**Automated LPG Usage and Safety Monitoring System Using Machine Learning**

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**Introduction:**

The Automated LPG Usage and Safety Monitoring System is an IoT based project designed to revolutionize the management and safety of LPG usage for households and industries. The system tackles critical issues like delayed refills, safety risks, and inefficient gas usage by using smart technologies and machine learning.

By integrating smart IoT technologies and advanced machine learning algorithms, the system offers real-time monitoring of LPG levels and detects potential leaks to ensure safety. It predicts gas consumption trends through data analytics, enabling timely alerts for refills and preventing interruptions in supply. Additionally, it automates the refill booking process by connecting with supplier APIs, providing convenience and efficiency for users.

**Objective:**  
The primary aim of this project is to enhance safety, convenience, and efficiency in LPG management by automating monitoring, leak detection, and refill bookings.

**Literature Survey:**

G. A. Senthil et al. proposed an IoT-based system for gas leakage detection, monitoring, and alerting aimed at enhancing safety and conserving gas resources. The system utilizes ultrasonic sensors to detect gas leaks within a specified area, such as industrial settings or cooking spaces, and integrates a flame sensor for fire detection. Upon detecting a leak, the system automatically shuts off the gas supply using an automated device and sends SMS alerts to users, including location details via GPRS, ensuring timely response. Additionally, a buzzer sounds during fire incidents for immediate warning. The system features cloud storage to track daily gas consumption, enabling users to monitor and reduce wastage. Tested for its effectiveness, the system demonstrated reliable gas leak detection, evacuation support, and alerting capabilities, significantly reducing domestic gas wastage while prioritizing safety and efficiency.

**Problem Statement:**

The problem of manual gas level monitoring and booking presents significant challenges in terms of safety, convenience, and operational efficiency. Addressing these issues requires a solution that integrates IoT-driven automation, real-time data processing, and predictive machine learning models. Such a system ensures enhanced safety by promptly detecting gas leaks and issuing timely alerts, reducing potential hazards. It offers convenience by automating the tedious processes of monitoring and booking, eliminating manual intervention. The system's efficiency lies in its ability to forecast gas consumption patterns, minimizing downtime and resource wastage through proactive refill scheduling. Additionally, its scalability ensures that it can be effectively deployed across various settings, from residential households to industrial environments, making it a versatile and impactful solution.

**Methodology:**  
The system leverages IoT sensors for real-time monitoring of LPG cylinder levels and gas leak detection. Machine learning algorithms are employed for predictive analytics, enabling accurate forecasting of gas consumption trends. Data is visualized on cloud platforms, and automated refill bookings are initiated via supplier APIs.

1. **Real-Time Monitoring:** IoT sensors track LPG levels and detect potential leaks.
2. **Predictive Analytics:** ML algorithms analyse usage patterns for accurate refill predictions.
3. **Cloud Integration:** Data visualization on cloud platforms enhances user accessibility.
4. **Automation:** Automatic refill booking through supplier integration ensures uninterrupted supply.
5. **Scalability:** The system can adapt to various usage scenarios, from residential to industrial settings.

**Impact:**  
The project has a significant impact on safety, convenience, energy efficiency, and sustainability, transforming the way LPG is managed in households and industries. By providing real-time gas leak detection, the system minimizes the risk of fire accidents and health hazards, ensuring a safer environment. Its machine learning algorithms optimize LPG usage, reducing waste and promoting cost-effective energy consumption. Timely refill alerts and automated booking eliminate the inconvenience of running out of gas, enhancing user convenience and operational continuity for industries. It reduces energy wastage and lowers the carbon footprint by promoting efficient LPG utilization, contributing to environmental sustainability. Overall, this project enhances safety standards, improves quality of life, and drives environmental responsibility, marking a vital step toward a smarter and more sustainable world.