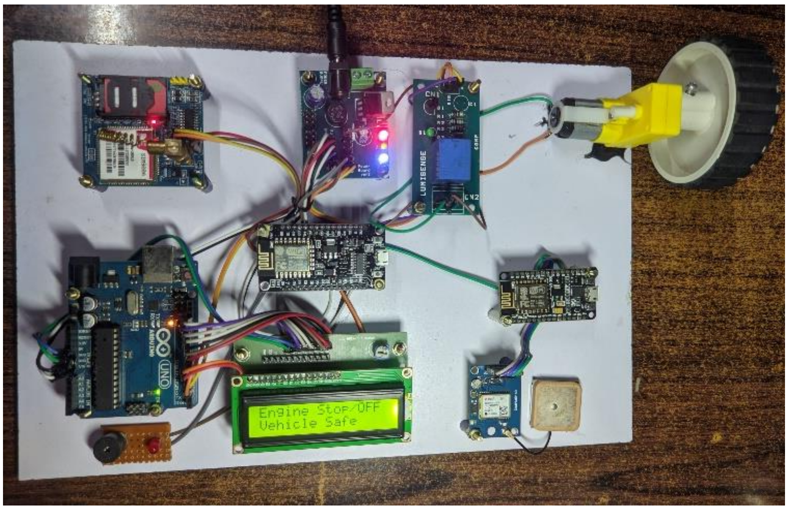

Fig 2:Vehicle tracking system

One item to note was that the Ublox GPS module's TX pin was connected to the Arduino Uno's RX pin.

Secondly, the GSM module is connected to the digital input/output pins of the Arduino Uno. The TX pin of the GSM module was connected to the RX pin of the Arduino Uno.

The pin configuration for the proposed vehicle tracking system is meticulously designed to ensure seamless integration and optimal functionality of all components. For the LCD display, the ground (GND) connection is established with Arduino's GND pin, while the VCC connection is linked to the 5V pin. The RS pin is connected to pin 13, EN to pin 12, and D4 to D7 pins are connected to pins 11, 10, 9, and 8, respectively, facilitating the transmission of vehicle status information. The variable power supply is linked to the Arduino, with the ground (GND) connection made to the Arduino's GND pin and the 5V input connected to the VIN pin, ensuring consistent and regulated power distribution. The GSM module's ground (GND) is connected to the ground terminal of the 12V variable power supply module, while the VCC is linked to the 5V power source. The RX pin is connected to Arduino's pin 3, and TX to pin 4, facilitating communication between the GSM module and Arduino for automatic call alerts.The NodeMCU's VIN pin is connected to the 5V output of the variable 12V power module, ensuring stable power input. The ground (GND) connection is established with the Arduino's GND pin. Pin D5 of the NodeMCU is linked to pin 6 of the Arduino, and pin D6 to pin 7, enabling the NodeMCU to display engine status through IoT integration.For emergency light with a buzzer, the positive terminal is connected to the 12V variable power module's ground, while the anode is connected to NodeMCU's D8 pin to activate the buzzer during emergency situations.NodeMCU's D5 pin is connected to the signal pin of the 12V relay module, while the anode and cathode are connected to the 12V variable power supply, facilitating relay control. At the receiver end, the common pin of the relay module is connected to the variable power supply's ground, and the normally closed pin is linked to the DC motor's anode, enabling motor control based on relay activation.For the second NodeMCU ESP8266 board, the GPS module is connected with the ground (GND) linked to NodeMCU's GND pin, VCC to VIN, TX to D5, and RX to D6, with power supplied by the variable power supply module.

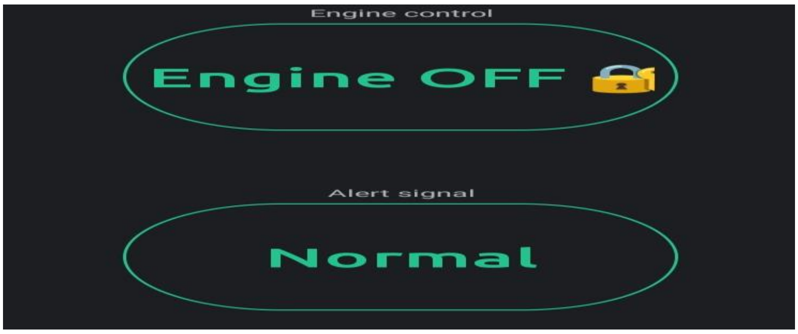

Fig 3 Blynk app interface

Utilizing the Blynk app interface, buttons are created to control hardware via virtual pins. When the IoT engine is turned off, it signifies the vehicle engine is turned on. Upon pressing the virtual button, the engine activates, and the button reflects the engine's state as turned on. In the event of an emergency, indicating potential theft or danger, the button displays a warning upon being pressed. Simultaneously, the LCD screen shows an emergency alert, triggering the buzzer .

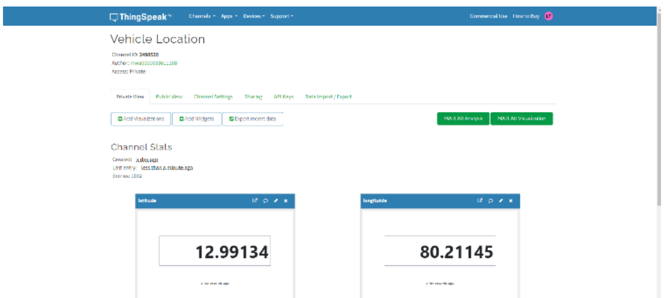

Fig 4:GPS output

The live location of the vehicle can be displayed on the ThingSpeak webpage using an API created with a new private channel. The location can be shown in terms of parameters such as longitude and latitude

III. RESULTS AND DISCUSSION

The simulated results of integrating a DC motor as the engine component in the location tracking system demonstrate its effectiveness in accurately detecting engine on/off events. The simulations confirm the system's ability to monitor the status of the DC motor in real-time, providing reliable feedback on engine activations and shutdowns. Clear distinctions between periods of motor operation and idleness are observed, ensuring precise tracking and analysis. The implemented DC motor effectively simulates engine behavior, producing consistent output signals indicative of engine activity. Analysis of the simulated data reveals the system's robustness in distinguishing between engine states, enabling accurate tracking of vehicle movement and seamless integration into various applications. These results validate the system's potential to enhance operational efficiency and security across industries, paving the way for further experimentation and real-world implementation.

GPS parameters :

- $GPGLL: Sentence Identifier
- 1249.3832: Latitude of current position (12 degrees 49.3832 minutes North)
- N: North hemisphere indicator
- 8021.9925: Longitude of current position (80 degrees 21.9925 minutes East)
- E: East hemisphere indicator
- 120542.56: Time of position fix (12 hours, 5 minutes, 42.56 seconds UTC)
- A: Data valid A: Autonomous mode
- *65: Checksum
- Carriage return and Line feed .

In this GPS dataset, Field 1 provides latitude in ddmm.mmm format, followed by the hemisphere indicator (N for north, S for south). Field 2 offers longitude similarly. Field 3 denotes UTC time in hhmmss.ss format, with 0 indicating 00:00:00.00. Field 4 indicates position status ('A' for valid, 'V' for warning, 'N' for invalid). Field 5 represents the mode ('A' for autonomous, 'D' for differential, '*' for estimated). Lastly, Field 6 is the checksum for data integrity.

Field	Example	Description
1	1249.3832(N)	Latitude in ddmm.mmm format. Leading Zeros transmitted Latitude Hemisphere indicator, N=North, S=South
2	8021.9925(E)	Longitude in ddmm.mmm format. Leading Zeros transmitted Longitude hemisphere indicator, E=East, W=West
3	120542.56	UTC time in hhmmss.ss format. 0 signifies 00:00:00.00
4	A	Status, 'A' = valid position, 'V' = navigation receiver warning, 'N' = Data Invalid
5	A	Mode indicator, 'A' = Autonomous, 'D' = Differential, '*' = Estimated
6	65	Checksum

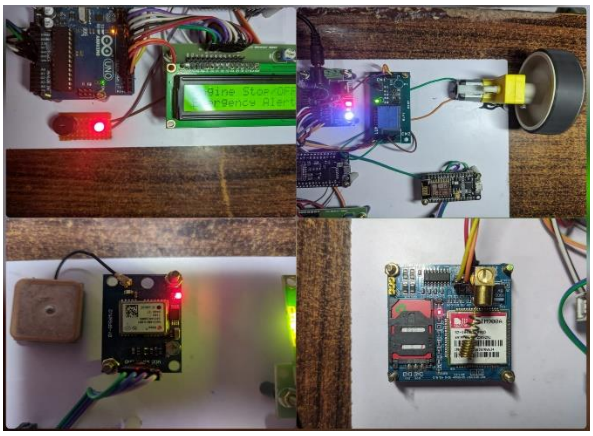

Fig 5:Desired output and results

The above depicts that the results of this project in which the engine turn ON/OFF using mobile interfaced with bylnk iot,and also red light and buzzer added for emergency alert when the emergency virtual button is pressed on mobile call will receive to the number in which we are provided to the microcontroller via code in case of theft in object.Gps will track the location continuosly in terms of latitude and longitiude and send the data to thinkspeak webpage .lcd display will continously update the each and every stauts of vehicle.

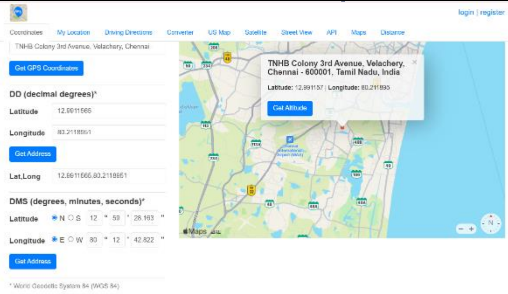

Fig 6: GPS results located on map

The provided latitude (12.99134) and longitude (80.21145) corresponded to a specific urban location in Chennai, India. Utilizing mapping tools, the coordinates accurately pinpointed this location on the map, showcasing the efficacy of geographic parameters in precisely defining geographical points. This demonstrates the practical application of latitude and longitude in mapping technologies for location identification and navigation purposes.

IV.FOCUSSED APPLICATIONS AND FUTURE WORKS

With its vast applications across multiple industries, the suggested position tracking system, when combined with engine on/off detection, provides a transformative advancement. It has unmatched possibilities for fleet management efficiency enhancement, asset protection, insurance telematics revolution, and logistics optimization. In the future, utilizing advanced analytics can facilitate anomaly identification and predictive maintenance algorithms, guaranteeing proactive asset management. Additionally, real-time insights on asset health, environmental conditions, and operational performance are promised by the integration of IoT and sensor technologies, which will facilitate well-informed decision-making. By investigating cutting-edge technologies like augmented reality for immersive visualization and blockchain for safe data sharing, one can extend the capabilities of the system and uncover novel solutions. Prioritizing user-centric design enhances user engagement and guarantees smooth integration into current workflows. When combined, these improvements push the system beyond traditional tracking methods.

V. CONCLUSION

In conclusion, the proposed integration of location tracking with engine on/off detection presents a unique approach with diverse applications across industries. Its significant impact on operational efficiency and risk management is evident in its potential to revolutionize sectors such as insurance telematics, fleet management, asset security, and logistics. Looking forward, the incorporation of advanced analytics and IoT technology offers prospects for predictive maintenance and real-time insights, providing stakeholders with valuable data. Additionally, the exploration of emerging technologies like augmented reality and blockchain introduces new possibilities for immersive visualization and robust data security, propelling the system towards innovation. Emphasizing adaptability and user-centric design ensures seamless adoption and long-term sustainability, heralding a new era of progress in the field.

REFERENCES

[1]San Hlaing, Ni Ni, Ma Naing, and San San Naing. "GPS and GSM based vehicle tracking system." International Journal of Trend in Scientific Research and Development (IJTSRD) 3.4 (2019): 271-275.
[2]Harshadbhai, Patel Krishna. "Design of GPS and GSM based vehicle location and tracking system." International Journal of Science and Research 2.1 (2013): 165-168.
[3]Idachaba, Francis Enejo. "Design of a GPS/GSM based tracker for the location of stolen items and kidnapped or missing persons in Nigeria." ARPN Journal of Engineering and Applied Sciences 6.10 (2011): 56-60.
[4]Sahoo, B. P. S., and Satyajit Rath. "Integrating GPS, GSM and cellular phone for location tracking and monitoring." arXiv preprint arXiv:1307.3147 (2013).
[5]Verma, Pankaj, and J. S. Bhatia. "Design and development of GPS-GSM based tracking system with Google map based monitoring." International Journal of Computer Science, Engineering and Applications (IJCSEA) 3.3 (2013): 33-40.
[6]Bhatia, Shaveta, and Saba Hilal. "A new approach for Location based Tracking." International Journal of Computer Science Issues (IJCSI) 10.3 (2013): 73.
[7]Maurya, Kunal, Mandeep Singh, and Neelu Jain. "Real time vehicle tracking system using GSM and GPS technology-an anti-theft tracking system." International Journal of Electronics and Computer Science Engineering 1.3 (2012): 1103-1107.
[8]Khin, June Myint Mo, and Nyein Nyein Oo. "Real-time vehicle tracking system using Arduino, GPS, GSM and web-based technologies." International Journal of Science and Engineering Applications 7.11,433-436 (2018).
[9]Mustafa, Ali, Mohammed IA al-Nouman, and Osama A. Awad. "A Smart real-time tracking system using GSM/GPRS technologies." 2019 First International Conference of Computer and Applied Sciences (CAS). IEEE, 2019.
[10]Kharisma, Oktaf B., et al. "Development of location tracking system via short message service (SMS) based on GPS unblox neo-6m and sim 800l module." Journal of Physics: Conference Series. Vol. 1363. No. 1. IOP Publishing, 2019.
[11]Mounika, J., et al. "Accident alert and vehicle tracking system using GPS and GSM." Asian Journal of Applied Science and Technology (AJAST) Volume 5 (2021): 81-89.
[12]Patil, Ulhas, et al. "Tracking and recovery of the vehicle using GPS and GSM." Int. Res. J. Eng. Technol. 4.3 (2017): 2074-2077.
Motakabber, S. M. A., et al. "GPS and GSM Based Vehicle Tracker." Asian Journal of Electrical and Electronic Engineering 2.1 (2022): 17-24.
[13]Patel, Poonam, et al. "Arduino based child tracking system using GPS and GSM." International Research Journal of Engineering and Technology (IRJET) 5.3 (2018): 4137-4140.