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Gas Leak Detection System (AIRSHIELD)

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Abstract :- The Internet of Things (IoT) has transformed the way we interact with our environment and has opened up new opportunities for enhancing safety and security. This abstract presents an overview of an IoT project centered on gas leak detection, which leverages IoT technologies to provide a smarter, more connected approach to safety. The IoT Gas Leak Detection System discussed in this abstract is a cutting-edge project that integrates various IoT devices and sensors to monitor gas leaks in real-time across a wide range of environments, including industrial facilities, residential spaces, and commercial establishments. These sensors are strategically deployed to ensure comprehensive coverage and are capable of detecting multiple gas types, including methane, propane, and carbon dioxide. At the core of this project is the seamless integration of IoT devices, which collect and transmit data to a centralized platform. Leveraging wireless connectivity and the system offers real-time monitoring, allowing for instant alerts and notifications in case of a gas leak. This real-time data flow enables prompt response, reducing potential hazards and preventing extensive damage.

I. INTRODUCTION

The Internet of Things (IoT) has ushered in a new era of connectivity and data-driven innovation, revolutionizing the way we interact with our surroundings. With the ability to transform virtually any object into a smart device, IoT technology has found applications in a myriad of fields, from healthcare to agriculture. In this context, we introduce a ground breaking IoT project designed to enhance safety and environmental protection: the IoT Gas Leak Detection System. Gas leaks represent a pervasive and persistent threat to human safety and the environment. Whether in industrial facilities, residential areas, or along work proposes a system that helps detect gas leakages in houses and industries and tries to minimize the circumstances that lead to gas leakage. The potential consequences of undetected gas leaks are severe. These hazards range from the immediate dangers of explosions and fires to the long-term environmental impacts, including air pollution and greenhouse gas emissions. Timely and precise gas leak detection is therefore of paramount importance.

Our IoT Gas Leak Detection System harnesses the power of IoT technology to provide an intelligent and connected solution to this critical issue. This project employs an array of cutting-edge sensors and IoT devices to enable real-time monitoring and control, ensuring early detection and swift response to gas leaks. By seamlessly integrating these components into a cohesive system, we aim to deliver a comprehensive and efficient approach to gas leak detection and mitigation.

This introduction provides an overview of the IoT Gas Leak Detection System, highlighting its significance and the challenges it addresses. The subsequent sections will delve into the project's components, functionalities, and the benefits it offers in terms of safety, environmental protection, and smart decision-

making. As we explore the intricacies of this innovative IoT project, we invite you to embark on a journey into the future of safety and security in the age of IoT.

II. LITERATURE REVIEW

LPG gas is mostly used in our homes and its use has become a basic necessity for everyone. Gas leaks have been observed in the past and continue to be the case, resulting in numerous accidents dangerous to inhale where there is danger of loss of life and if its level increases it may explode and necessary measures must be taken to prevent this.Continuous monitoring of the atmosphere is the pressure in the massive gas containers storing the toxic gases to prevent them from rupturing, leading to a sudden gas leak. The system is server-based, identifies leaks and alerts people, helping to reduce the incidence of gas leaks. A gas leak from the pressure cylinder is detected using the MQ-5 gas sensor. Alcohol, smoke, propane, H2, LPG, CH4 and CO are all detectable with the MQ-5. It is connected to a NodeMCU (ESP8266) which is set to send a message via the cloud directly to the user's smartphone. A buzzer is also connected to the circuit for quick feedback. alarm for the occupants of the house, allowing us to shut down the cylinder and save it from exploding.

After uploading the code to the MCU node, the MQ5 sensor values can be seen on the Arduino IDE serial monitor. Which displays statistics of gas readings that are continuously fed to Thing Speak. The microcontroller will send the gas concentration data to Thing speak when it receives information that the information will appear when it speaks as seen below, latency can be eliminated because gas sensor data is received every 15 seconds using the API key or channel ID received datacan be examined in the matter of speaking. These graphs, which are used to get details of the gas concentration from the house, can be viewed by the user. The user can take the necessary measures in the event of a gas leak.

The gas leak IOT system makes it much easier to find the leak and stop it easily. In this study, we used cloud and IOT technology to improve the current standards of security measures, this prototype will try to eliminate any big or small risk associated with gas leakage. developed a gas leak detector for the company using IOT technology to send text messages to relevant authorities and theability to analyze data on sensors are two aspects of using smartwarning strategies.

In the event of a gas leak, this information will be updated via IoT communication to the web browser. This article is an effective method and specifies checking the gas volume in the container as well as ordering near the relevant branch (gas agent) and filling out an online message via the IoT module. Subsequent measurements are made using a force meter working on the basis of a piezoelectric sensor, e.g. when gas is placed in a container, it measures the weight and sends an electrical impulse to the microcontroller, which compares the impulse with the best value in digital form (the electrical impulse becomes an equivalent numerical value). If the output of the comparator is high, it will send a (high) pulse to the web server, update the internet, but it has no sequence, and if the comparator is low, it will send a (low) pulse to the web server, update the internet, and even as a small, we have developed a gas leak detector for the company using IOT technology to sendtext messages to relevant authorities and having the capacity to perform data analysis on sensors two aspects of using smart warning strategies To avoid such losses, the gas leak must be detected, which is an important part of gas leak detection and can only be doneartificially. It means fuel for our orders. For the convenience of the user, there is even a radio frequency module (100 mm) with an encoder set from the main board and a decoder from the internal panel, so there is a need to ensure when ordering gas. Informs the client about the siren alarm. A gas leak can be very dangerous if proper precautions are not taken at the right time. The large scale of the fire could also contribute to serious injury or death. The proposed system can alert the user if there is an LPG gas leak. The sensor is capable of detecting an LPG leak. This sensor can also be used to sense other gases such as ISO-butane, propane, CNG and even cigarette smoke. The sensor output is high because the sensor is sensing LPG gas leakage. This is detected by the Arm7 processor. As soon as a gas leak is detected in the room, the GSM module is activated and sends an ALERT message to the user using the GSM module and turns on the exhaust fan to release the gas. The weight sensor is used to check the weight of the bottle and send an ALERT message to the user to refill the bottle if it falls below 5 of the total weight of the bottle and the user can also book the bottle through the website by clicking on the URL provided in the ALERT message to refill the bottle. We can also monitor LPG consumption for each month so that we can reduce gas wastage and save it. We can install this product in homes where LPG cylinders are used for cooking and other household purposes

IV. EXISTING SYSTEM

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V. IMPLIMENTED SYSTEM

A necessary challenge is to design and implement an Internet of Things (IoT) gas leak detection system that can detect and warn users of dangerous gas leaks in various environments. In residential, commercial or industrial settings, it poses serious hazards such as gas leaks, fire hazards, health hazards and environmental problems. The main goal of this project is to create a smart, reliable and cost-effective solution to reduce this risk, existing system redundancy.

1. Gas detection: Build a powerful sensor system capable of detecting various gas leaks, such as natural gas (methane), propane, carbon dioxide, and other harmful gases commonly used or produced in various environments.
2. Real-time monitoring: Implement continuous collection and real-time monitoring system leak detection and user safety.

Here is an overview of the proposed system: gas sensor:
1. Use the MQ2 gas sensor for several gases (eg methane, propane, carbon monoxide) based on the specific application and environment.
2. Strategically place these sensors at potential gas leak points.

Microcontroller or IoT gateway:
1. Use a microcontroller (e.g. Node MCU, Arduino, Raspberry Pi) or a dedicated IoT gateway to manage sensors and data collection.
2. Connect the microcontroller / gateway to the Internet through a Wi-Fi connection.

Warning Mechanism:
1. Install a multi-channel alarm system to notify usersand management in the event of a gas leak.
2. Notifications can include: phone, Android/Webapp notifications.

VI. METHODOLOGY

1. Node MCU The NodeMCU is a versatile open-source development platform designed for IoT (Internet of Things) projects and prototyping. It features an ESP8266 Wi-Fi module, which allows for wireless connectivity, and is equipped with GPIO pins, analog inputs, UART, I2C, and SPI interfaces, enabling it to interface with a wide range of sensors, actuators, and other peripherals. Its compact size, low cost, and ease of use make it popular among hobbyists, makers, and professionals alike. The NodeMCU is programmed using the Arduino IDE or Lua scripting language, offering flexibility in development. With its onboard Wi-Fi capabilities, it can connect to the internet, enabling applications such as home automation, remote monitoring, and data logging. Additionally, its compatibility with various IoT platforms and services further enhances its utility. Whether you're a beginner exploring the world of IoT or an experienced developer creating advanced projects, the NodeMCU provides a powerful platform for bringing your ideas to life.

2. MQ2 Sensor The MQ2 gas sensor can be used in both residential settings and commercial settings to detect gas leaks. The MQ2 sensor is a gas sensor module that detects various gases like LPG, propane, methane, alcohol, hydrogen, and smoke in the air. It operates based on the principle of resistance change upon gas detection and is commonly used in gas leak detection systems and air quality monitors.

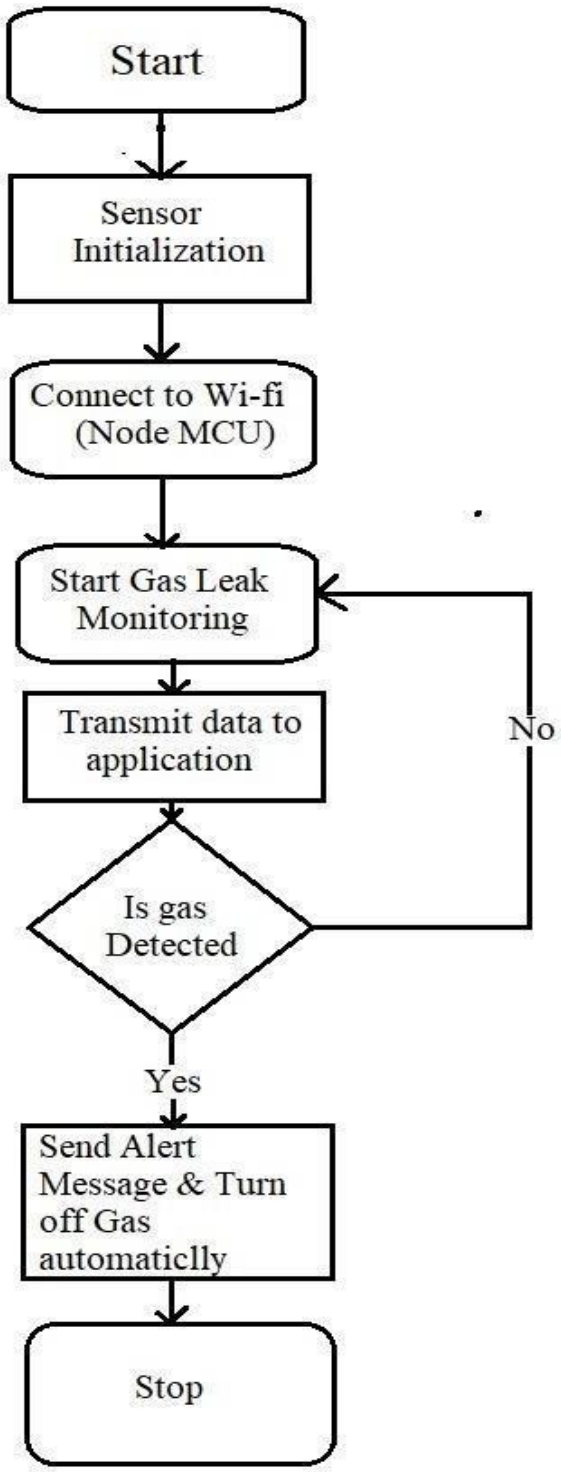
3. Piezo A piezoelectric sensor, commonly referred to as a piezo, is a transducer that converts mechanical energy into electrical signals or vice versa through the piezoelectric effect. This effect occurs when certain materials, such as quartz, ceramics, or certain crystals, generate a voltage when subjected to mechanical stress or, conversely, deform when an electric field is applied to them. Piezoelectric machinery, pressure sensors in automotive systems, and even as components in inkjet printers. They offer advantages such as high sensitivity, fast response times, and ruggedness, making them suitable for diverse sensing tasks across different industries. Additionally, piezoelectric materials can be engineered to operate in harsh environments and extreme temperatures, further expanding their range of applications

4. USB 2.0 Type A To Micro B cable is a standard connection cable featuring a Type A connector on one end and a Micro B connector on the other. It is commonly utilized for data transfer and charging between devices such as computers, laptops, smartphones, tablets, digital cameras, and external hard drives. With USB 2.0 capabilities, it supports data transfer speeds of up to 480 Mbps, providing a reliable and efficient means of connectivity for a wide range of devices in various settings.

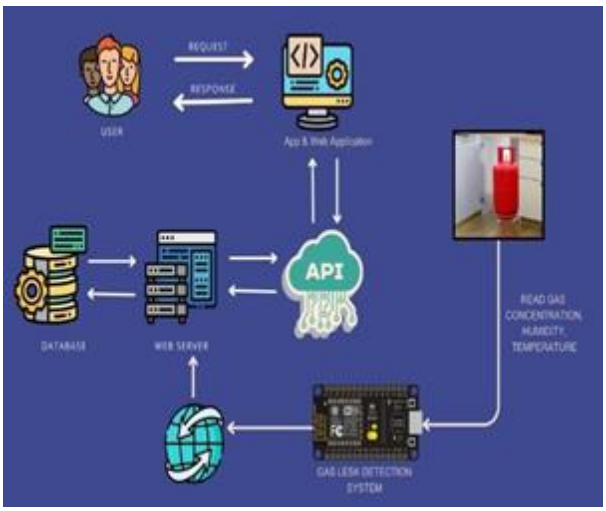
5. Jumper Wires Jumper wires are employed for circuit connections male to male, male to female and female to female jumper wires are the three varieties available the usage of jumper wires prevents soldering.

6. DHT22 sensor, also known as the AM2302, is a digital temperature and humidity sensor renowned for its accuracy and reliability in measuring environmental conditions. Utilizing a capacitive humidity sensor and a thermistor for temperature sensing, the DHT22 provides precise readings with low drift over time. Operating on a digital communication protocol, it's compatible with a wide range of microcontrollers and single-board computers, making it popular for IoT projects, weather stations, and climate monitoring systems. With its robust construction and relatively simple interface, the DHT22 sensor offers an accessible solution for accurately monitoring temperature and humidity in various applications.

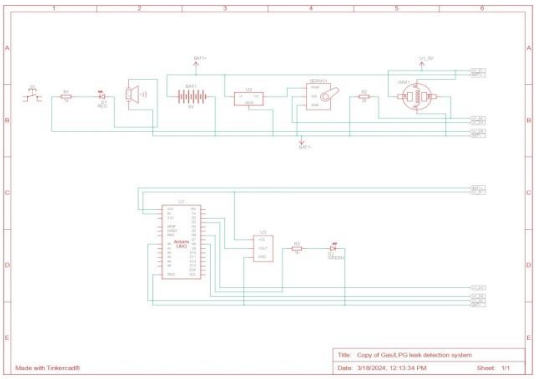
FLOWCHART

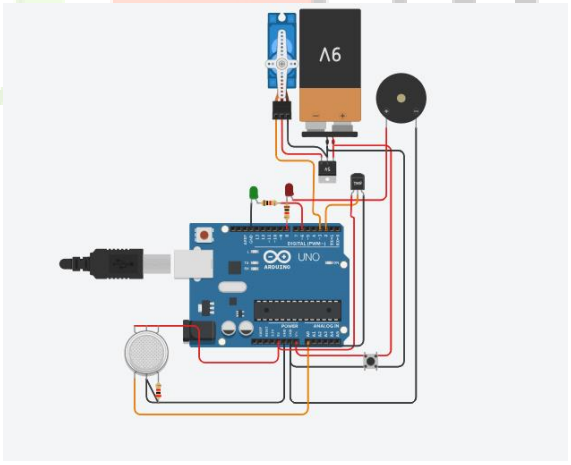


WORKFLOW DIAGRAM

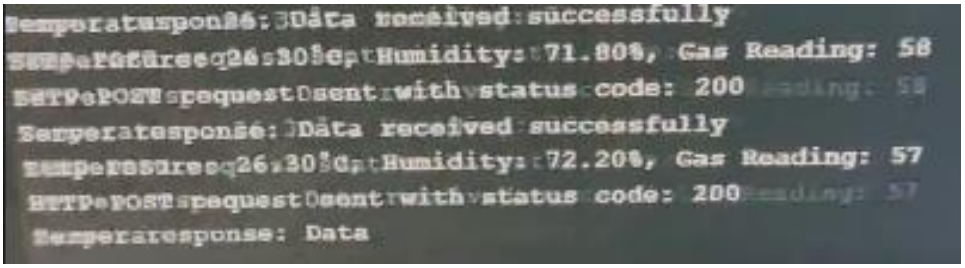


Circuit Diagram



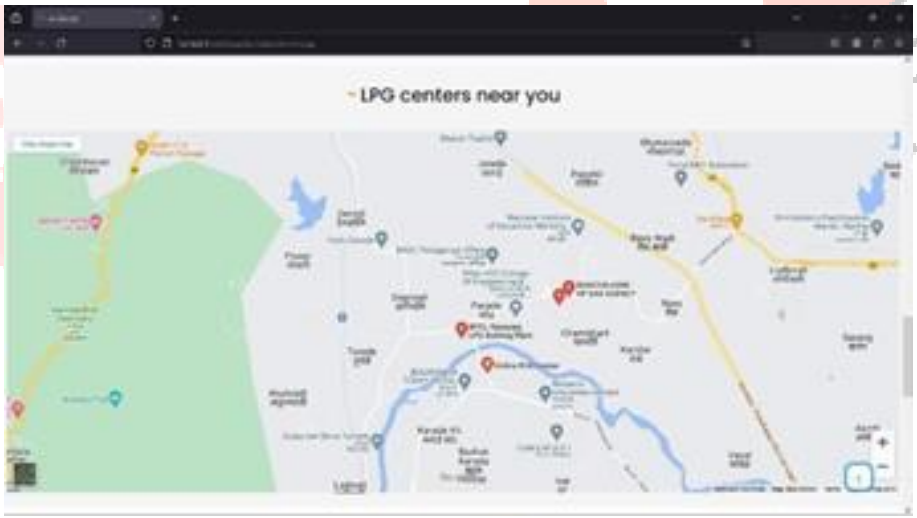


IV. RESULTS

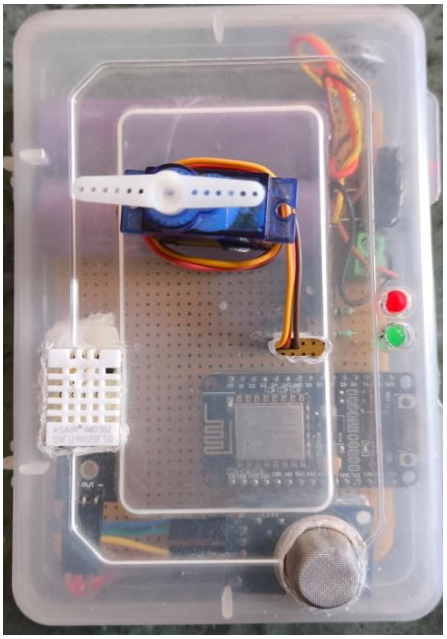


System Readings

Frontend



Map of LPG center near you



Device

VII. CONCLUSION

In conclusion, the development of an IoT Gas Leak Detection System is a critical end eavor that addresses a pressing safety concern in various environments, including residential, commercial, and industrial settings. Gas leaks can lead to catastrophic consequences, including fires, health hazards, and environmental damage. The proposed system, with its well-defined problem statement, components, and methodology, offers a comprehensive solution to mitigate these risks and enhance safety. The IoT Gas Leak Detection System leverages advanced sensor technology, real-time data analysis, and a multi-tiered alerting mechanism to provide timely and accurate gas leak detection. The system not only serves as a proactive safety measure but also contributes to data-driven decision-making by storing historical gas concentration data for analysis and reporting.

VIII. REFRENCES

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