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IoT Based Automatic LPG Gas Booking System

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Abstract: Liquefied Petroleum Gas (LPG) is widely used in households for cooking and heating purposes. However, traditional LPG systems require manual monitoring and booking of cylinders, which can lead to inconvenience and delays. The proposed IoT Based Automatic LPG Gas Booking System aims to solve this problem by automatically monitoring the gas level using sensors and triggering cylinder booking when the gas level reaches a predefined threshold. The system uses an ESP32 microcontroller, load sensor, and Firebase cloud database to measure cylinder weight and send data to a web dashboard. The user can view gas levels, booking history, and receive alerts through a web-based interface. The system also includes automatic booking, manual booking, wallet payment options, and administrative monitoring. This solution improves efficiency, prevents sudden gas outages, and provides real-time monitoring through Internet of Things (IoT) technology.

I. INTRODUCTION

Liquefied Petroleum Gas (LPG) plays a crucial role in modern households for cooking and heating. Traditionally, users must manually check gas levels and book a new cylinder once the current one is empty. This process is inefficient and can lead to sudden gas shortages. With the advancement of Internet of Things (IoT) technology, everyday devices can now communicate through the internet and automate various processes. IoT-based systems allow real-time monitoring and remote control of devices.

The proposed system integrates gas level monitoring, cloud storage, and automatic booking into one smart platform. A load sensor measures the cylinder weight, and the ESP32 microcontroller processes the data and sends it to a cloud database. When the gas level drops below a threshold value, the system automatically places a booking request.

This project improves the LPG distribution process by making it automated, reliable, and user-friendly.

II. PROBLEM STATEMENT

Many households face inconvenience due to sudden depletion of LPG cylinders. The existing LPG booking system requires users to manually check gas levels and place booking requests through agencies. This process can cause delays and interruptions in daily cooking activities. Therefore, an automated system is required that can monitor LPG levels and automatically initiate the booking process when the gas level becomes low.

III. OBJECTIVES

The main objectives of this project are:

1) To monitor LPG cylinder weight using sensors.
2) To automatically detect low gas levels.
3) To send real-time data to a cloud database.
4) To automatically trigger LPG booking when gas level drops below threshold.
5) To provide a user-friendly dashboard for monitoring gas levels.
6) To maintain booking history and payment system.
7) To improve efficiency and reduce manual effort.

IV. LITERATURE SURVEY

Several researchers have worked on LPG monitoring systems using IoT technologies.

Previous systems used GSM modules to send SMS alerts when the gas level became low. While these systems were useful, they lacked real-time monitoring and cloud integration. Other studies implemented Arduino-based gas detection systems that focused mainly on gas leakage detection rather than cylinder monitoring.

Recent research has introduced IoT-based LPG monitoring systems that utilize microcontrollers like ESP8266 or ESP32 along with cloud platforms such as Firebase or Thingspeak. These systems allow remote monitoring through mobile applications.

However, many existing solutions lack features such as automatic booking, payment integration, and user dashboards. The proposed system addresses these limitations by integrating sensor monitoring, cloud storage, automatic booking, and administrative management.

V. PROPOSED SYSTEM

The proposed system is an IoT-based LPG monitoring and automatic booking system that continuously measures the weight of the gas cylinder using a load sensor.

The system architecture includes:

1) Load Sensor (Weight Measurement)
2) ESP32 Microcontroller
3) WiFi Communication
4) Firebase Cloud Database
5) Web Dashboard
6) Automatic Booking Mechanism

The ESP32 reads the cylinder weight and calculates the remaining gas percentage. This data is uploaded to the Firebase database.

The user dashboard displays the gas level graphically and allows manual booking if required.

When the gas level falls below a predefined threshold, the system automatically sends a booking request to the database.

VI. METHODOLOGY

The system operates using the following methodology:

1) The load sensor measures the cylinder weight.
2) The ESP32 microcontroller processes the sensor data.
3) The gas percentage is calculated based on cylinder weight.
4) The data is transmitted to Firebase cloud database.
5) The dashboard retrieves and displays gas levels in real-time.
6) When the gas level drops below threshold, the system automatically triggers booking. This approach ensures continuous monitoring and timely cylinder replacement.

VII. HARDWARE COMPONENTS

The hardware components used in the project include:

ESP32 Microcontroller

- Main controller of the system
- Handles WiFi communication and sensor data processing

Load Cell Sensor

- Measures the weight of the LPG cylinder

HX711 Amplifier Module

- Amplifies load cell signals for ESP32

LCD Display

- Displays real-time gas level and system status

WiFi Module

- Built into ESP32 for internet communication

VIII. SOFTWARE COMPONENTS

The software tools used in the project include:

Arduino IDE

- Used to program the ESP32 microcontroller

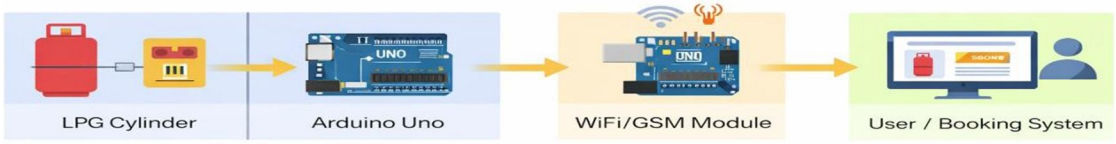
Firebase Realtime Database

- Stores gas level data and booking information

HTML, CSS, JavaScript

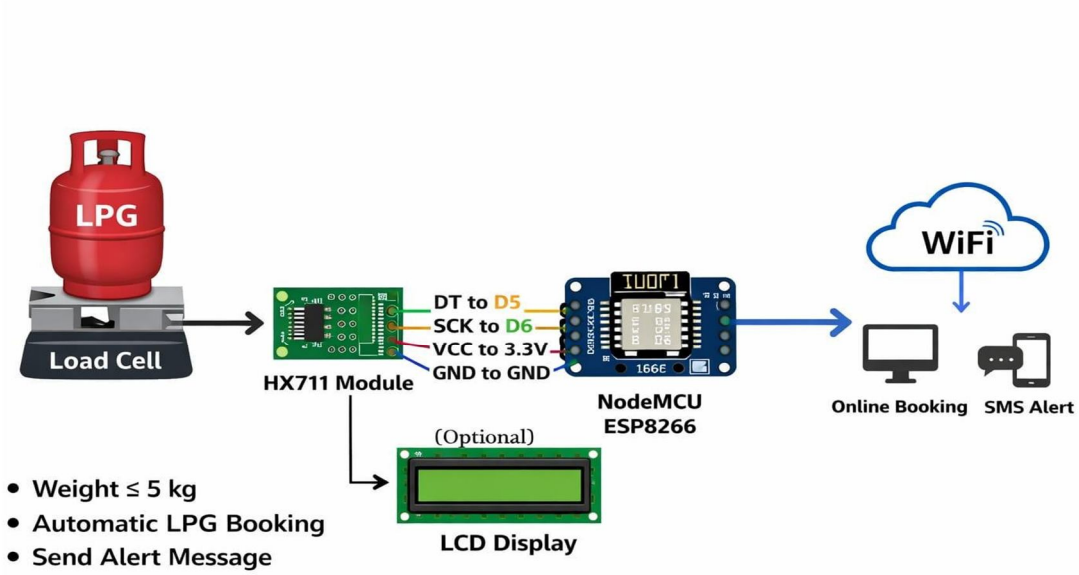
- Used to develop the user dashboard

IX. BLOCK DIAGRAM



X. CIRCUIT DIAGRAM

The circuit consists of a load cell connected to the HX711 amplifier module, which is interfaced with the ESP32 microcontroller.



XI. WORKING PRINCIPLE

The system works by continuously measuring the LPG cylinder weight using a load sensor. The measured data is processed by the ESP32 microcontroller, which calculates the gas percentage.

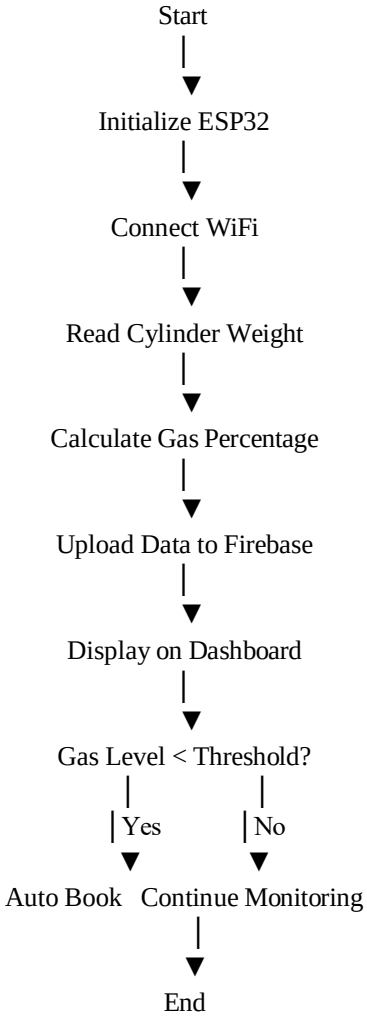
This data is then uploaded to the Firebase cloud database via WiFi. The web dashboard retrieves the data and displays it to the user in graphical form.

When the gas level falls below a predefined threshold value, the system automatically sends a booking request to the database. The user can also manually book a cylinder through the dashboard.

XII. ALGORITHM

1) Start system
2) Connect ESP32 to WiFi
3) Initialize load sensor
4) Read cylinder weight
5) Calculate gas percentage
6) Upload data to Firebase
7) Display gas level on dashboard
8) If gas level < threshold → Trigger booking
9) Repeat process continuously

XIII. FLOWCHART



XIV. ADVANTAGES

1) Automatic LPG booking system
2) Real-time monitoring of gas level
3) Reduces manual effort
4) Prevents sudden gas outages
5) User-friendly dashboard interface

XV. APPLICATIONS

6) Smart homes
7) LPG distribution systems
8) Hotels and restaurants
9) Industrial gas monitoring systems

XVI. RESULT

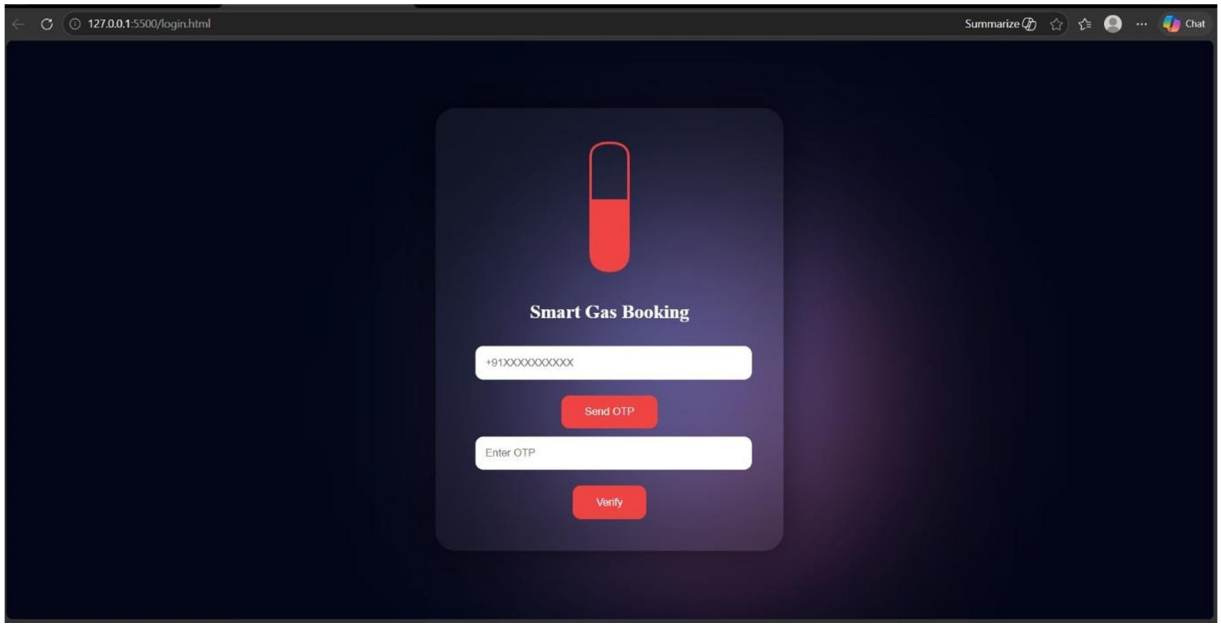


Figure 1: Login-Page

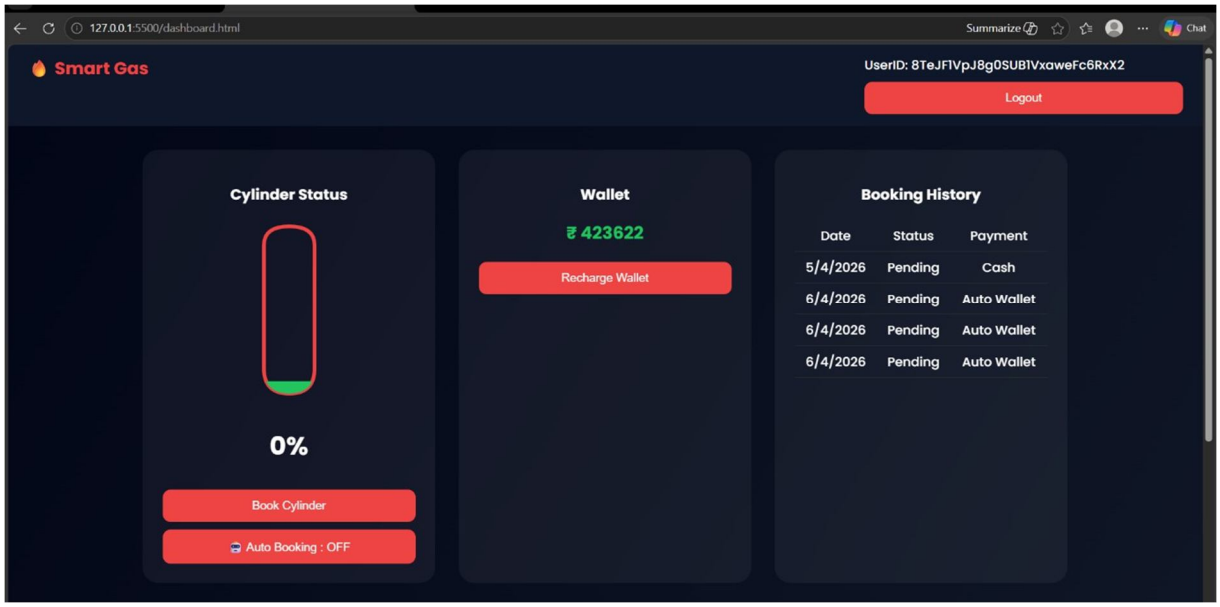


Figure 2: Dashboard page

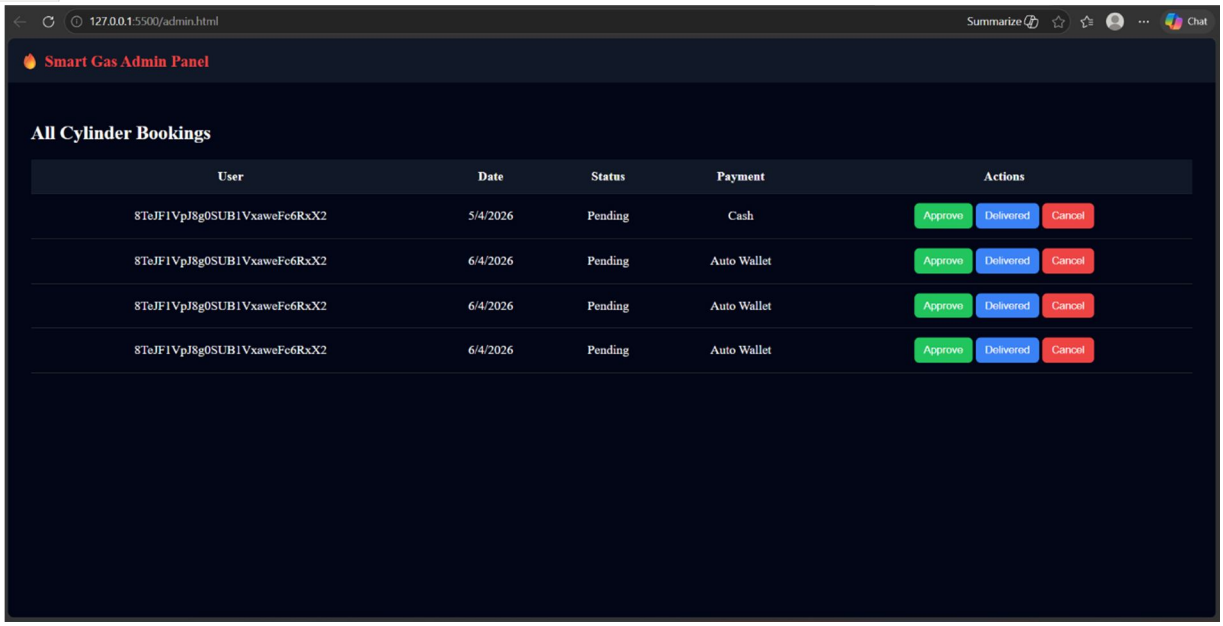


Figure 3: Admin-Page

XVII. FUTURE SCOPE

The system can be enhanced with additional features such as:

1) Mobile application integration
2) SMS and email notifications
3) Gas leakage detection sensors
4) AI-based gas consumption prediction

XVIII. CONCLUSION

The IoT Based Automatic LPG Gas Booking System provides a smart solution for monitoring LPG cylinders and automating the booking process. By integrating sensors, cloud databases, and a web dashboard, the system ensures real-time monitoring and improves efficiency. This project
demonstrates how IoT technology can simplify everyday tasks and enhance user convenience.

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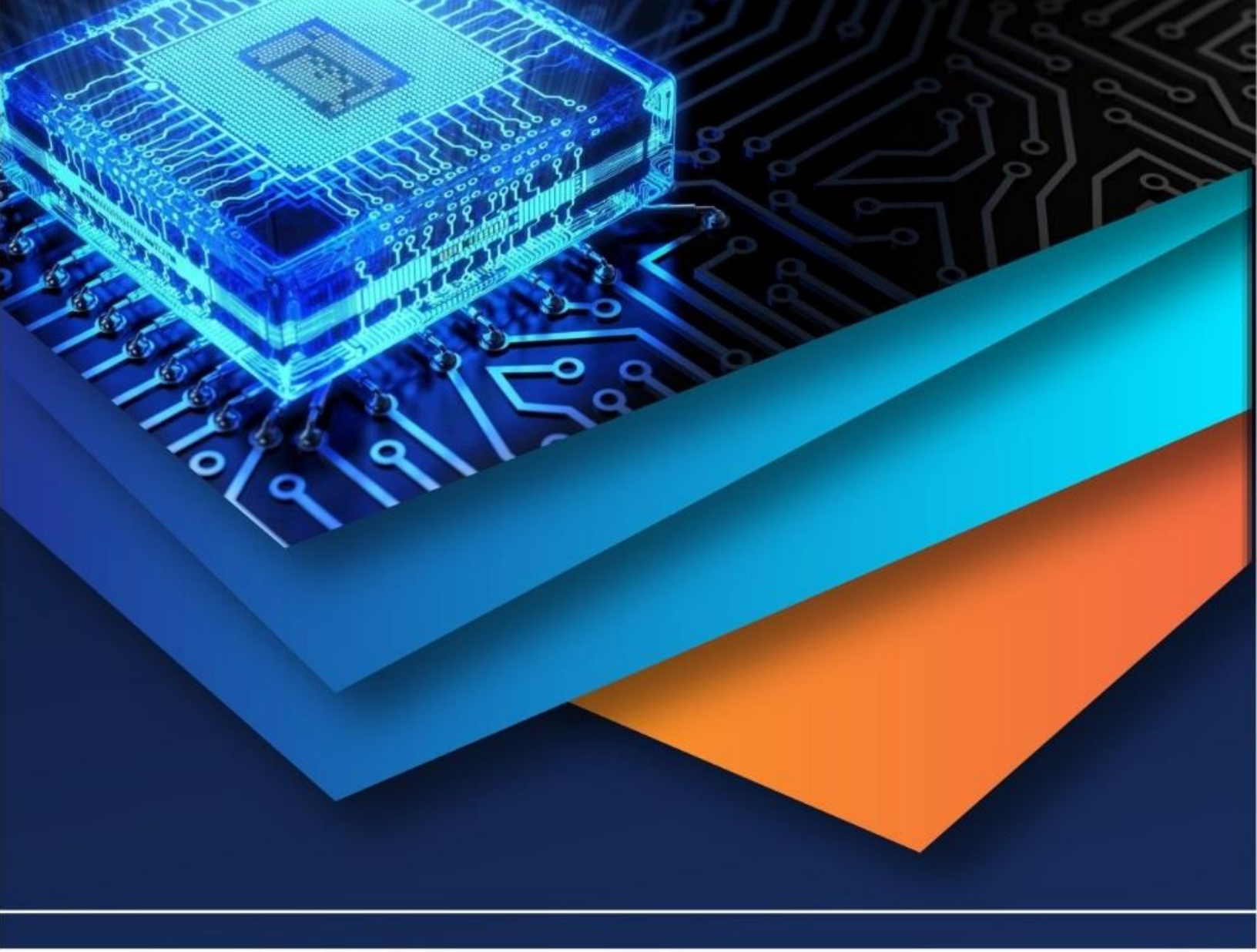

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