IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

IOT ENABLED WEB BASED SOLUTION FOR FLEET MANAGEMENT AND FUEL THEFT DETECTION

[1]P. Sravanthi, [2]G. Naga Sekhar, [3]G. Jaswant, [4]G. Chandra Sekhar, [5]K. Yaga Rishi Vardhan

[1]Assistant Professor, [2]Student, [3]Student, [4]Student, [5] Student,
[1]Electronics and Communication Engineering,
[1]Lendi Institute of Engineering and Technology, Vizianagaram, India

Abstract : Fleet management is vital for industries relying on transportation, ensuring efficiency, safety, and cost optimization. However, challenges like fuel theft and operational inefficiencies significantly impact productivity and profitability. To address these, an IoT-based fleet management system is proposed. This solution integrates real-time fuel monitoring, theft detection, and GPS tracking to enhance control and security. Advanced sensors and cloud-based platforms monitor fuel levels, detect etc unauthorized usage, and track rack vehicle locations in real time. By providing actionable insights and alerts, the system minimizes fuel losses, optimizes resource utilization, and improves operational efficiency. This cost-effective approach offers fleet operators a reliable solution to combat fuel theft and ensure seamless fleet operations.

The system incorporates sensors like an ultrasonic sensor for fuel level monitoring and a GPS module for real-time vehicle tracking, connected via ESP8266 WiFi modules for seamless data collection and cloud transmission. A communication system with API-based messaging sends instant alerts for fuel theft or leakage, while an alert system notifies users of critical issues. RFID technology enhances security by limiting access to authorized personnel, with unauthorized movements triggering immediate alerts to fleet operators. Platforms like Blynk enable real-time monitoring, providing insights into fuel consumption, vehicle performance, and security threats. Advanced GPS modules, such as UBlox NEO-6M, ensure precise tracking for route planning and feet optimization. This IoT solution is scalable, reliable, and cost-effective, addressing challenges like fuel theft, wastage, and inefficiency while improving operational management.

IndexTerms **- Fleet Management, Fuel Theft Detection, Theft Prevention, Real-time Monitoring, GPS Tracking, Blynk Application, API-based Alerts**

1 INTRODUCTION

Fleet management plays a critical role in industries reliant on transportation by ensuring operational efficiency, safety, and cost control. However, issues such as fuel theft, route inefficiencies, and unauthorized vehicle access continue to challenge fleet operators. With the advent of IoT technologies, smarter and more secure fleet solutions are now possible. This paper presents an IoT-based fleet management system that integrates ultrasonic sensors, GPS modules, and Wi-Fi communication for real-time fuel monitoring and vehicle tracking. The system provides instant alerts for fuel theft or leakage, and ensures secure vehicle access through RFID technology. Cloud-based platforms enable remote monitoring and data analysis for improved decision-making. The proposed system is scalable, cost-effective, and reliable. It offers a comprehensive solution to enhance fleet efficiency, reduce losses, and ensure operational transparency

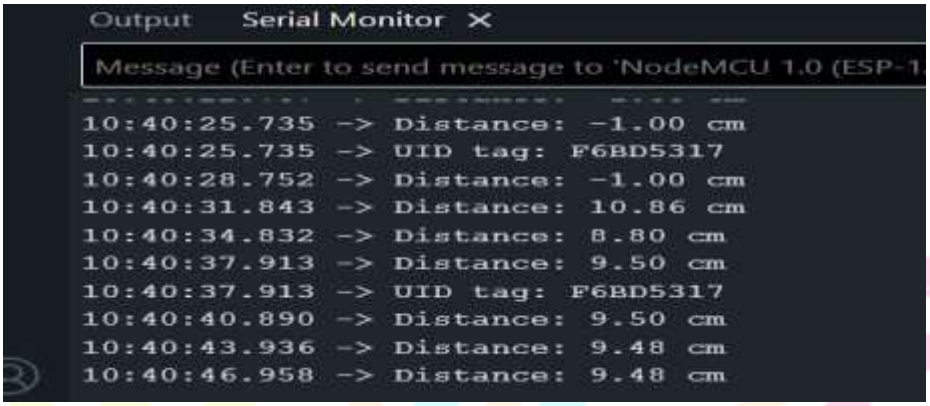
2 NEED OF THE STUDY.

Fleet operations face growing challenges such as fuel theft, unauthorized access, and inefficient route management. These issues lead to significant financial losses and reduced operational effectiveness. Traditional monitoring systems lack real-time insights and automated alerts. There is a critical need for smart, IoT-enabled solutions to ensure fuel security and improve fleet performance. This study addresses these gaps by proposing a real-time, automated fleet monitoring system.

3.1 Acess control efficiency with RFID

Access control is a key feature in ensuring that only authorized personnel can operate the vehicles in the fleet. The RFID-based system implemented in this IoT-based fleet management system plays a pivotal role in securing the vehicles from unauthorized access. Each vehicle is fitted with an RFID reader, and drivers must scan their unique RFID tags for the vehicle to start. The system efficiently tracks this data in real time and provides immediate feedback to fleet managers through alerts when unauthorized access is detected.

The RFID system was thoroughly tested to measure the efficiency and accuracy of vehicle access control. The RFID tags used for testing were assigned to individual drivers, and the system's ability to restrict access based on valid or invalid RFID tags was monitored. The results were consistent and showed that the system was highly effective in preventing unauthorized vehicle usage.

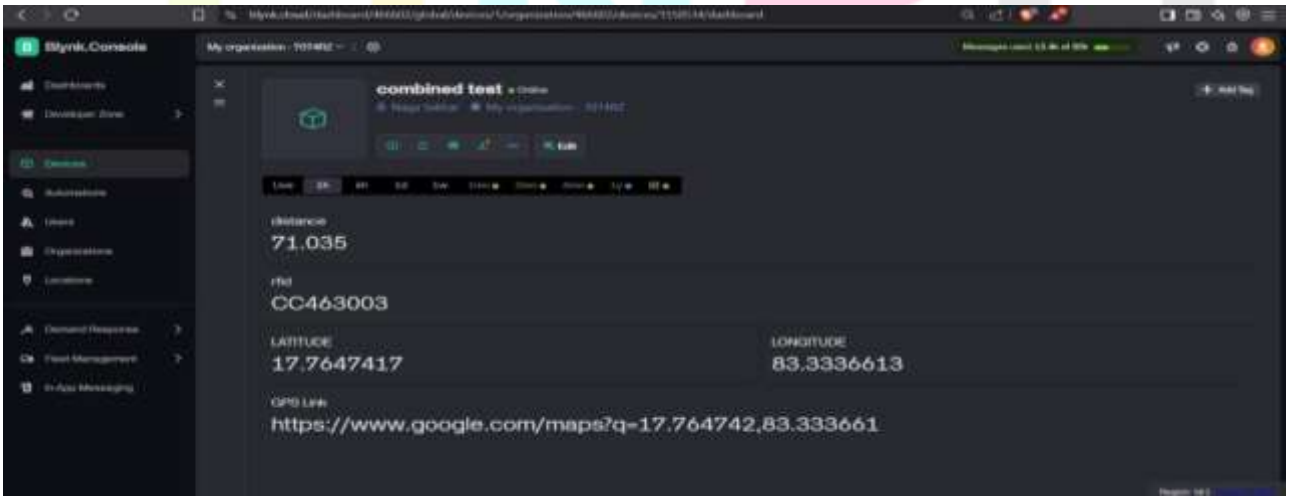


RFID tag acess results

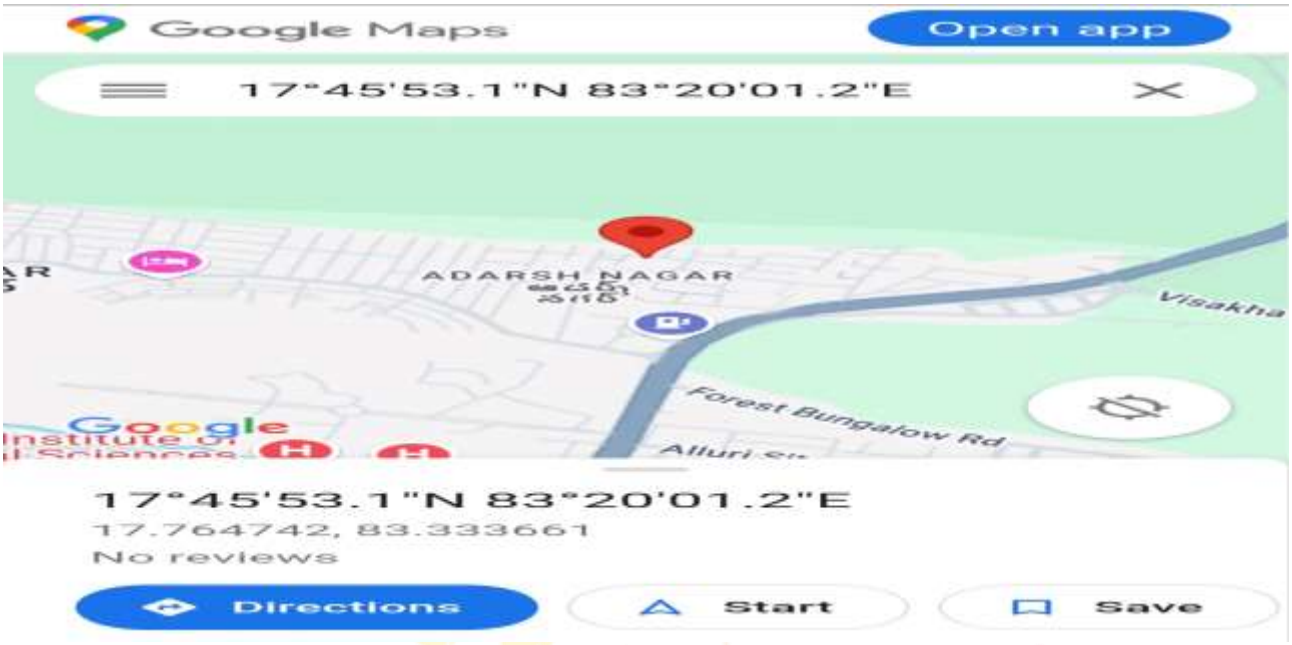
3.2 Gps tracking accuracy

The **UBlox NEO-6M GPS module** used in the system proved to be highly reliable for real-time vehicle tracking, which is crucial for efficient fleet management. The GPS module provided accurate location data that was transmitted to the cloud-based Blynk platform, allowing fleet managers to monitor vehicles at all times. The tracking accuracy was tested across various environments, and the system consistently performed well, providing fleet operators with precise location data that can be used for route planning, vehicle security, and operational analysis.

The system was tested under different conditions, including open roads, urban environments, and areas with potential signal interference such as underground parking lots. In open road conditions, where satellite signals were unobstructed, the GPS module showed a deviation of less than **5 meters** from known reference points. This level of accuracy is suitable for real-time vehicle tracking and route optimization. However, in more urban areas with high-rise buildings and possible signal reflections, the GPS system showed slight inaccuracies, with deviations ranging between **7 to 10 meters**. This deviation is typical in environments where the GPS signal might be subject to multipath errors caused by buildings or other obstacles that reflect GPS signals.



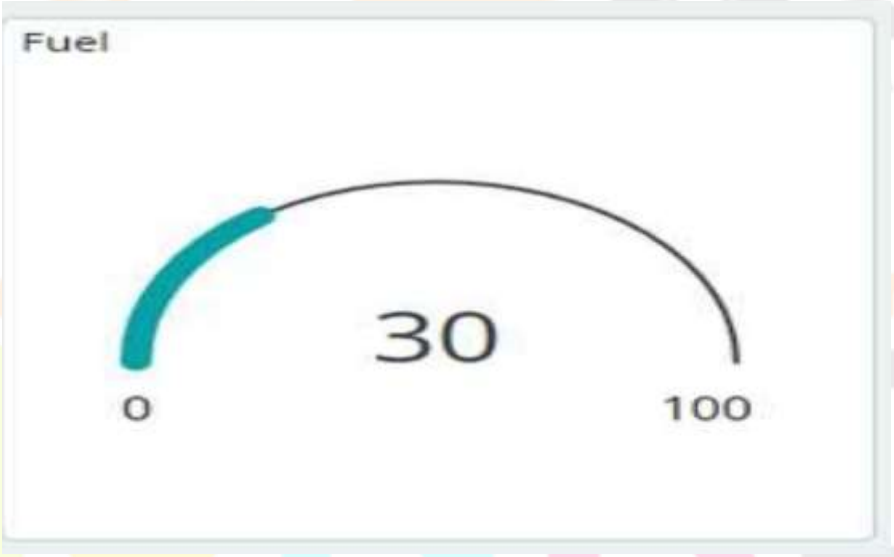
Blynk output of location



Google map location of fleet

3.3 Fuel monitoring results

The real-time fuel monitoring system played a vital role in the IoT-based fleet management setup. Ultrasonic sensors captured fuel levels every 5 seconds and transmitted data via ESP8266 to the Blynk dashboard. During normal operation, readings showed a steady, accurate decrease matching fuel usage. In a simulated theft scenario, a sudden drop in fuel level triggered an alert based on predefined thresholds. The system proved reliable in detecting abnormal fuel loss and resisting noise from vehicle movement



Fuel level indication in blynk interface

4 RESULT AND DISCUSSION

The system consistently provided accurate real-time fuel level data under normal driving conditions. Graphical outputs on the Blynk dashboard showed smooth trends corresponding to actual fuel consumption. During simulated fuel theft, the system detected abrupt changes and triggered alerts effectively. Minor vibrations and fuel movement did not affect the sensor's accuracy, proving its stability. Overall, the system demonstrated reliability, responsiveness, and practical viability for fleet fuel monitoring.

REFERENCES

[1] Agajyelew, Bekele & Siraj, Kedir & R, Dr. Balakrishna & a Y, Prasad & K S, Ananda Kumar. (2020). DEVELOPMENT OF INTEGRATED IOT APPLICATION ON VEHICLE TRACKING, TRAFFIC MONITORING AND VEHICLE THEFT. International Journal of Future Generation Communication and Networking. 13.1-10. 10.33832/ijfgcn.2020.13.4.01.

[2] S. B. Prabhu, K. Deepa and M. Nithya, "IoT Enabled Fuel Level Monitoring and Automatic Fuel Theft Detection System," 2022 13th International Conference on Computing Communication and Networking Technologies (ICCCNT), Kharagpur, India, 2022, pp. 1-7, doi: 10.1109/ICCCNT54827.2022.9984515.

[3] M. S. Punith, M. Nithya and K. Deepa, "IoT Enabled Smart Fleet Management," 2022 IEEE 4th International Conference on Cybernetics, Cognition and Machine Learning Applications (ICCCMLA)Goa, India, 2022, pp. 256-260, doi: 10.1109/ICCCMLA56841.2022.9989097.

[4] P. V. Crisgar, P. R. Wijaya, M. D. F. Pakpahan, E. Y. Syamsuddin and M. O. Hasanuddin, "GPS-Based Vehicle Tracking and Theft Detection Systems using Google Cloud IoT Core & Firebase," 2021 also
International Symposium on Electronics and Smart Devices (ISESD), Bandung, Indonesia, 2021, pp. 1-6, doi: 10.1109/ISESD53023.2021.9501928.