GAS LEAKAGE DETECTOR USING GSM AND ARDUINO

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Abstract- **Gas leaks leading to explosions are a serious concern in our daily lives. To prevent such accidents, it is crucial to utilize technology effectively. By implementing a system with a microcontroller, gas sensors, GSM technology, a display, and a buzzer, we can monitor and alert for gas leaks. Using an Arduino Mega and MQ135 gas sensor, the system detects gas leaks and notifies the user through the display and GSM alerts. The Arduino microcontroller allows for easy modifications to meet future needs. This technology-driven approach enhances safety and mitigates the risks of gas-related accidents. The gas leakage monitoring system demonstrates the potential of technology in preventing hazardous situations.**

Keywords- **Arduino UNO, Breadboard, GSM Module, LCD, MQX sensor.**

I.   INTRODUCTION

Gas leaks leading to explosions are a serious concern in our daily lives. To prevent such accidents, it is crucial to utilize technology effectively. By implementing a system with a microcontroller, gas sensors, GSM technology, a display, and a buzzer, we can monitor and alert for gas leaks. Using an Arduino Mega and MQ135 gas sensor, the system detects gas leaks and notifies the user through the display and GSM alerts. The Arduino microcontroller allows for easy modifications to meet future needs. This technology-driven approach enhances safety and mitigates the risks of gas-related accidents. The gas leakage monitoring system demonstrates the potential of technology in preventing hazardous situations.

Gas leakage detection and prevention systems have been developed to address the critical issue of gas leaks and prevent explosions. These systems employ microcontrollers, gas sensors, GSM modules, and other components to provide reliable, tamper-proof, and secure solutions with efficient long-term maintenance.

Liquefied petroleum gas (LPG), a widely utilized fuel made mostly of propane and butane, is frequently used for cooking and heating. Due to its highly flammable nature, it is classified as a hazardous material. Traditional gas leak detection methods relied on chemically infused paper that changed

color when exposed to gas. However, modern electronic gas detectors have replaced these methods, offering more accurate and efficient monitoring and alert systems.

Gas sensors play a key role in these systems by detecting gas leaks. The sensors send signals to the microcontroller when the gas concentration exceeds a predetermined threshold. The microcontroller then triggers various actions, such as displaying warning messages on connected displays and sending SMS alerts via GSM modules. These systems provide enhanced security by addressing theft, leakage, and fire accidents.

Gas leak detection systems can be implemented on trustworthy platforms like Arduino microcontrollers like the Arduino Uno R3. The ATmega328-based Arduino Uno R3 has a variety of features, including SRAM, EEPROM, I/O pins, a control jack, a USB port, an ICSP header, a control jack, and a USB connection. To ensure efficient and effective operation, its clock speed is set at 16 MHz..

In summary, gas leakage detection systems utilizing microcontrollers and GSM modules significantly contribute to public safety by swiftly detecting hazardous gas concentrations and providing timely alerts. These systems can detect various economic fuels and find applications in both domestic and commercial settings. Key features include early warning indications, SMS alerts, sound alarms, and status displays on LCD modules.

II.   LITERATURE REVIEW

Gas leakage detection and prevention systems have been developed to address the critical issue of gas leaks and prevent explosions. These systems employ microcontrollers, gas sensors, GSM modules, and other components to provide reliable, tamper-proof, and secure solutions with efficient long-term maintenance.

Condensed Petroleum Gas (LPG) could be a commonly utilized fuel composed of a combination of commercial propane and butane. It finds broad utilize in warming and cooking applications. In any case, it's vital to note that LPG is considered a unsafe fabric due

to its profoundly combustible nature Traditional gas leak detection methods relied on chemically infused paper that changed color when exposed to gas. However, modern electronic gas detectors have replaced these methods, offering more accurate and efficient monitoring and alert systems.

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Arduino microcontrollers, like the Arduino Uno R3, serve as reliable platforms for implementing gas leak detection systems. The Arduino Uno R3, based on the ATmega328 microcontroller, offers a range of features, including SRAM, EEPROM, along with a reset button, an ICSP header, a USB port, a power jack, and a power jack. Effective performance is guaranteed by its 16 MHz clock speed..

In summary, gas leakage detection systems utilizing microcontrollers and GSM modules significantly
contribute to public safety by swiftly detecting hazardous gas concentrations and providing timely alerts. These systems can detect various economic fuels and find applications in both domestic and commercial settings. Key features include early warning indications, SMS alerts, sound alarms, and status displays on LCD modules.

III. METHODOLOGY

Methodology systematically analyzes methods in a field, applying best practices and guiding decision-making for effective planning, design, and implementation.
Our project focuses on detecting LPG gas leaks and promptly notifying users through signals and SMS alerts to a designated mobile number. To accomplish this, we will develop a system comprising an Arduino board, GSM module, buzzer, and LCD.

The Arduino board will control signals and handle data from the GSM module. At first, the microcontroller will send a flag to the GSM module, receiving an acknowledgment if the connection is successful. The gas sensor unit, equipped with an MQ-6 sensor, will detect gas leaks in the surrounding environment. Upon detection, a signal will be sent to the microcontroller's ADC unit.

The microcontroller will activate external devices connected to it, including the buzzer, GSM module, and LCD display. The gas sensor module will connect to the Arduino's pin 12, with Vcc and GND connections established accordingly. An analog-to-digital converter will convert the MQ3 sensor's analog output to digital.

A 16x2 LCD display will be connected to the Arduino in 4-bit mode, while a buzzer will connect to pin 8 via an NPN BC547 transistor and a resistor at the transistor's base.
The microcontroller circuit, GSM module, control supply, gas sensor module, and buzzer will all be listed on the association chart.. Microcontroller will activate the LED and buzzer upon gas leakage detection and send a predefined "GAS LEAKAGE" message to the designated mobile number using the GSM module.
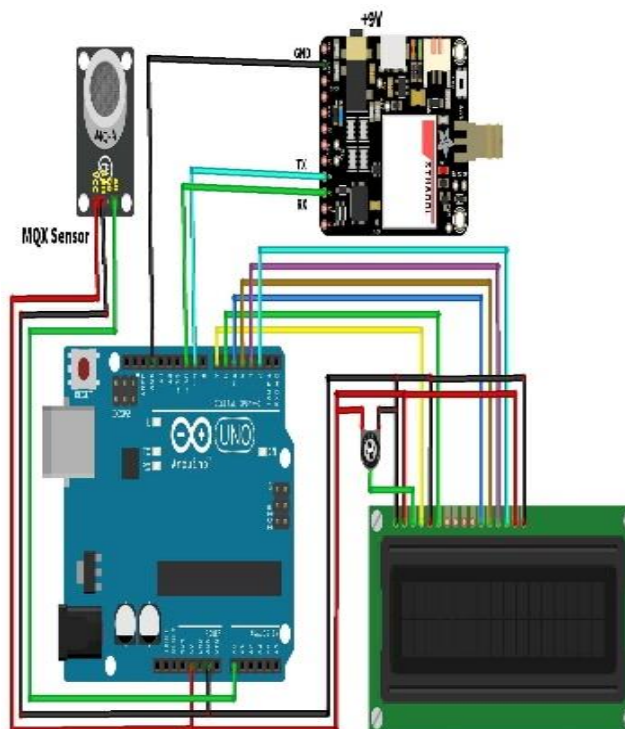

Figure 1.Circuit Diagram.

IV.   TESTING AND EXPERIMENTS

The microcontroller starts flag transmission to the GSM module, which recognizes the effective association. Gas spills are identified by the MQ-6 sensor, activating the actuation of outside gadgets through the microcontroller The association chart incorporates the Microcontroller, GSM Module, Control Supply, Gas Sensor, and Buzzer. Gas discovery triggers the Driven, buzzer, and GSM Module to send a "GAS Spillage" message to a assigned versatile number. Utilizing our framework, the user gets quickly notified about gas leaks through signals, SMS, and a predetermined mobile number.

V.   RESULTS AND DISCUSSION.

The gas leakage detection system we have developed utilizes an MQ2 gas sensor to detect gas leaks. When a gas leak is detected, the sensor sends a signal to the Arduino UNO. The Arduino then activates various devices connected to it, including an LCD, buzzer, and GSM module, to generate alerts. The GSM module sends an SMS to a designated mobile number, providing immediate notification of the gas leak.

In real-world situations, the LCD displays the detected gas leakage results, allowing people in the vicinity to be informed visually. Additionally, the buzzer emits a distinct beep sound, serving as an audible warning to indicate the presence of danger. By combining visual and audible signals, our system ensures that people are promptly aware of gas leaks, promoting their safety and well-being.

VI.   CONCLUSION

Our gas leakage detector effectively alerts stakeholders about LPG gas leaks. Future enhancements include a GSM module and tripper circuit for improved efficiency and user safety. It is user-friendly, cost-effective, and can detect gas leaks even in unattended situations. The GSM module sends immediate messages to stakeholders, reducing accident risks. This device ensures timely notifications and offers enhanced safety measures, mitigating potential hazards. Overall, our gas leakage detector provides an efficient solution, giving users peace of mind.

VII.   ACKNOWLEDGMENT

VIII.   FUTURE SCOPE

In the future, we will enhance our gas detection, control, and alert system by incorporating advanced software-based intelligent functions. This will include features like notifying emergency services during accidents and developing mobile and web-based apps for real-time monitoring. The user app will have smart features to improve safety and usability. We will optimize the system for various environments, such as cars, homes, and industries. Once we finalize the prototype with these smart features, we will proceed with real-life implementation, ensuring the system provides effective gas detection and safety benefits.

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