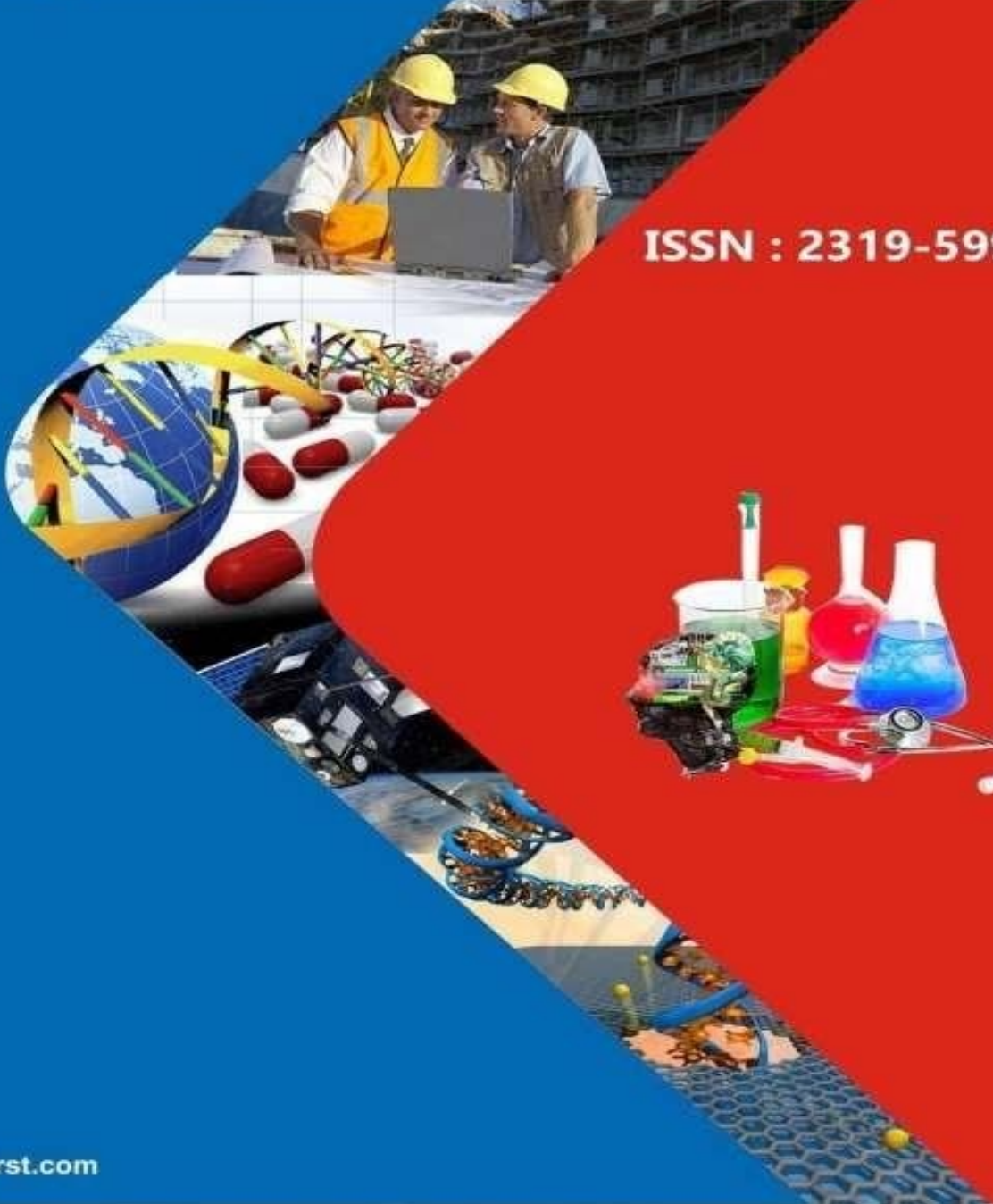


International Journal of
Engineering Research and Science & Technology



ISSN : 2319-5991



www.ijerst.com

Email: editor@ijerst.com or editor.ijerst@gmail.com

LPG LEAKAGE DETECTION AND ACCIDENT PREVENTION SYSTEM WITH AUTO ALERTING

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ABSTRACT

The Gas leakage is an alarming problem in domesticated, industrial, and commercial environments, demanding the establishment of trustworthy and effective detection systems. This paper suggests a novel LPG gas detection model with smart tracking capabilities using Arduino and IOT technology. The proposed system employs gas sensors to quickly and accurately identify gas leaks by detecting the presence of potentially dangerous gasses. Upon detection, the system generates an alarm and starts immediate communication through WI-FI modules. The device sends alerts to the appropriate authorities, such as homeowners, security personnel, and emergency services, providing crucial information about the gas leak's location. Additionally, the gadget uses relay and water pump to avoiding fire accidents intelligently detect gas leaks, enabling quick response and efficient remediation. Users may regulate and supervise the system without using any guidance or instructions. The performance of the system is thoroughly examined in the research, which proves its exceptional accuracy, reliability, and responsiveness in real time. By enabling the early detection, tracking, and reaction to gas leak emergencies, the recommended LPG gas detection model and smart tracking system provide a new and standardized way to enhance gas safety.

Keywords: Microcontroller, LCD, IOT, MQ-3 Sensor, Buzzer, Fire Sensor, MQ-2 sensor, Power Source, Relay, Water Motor.

I. INTRODUCTION

1.1 INTRODUCTION

Microcontroller are widely used in Embedded Systems products. An Embedded product uses the microprocessor (or microcontroller) to do one task & one task only. A printer is an example of Embedded system since the processor inside it perform one task only

namely getting the data and printing it. Although microcontroller is preferred choice for many Embedded systems, there are times that a microcontroller is inadequate for the task. For this reason, in recent years many manufactures of general-purpose microprocessors such as INTEL, Motorola, AMD & Cyrix have targeted their microprocessors for the high end of Embedded

market. One of the most critical needs of the embedded system is to decrease power consumptions and space. This can be achieved by integrating more functions into the CPU chips. All the embedded processors have low power consumptions in additions to some forms of I/O, ROM all on a single chip. In higher performance Embedded system, the trend is to integrate more & more function on the CPU chip & let the designer decide which feature he/she wants to use.

1.2 EMBEDDED SYSTEM

Physically, embedded systems range from portable devices such as digital watches and MP3 players to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure

In general, "embedded system" is not an exactly defined term, as many systems have some element of programmability. For example, Handheld computers share some elements with embedded systems such as the operating systems and microprocessors which power them but are not truly embedded systems, because they allow different applications to be loaded and peripherals to be connected. Embedded systems span all aspects of modern life and there are many examples of their use. Telecommunications systems employ

numerous embedded systems from telephone switches for the network to mobile phones at the end-user. Computer networking uses dedicated routers and network bridges to route data.

EXAMPLES OF EMBEDDED SYSTEM:

Automated teller machines (ATMS). Integrated system in aircraft and missile. Cellular telephones and telephonic switches. Computer network equipment, including routers timeservers and firewalls. Computer printers, Copiers. Disk drives (floppy disk drive and hard disk drive). Engine controllers and antilock brake controllers for automobiles. Home automation products like thermostat, air conditioners sprinkles and security monitoring system. House hold appliances including microwave ovens, washing machines, TV sets DVD layers/recorders. Medical equipment. Measurement equipment such as digital storage oscilloscopes, logic analysers and spectrum analysers. Multimedia appliances: internet radio receivers, TV set top boxes. Small hand-held computer with P1M5 and other applications. Programmable logic controllers (PLC's) for industrial automation and monitoring. Stationary video game controllers.

1.3 CHARACTERISTICS:

Embedded systems are designed to do some specific tasks, rather than be a general-purpose computer for multiple tasks. Some also have

real-time performance constraints that must be met, for reasons such as safety and usability; others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs. Embedded systems are not always standalone devices. Many embedded systems consist of small, computerized parts within a larger device that serves a more general purpose. For example, the Gibson Robot Guitar features an embedded system for tuning the strings, but the overall purpose of the Robot Guitar is, of course, to play music. Similarly, an embedded system in an automobile provides a specific function as a subsystem of the car itself.

The software written for embedded systems is often called firmware, and is usually stored in read- only memory or Flash memory chips rather than a disk drive. It often runs with limited computer hardware resources: small or no keyboard, screen, and little memory.

1.4 MICROPROCESSOR (MP):

A microprocessor is a general-purpose digital computer central processing unit (CPU). Although popularly known as a “computer on a chip” is in no sense a complete digital computer. The block diagram of a microprocessor CPU is shown, which contains an arithmetic and logical unit (ALU), a program counter (PC), a stack pointer (SP), some working registers, a clock timing circuit, and interrupt circuits.

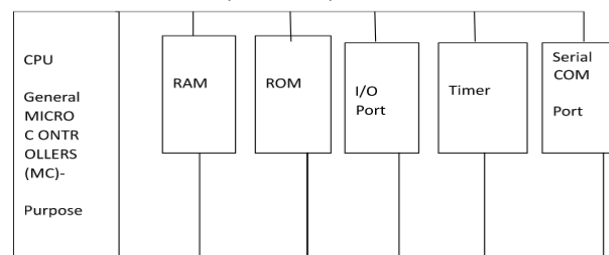


Fig 1.1 Block diagram of microprocessor

1.5 MICROCONTROLLER (MC):

Figure shows the block diagram of a typical microcontroller. The design incorporates all of the features found in micro-processor CPU: ALU, PC, SP, and registers. It also added the other features needed to make a complete computer: ROM, RAM, parallel I/O, serial I/O, counters, and clock circuit.

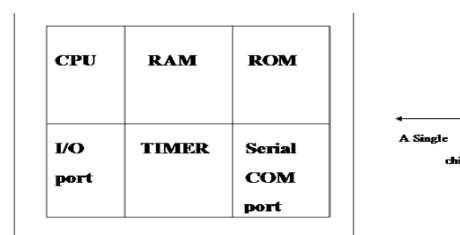


Fig 1.2 Microcontroller

1.6 COMPARISION BETWEEN MICROPROCESSOR AND MICROCONTROLLER

The microprocessor must have many additional parts to be operational as a computer whereas microcontroller requires no additional external digital parts. The prime use of microprocessor is to read data, perform extensive calculations on that data and store them in the mass storage device or display it. The prime functions of microcontroller is to read data, perform limited calculations on it,

control its environment based on these data. Thus the microprocessor is said to be general-purpose digital computers whereas the microcontroller are intend to be special purpose digital controller. Microprocessor need many opcodes for moving data from the external memory to the CPU, microcontroller may require just one or two, also microprocessor may have one or two types of bit handling instructions whereas microcontrollers have many.

II. LITERATURE SURVEY

2.1 INTRODUCTION

The use of liquefied petroleum gas (LPG) as a fuel source has become increasingly popular in households and industries due to its affordability and efficiency. However, the risk associated with LPG gas leakage cannot be overstated. LPG is highly flammable and explosive, and its leakage can lead to accidents, fires, and explosions that can cause fatalities and significant damage to property. Therefore, there is a growing need for an effective gas leak detection system that can identify potential hazards and provide early warning to prevent catastrophic consequences. To address this concern, this project proposes designing and implementing an LPG gas leakage detection and alert system for households and industries. The system is designed to detect the presence of LPG gas using various gas sensors, including wireless and IOT technology. These sensors can detect the concentration of LPG gas in the environment and send the data to a

microcontroller for processing. The microcontroller processes the sensor data and triggers an alarm or shuts off the gas supply in case of a gas leak. Additionally, the system is designed to send an alert through Wi-Fi Modules in case of gas leakage, providing an early warning to prevent accidents, fires, and explosions. Additionally, the gadget uses relay and water pump to avoiding fire accidents intelligently detect gas leaks, enabling quick response and efficient remediation.

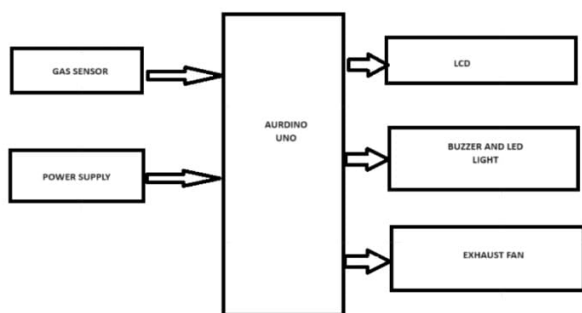
III. PROBLEM STATEMENT

Gas leakage is one of the major problems and in recent days, it is observed in many places including residences, industries, and gas-operating vehicles like CNG buses, cars, etc. Dangerous mishaps are observed to occur as a result of gas leaks. Since LPG is extremely flammable, it can burn even at a considerable distance from the site of the leak. This energy source principally consists of the extremely combustible chemical molecules propane and butane. In homes, LPG is primarily used for cooking purposes. When a leak occurs, the leaked gases may lead to an explosion. Accidents caused by gas leaks result in both material loss and human injuries. The threat of home fires has been on the rise in recent years, resulting in an increased risk of human death and property damage. In order to prevent harm to the public, gas leaks should be detected and controlled. Hence gas leakage detectors are essential for detecting leaks and protecting people from

danger and low-cost advanced sensor-based gas leakage detector and alert system is proposed.

3.1 BLOCK DIAGRAM OF EXISTING SYSTEM

shows block diagram of existing system



Block diagram of Existing System

3.1 Disadvantages of Existing System:

Power requirement: A power outage can render the system useless, leaving no alert in case of a leak. **Connectivity issues:** Wireless communication can be unreliable in certain areas, impacting alert delivery. **Sensitivity variations:** Sensor performance can degrade over time, leading to reduced detection sensitivity and potential missed leaks.

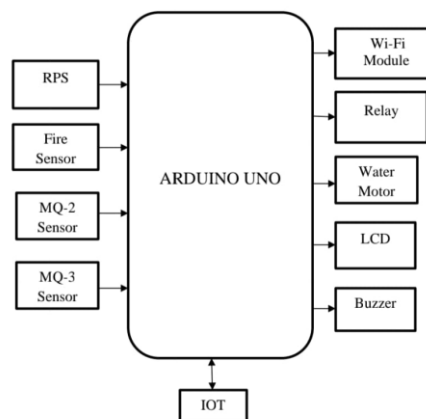
IV. PROPOSED SYSTEM

In this study it can be described how the tool can work to capture the gas received by the sensor, then the sensor is processed in an Arduino program that can display data in the LCD, emit sound, and send a short message to the registered mobile number. This LPG Gas Detection and Alert system consists of four main modules. In the first module, the MQ-2 gas sensor is used to determine the status of the LPG gas

level in the surroundings. The second module consists of an Arduino Uno, a microcontroller that acts as the central system. In third module gas level shows on LCD. Buzzer makes sound and alert is sent to mobile. In fourth Module the relay controls a water motor or gas valve to suppress the leak.

4.1 BLOCK DIAGRAM OF PROPOSED SYSTEM

the block diagram of proposed system. The proposed system contains different modules consisting of both hardware and software components



V. BLOCK DIAGRAM OF PROPOSED SYSTEM

HARDWARE COMPONENTS

Power Supply, Arduino UNO, MQ-2 Sensor, MQ-3 Sensor, Fire Sensor, Relay, Water Motor, LCD, Buzzer, Wi-Fi Module

SOFTWARE COMPONENTS

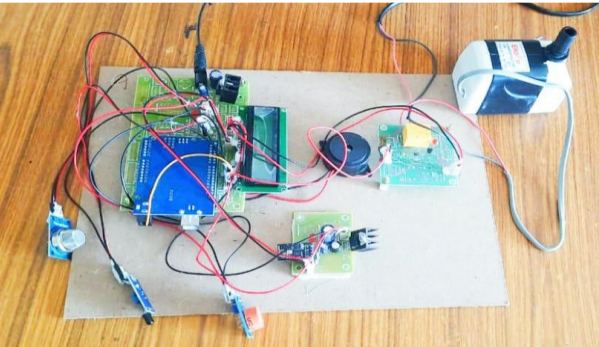
The following software tools used in the proposed system

Arduino IDE, Proteus Design Tool

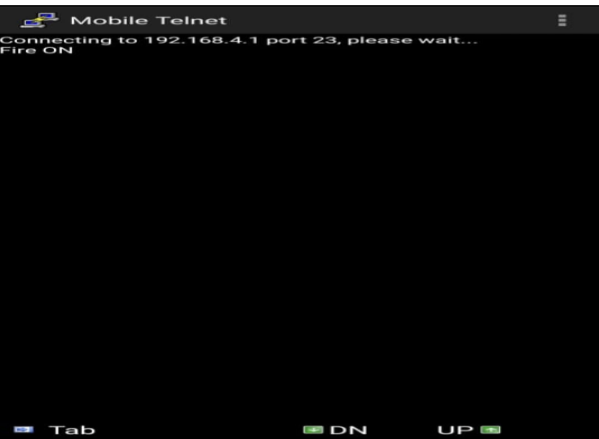
VI. RESULT AND DISCUSSION

6.1 PROTOTYPE (THROUGH KIT)

shows the prototype of the project



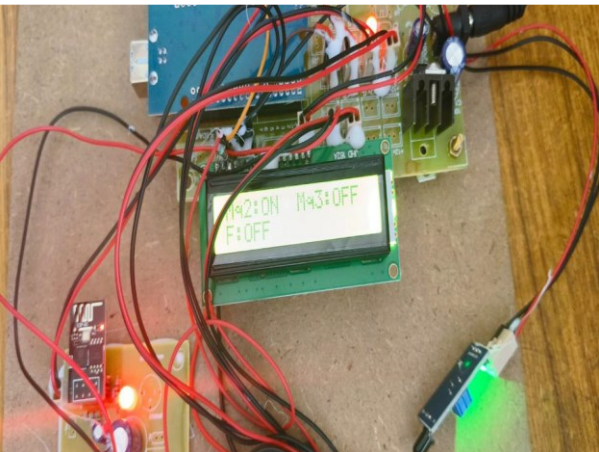
the Fire Alert Displayed on Mobile via Telnet



Fire Alert Displayed on Mobile via Telnet
Prototype of the Project

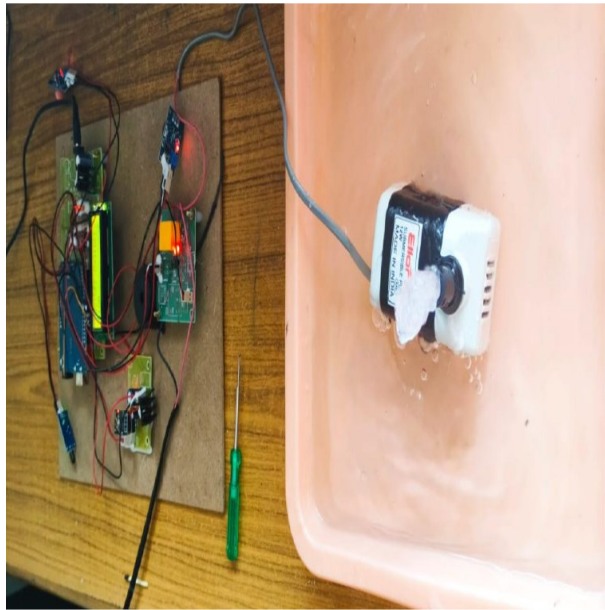
EXPERIMENTAL RESULTS

shows the displaying the gas on LCD



Realtime ultra sonic sensor ranges

the Fire Detected and Water pump Activated



VII. CONCLUSION

The LPG gas leakage detection and alert system is an essential tool for enhancing safety in households and industries. LPG gas leakage can cause serious accidents, fires, and explosions, leading to fatalities and significant damage to property. The proposed system offers a reliable and effective solution to detect potential hazards and provide an early warning to prevent catastrophic consequences. Various gas sensors, wireless and IOT technology, microcontrollers, and an alarm system are used to detect the presence of LPG gas and trigger an alarm, shut off the gas supply, and send an alert through Wi-Fi Modules in case of gas leakage. The experimental results of the system should demonstrate its ability to accurately detect gas leakage, provide an early warning, and minimize damage caused by gas leakage. Hence, the proposed LPG Gas Leak Detection Smart Tool can significantly improve house safety and

industrial safety, prevent accidents, and minimize damage caused by gas leakage. Therefore, it is a valuable and necessary investment for anyone using LPG gas as a fuel source.

VIII. FUTURE SCOPE

The LPG gas leakage detection and the alert system have a significant future in improving safety and preventing accidents in households and industries. With advancements in technology, the system can be further enhanced to provide more accurate and efficient detection of gas leakage. The integration of artificial intelligence and machine learning algorithms can improve the system's ability to identify potential hazards and trigger appropriate responses. Additionally, the system can be connected to a central monitoring system, enabling remote monitoring and management of gas leakage in real time. Overall, the future scope of the LPG gas leakage detection and alert system is promising, and continuous research and development can further enhance its capabilities.

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