IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 2, February 2024

DOI: 10.17148/IJARCCE.2024.13219

FUEL SMART: REAL-TIME IOT SURVEILLANCE FOR VEHICLE

Karunya L[1], Sugapriya S.A[2], B. Pravin Balu[3], G. Thiagarajan[4]

Final Year IT Student, CSI College of Engineering, Ketti, The Nilgiris – 643215[1]

Final Year IT Student, CSI College of Engineering, Ketti, The Nilgiris – 643215[2]

Assistant Professor, IT department, CSI College of Engineering, Ketti, The Nilgiris – 643215[3]

Head of the Department, IT, CSI College of Engineering, Ketti, The Nilgiris – 643215[4]

Abstract: The evolution of today's world an IoT technologies have encouraged innovative solutions across various domains, and that the trend or development being discussed is not unique to other industries. The paper presents a comprehensive review of IoT-powered self-vehicle fuel gauge surveillance system, emphasizing their role in smart fuel management. The travel firms facing the challenges are lack accurate records of fuel in their vehicle use, leading to financial loss and business concerns. In our proposed system, fuel management system the record of the fuel in vehicle's will be stored in the cloud we can retrieve anytime we want, to track the location of the vehicle, also will send the alerts to the owner's device when fuel levels are low and when refilling occurs and its efficient for real-time data acquisition, instant push notification and also secure cloud storage.

Keywords: IoT, Sensors, Fuel Consumption, Real-time Tracking, Instant alerts.

I. INTRODUCTION

The Internet of Things, connects everyday objects to the internet, enabling them to send and receive data. By adding sensors and communication technology to objects, IoT allows for remote monitoring, control, and automation. This makes objects "smart," enhancing convenience and efficiency in various contexts.

Ultrasonic refers to high-frequency sound waves beyond the range of human hearing. These waves are often used in sensors to measure distances or detect objects by emitting sound pulses and analyzing their reflections.

A level sensor is a device that detects the level of substances like liquids or solids in a container. It works by measuring the height or depth of the substance and providing an output signal based on this measurement. This project focuses on finding a smart method to monitor fuel levels in a tank.

We're using IoT, a technology that connects devices to the internet to make them smarter. Our system is equipped with special sensors that can accurately measure the amount of fuel in the tank. It also uses GPS, like what you might have in your car, to track where the vehicle's tank is. And there's a special computer system that collects all this information in real-time.

It can send alerts if the fuel level is getting low or if something seems fishy, like someone trying to steal fuel. It also shows all this data in easy-to-understand charts and graphs, so users can see what's going on with the fuel at a glance. With this system, people can keep better track of their fuel, stop thieves from stealing it, and know when it's time to top up the tank. As industries continue to grow and evolve, the demand for effective fuel management systems has become increasingly apparent. However, traditional methods of surveillance of fuel tanks have proven to be insufficient, often lacking in accuracy, real-time tracking, and remote Surveillance capabilities.

To address these limitations, this project proposes the development of a smart fuel tank surveillance system leveraging IoT technologies. By harnessing the power of IoT, this innovative solution offers enhanced accuracy, real-time monitoring, and remote accessibility.

Through the integration of IoT technologies such as ultrasonic and level sensors for precise fuel level surveillance, GPS for accurate location tracking, and an IoT platform for real-time alerts and data visualization, this system provides a comprehensive solution to the challenges faced by traditional fuel Surveillance methods.

International Journal of Advanced Research in Computer and Communication Engineering
Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 2, February 2024
DOI: 10.17148/IJARCCE.2024.13219

With the ability to offer real-time insights and remote accessibility, this smart fuel tank surveillance system promises to revolutionize fuel management practices, meeting the growing demand for efficient and effective solutions across various industries.

II. LITERATURE REVIEW

An approach to stop gas pump fraud was put out by the author. The flow sensor fires up and emits a sequence of pulses based on the actual flow rate as soon as the agent starts to fill the car with fuel. Data is transmitted from the ESP8266 to the cloud server. The GPS is also used by the user application to locate the user. Fuel from different-sized fuel tanks is measured using an ultrasonic sensor in the suggested method, as opposed to a flow sensor in the reviewed research.[1]

Using the Blynk platform as a data transit and presentation medium, the author proposed a vehicle Surveillance and tracking system. The ultrasonic, gas, infrared, temperature, and GPS sensors are all used in this system. The recommended method depended on a mobile application, whereas the examined work used Blynk for surveillance.[2]

The author proposed a method of constructing a vehicle tracking, monitoring, and warning system. The alerting system uses GSM or GPRS to deliver information. GPS is used to present the user with the car's true location. The evaluated work proposes constructing a vehicle tracking, monitoring, and alerting system;

The proposed system develops vehicle activities such as fuel surveillance, vehicle location tracing, locating the nearest gasoline pump, and getting alert notifications. [3]

The author described a system made up of an Arduino, GPS, GSM, fuel sensor, and speed sensor. It reports the outcomes of interactions between system devices on the bus, the online application, and the desktop application. The reviewed work transferred data over GSM, but the suggested solution does it via NodeMCU (ESP8266). The reviewed paper employed a web application to monitor the system, whereas the suggested method employs a mobile app.[4]

The author demonstrated a solution for tracking and finding any car using the Global Positioning solution (GPS) and GSM. This system constantly manages and monitors the vehicle's status, which is only possible because of the frequency of GPS tracking reports. It will use Android applications to monitor and track their vehicles for safety problems. The reviewed research uses the PIC18F4520, whereas the proposed solution uses the NodeMCU. [5]

The author designed a GPS and GSM-based tracking system. An Arduino MEGA2560 is used to connect the vehicle's GPS and GSM modem. The reviewed paper used GSM to transmit data, however the proposed system sends data to the database via NodeMCU (ESP8266) with a built-in Wi-Fi chip. [6]

III. SYSTEM ARCHITECTURE

The system architecture of the proposed smart fuel tank surveillance system is designed to address the shortcomings of traditional fuel management methods by leveraging IoT technologies (Fig.1).

At its foundation, the system incorporates ultrasonic and level sensors installed within fuel tanks to provide accurate and real-time surveillance of fuel levels. These sensors transmit data wirelessly to a central IoT platform, which serves as the core of the system.

The IoT platform processes incoming data and provides real-time alerts and data visualization to users through a web-based dashboard or mobile application. Additionally, the system integrates GPS technology to enable location tracking of fuel tanks, enhancing security measures and allowing for remote Surveillance capabilities.

By seamlessly integrating these components, the smart fuel tank Surveillance system offers an innovative solution for efficient fuel management in various industries, ensuring accurate monitoring, real-time tracking, and remote accessibility to optimize fuel usage and prevent theft.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 2, February 2024

DOI: 10.17148/IJARCCE.2024.13219

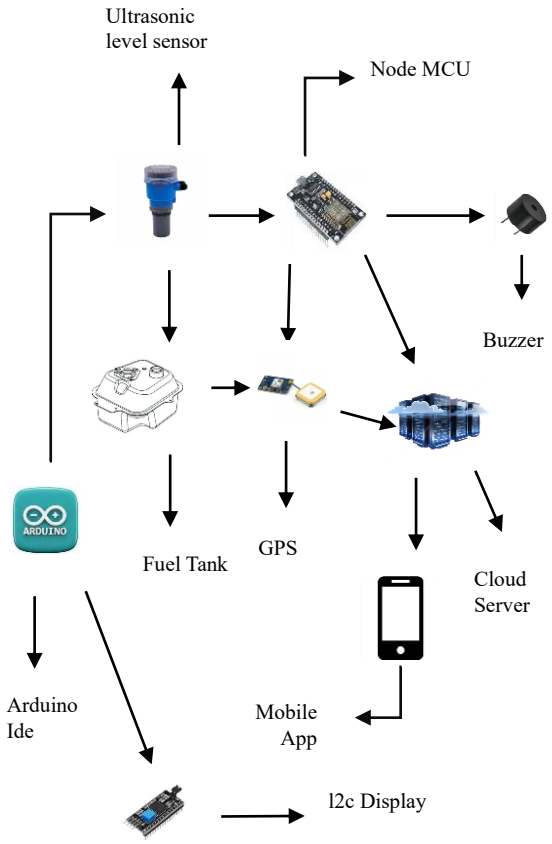

Fig.1: System Architecture

IV. REQUIREMENTS

a) Hardware Requirements.
b) Software Requirements.

a) HARDWARE REQUIREMENTS:

1.Microcontroller (Node MCU):

NodeMCU is an open-source IoT (Internet of Things) platform based on the ESP8266 Wi-Fi module. (Fig.2).It combines the capabilities of a microcontroller with built-in Wi-Fi support, making it easy to connect to the internet and interact with various sensors and devices.

NodeMCU is popular for its simplicity, low cost, and extensive community support.

Fig.2: Node MCU

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 2, February 2024

DOI: 10.17148/IJARCCE.2024.13219

2.Ultrasonic Level Sensor:

An ultrasonic level sensor is a device used to measure the distance or level of a target object by emitting high-frequency sound waves and analyzing the time it takes for the sound waves to reflect back. (Fig.3). These sensors are commonly employed in various industries for Surveillance fluid levels in tanks, containers, or other vessels.

Fig.3: Ultrasonic Level Sensor

3.Buzzer:

A buzzer is a simple yet effective electronic device commonly used to produce audible alerts, notifications, or warnings (Fig.4). It typically consists of a housing, a vibrating element and electrical connections. When an electric current is applied to the buzzer, the vibrating element rapidly oscillates, creating sound waves at a specific frequency determined by the design of the buzzer.

Fig.4: Buzzer

4.LCD Display:

An LCD display with an I2C serial interface board combines the functionality of a liquid crystal display (LCD) with the convenience of an I2C (Inter-Integrated Circuit) serial communication interface (Fig.5). This setup allows for easy integration and control of the LCD display using only a few digital pins on a microcontroller or other embedded system.

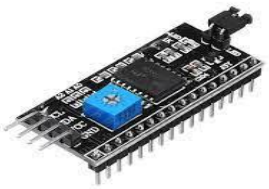

Fig.5: LCD Display

5.GPS:

By integrating GPS modules into IoT devices, developers can track and monitor the geographical position of assets, vehicles, or even individuals in real-time (Fig.6). GPS-equipped IoT devices can transmit location data to centralized servers or other devices via wireless networks, allowing for remote monitoring, analysis, and decision-making.

Fig.6: GPS

International Journal of Advanced Research in Computer and Communication Engineering
Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 2, February 2024
DOI: 10.17148/IJARCCE.2024.13219

b) SOFTWARE REQUIREMENTS:

1.Arduino IDE:

The Arduino Integrated Development Environment is a software platform designed to simplify the process of programming Arduino microcontroller boards. It provides a user-friendly interface for writing, compiling, and uploading code to Arduino-compatible devices. The Arduino IDE supports the programming language, which is based on Wiring, a simplified version of C and C++.

2.Embedded C:

Embedded C, often referred to as "Embedded C programming," is a specialized subset of the C programming language tailored for embedded systems development. Embedded systems are small, specialized computers embedded within larger systems or devices to control specific functions. Embedded C is optimized for these systems' constraints, such as limited memory, processing power, and sometimes real-time requirements.

V. EXISTING SYSTEM

The existing system for smart fuel management typically relies on manual methods or basic monitoring systems that lack real-time capabilities and comprehensive data analysis. In many cases, fuel levels are monitored through periodic manual checks or basic gauges installed in vehicles, which can lead to inaccuracies and inefficiencies. Moreover, these systems often lack integration with advanced technologies such as IoT, limiting their ability to provide timely alerts or remote monitoring capabilities. As a result, fuel management processes may suffer from issues such as fuel theft, inefficient fuel usage, and unplanned downtime due to unexpected fuel shortages.

In light of these limitations, there is a clear need for an innovative solution that leverages IoT technologies to provide accurate, real-time monitoring of fuel levels and enhance overall fuel management efficiency in self-vehicles. These methods are prone to errors, inefficiencies, and lack real-time tracking capabilities. Moreover, they do not provide alerts or notifications to users when fuel levels are low or when fuel is being refilled, leading to potential disruptions in operations and increased costs.

DISADVANTAGES

- Lack of real-time monitoring.
- Inaccurate fuel level measurements.
- Limited tracking capabilities.
- Absence of alerts for low fuel levels or refilling events.
- Increased risk of fuel theft or misuse.

VI. PROPOSED SYSTEM

The proposed system for the IoT-powered self-vehicle fuel gauge Surveillance system aims to revolutionize fuel management by integrating advanced technologies for real-time Surveillance and optimization. At the heart of the system are ultrasonic and level sensors installed within the vehicle's fuel tank, enabling precise measurement of fuel levels. These sensors communicate wirelessly with a central IoT platform, which serves as the core of the system (Fig.7).

The IoT platform processes incoming data and provides real-time insights into fuel levels, consumption patterns, and vehicle location. Additionally, the system incorporates GPS technology to enhance tracking capabilities and ensure the security of fuel assets. Users can access the system through a user-friendly interface, such as a mobile application or web portal, allowing them to monitor fuel levels, receive alerts for low fuel or suspicious activity, and optimize fuel replenishment processes.

This information would then be relayed back to the vehicle's CPU, potentially displayed on the dashboard or accessible through a mobile app for the driver. Furthermore, the system could be integrated with other vehicle components, like the GPS and odometer, to calculate real-time fuel efficiency and provide insights into driving habits that impact fuel consumption. This comprehensive data could empower drivers to make informed decisions about their fuel usage, potentially leading to cost savings and reduced environmental impact. By seamlessly integrating these components, the proposed system offers an innovative solution for efficient fuel management in self-vehicles, empowering users to make data-driven decisions and maximize operational efficiency.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 2, February 2024

DOI: 10.17148/IJARCCE.2024.13219

ADVANTAGES:

- Alerts for low fuel levels and replenishing events.
- Accurate fuel level measurements.
- Location tracking of the vehicle's fuel tank.
- Enhanced protection against fuel theft or misuse.

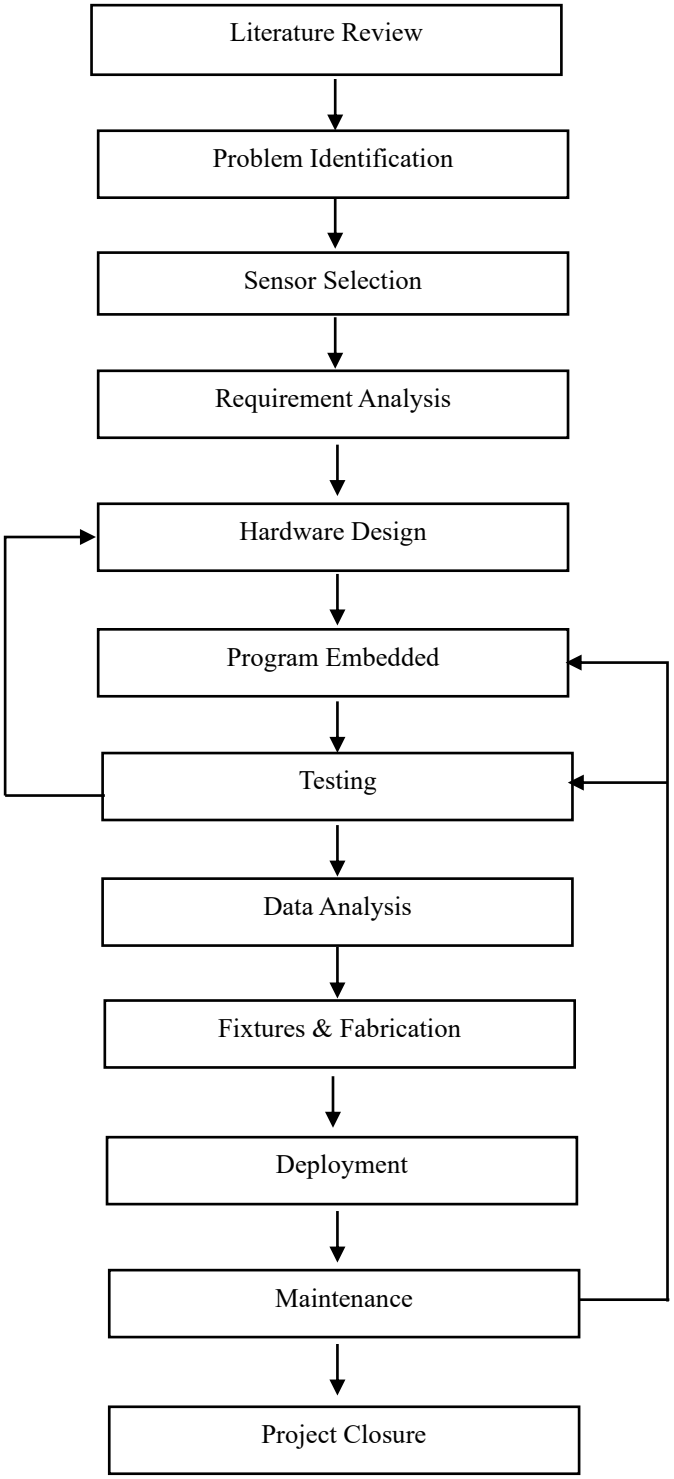

Fig.7: Proposed Methodology

International Journal of Advanced Research in Computer and Communication Engineering
Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 2, February 2024
DOI: 10.17148/IJARCCE.2024.13219

VII. CONCLUSION

In conclusion, there are a lot of benefits over more conventional surveillance techniques when creating a smart fuel tank surveillance system with IoT technologies. The suggested system offers precise real-time surveillance, location tracking, and timely notifications by utilizing ultrasonic sensors, level sensors, GPS, and IoT platforms. This improves efficiency, lowers costs, and strengthens security in fuel management procedures.

REFERENCES

[1]. IOT BASED FUEL SURVEILLANCEFOR FUTURE VEHICLES. Prof. J. N. Nandimath, Varsha Alekar, Sayali Joshi, Sonal Bhite, Pradnya Chaudhari. Department Of Computer Engineering STES, Smt Kashibai Navale College of Engineering, Pune Savitribai Phule Pune University. Volume: 04 Issue: 02 | Feb -2017.

[2]. Vehicle Fuel Activities Monitoring System Using IoT Rasheda Khatun , Sabbir Ahmed Antor, Ahsan Ullah, Afzal Hossain. Department of Computer Science and Engineering, World University of Bangladesh, Dhaka, Bangladesh.Vol.09 No.04(2019), Article ID:95896,9 pages.

[3]. Mrs. S. A. Chiwhane , Mrs. Deepa Mishra, Akshada Kawane , Shweta Kompa , Pranali Survase , Pratiksha Thorat HOD, Computer Department, NBN Sinhgad School of Engineering, Pune1. Vol. 6, Issue 11, November 2017.

[4]. Real Time Fuel Monitoring System for Diesel Generator using Internet of Things (IoT). R. Sugumar, T. Vignesh, D. R. Surya, T. Sanjevi, K. Durgadevi. Volume 3 issues 2 Mar- Apr 2020.

[5]. Fuel SurveillanceSystem for Vehicles Using Iot Technology. Navagire, Kartik R.; Khaleel, Mohammed Usama; Naik, Shiva Kumar R.; S., Santosh Kumar; Sasabal, Ravi. International Journal of Advanced Research in Computer Science, 2020, Vol 11, p88.

[6]. Smart fleet Monitoring system using Internet of Things(IoT).Mahaveer Penna; Shivashankar; B Arjun; K R Goutham; Lohith N Madhaw; Kumar G Sanjay. 2017 2nd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT).19-20 May 2017.

[7]. Internet of Things based vehicle Monitoring system.Mayuresh Desai Department of Electronics, K. J. Somaiya College of Engineering, Mumbai, India; Arati Phadke. 2017 Fourteenth International Conference on Wireless and Optical Communications Networks (WOCN).24-26 February 2017.