

IOT Based Gas Leakage Detection, Monitoring and Control

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ABSTRACT -Safety plays a major role in today's world and it is most necessary that very good safety systems are to be implemented in places of education and work. This work modifies the existing safety model installed in industries and also can be used in homes and offices. The main objective is designing IOT based toxic gas detecting and alerting system. The hazardous gases like LPG and propane are sensed and displayed each and every second in the Server display. If these gases exceed the normal level then an alarm message is generated immediately and an alert message is sent to the authorized person through the INTERNET. Also designing a module that automatically controls the precautionary measures to prevent any mishap. The advantage of this automated detection and alerting system over the manual method is that it offers quick response time and also accurate detection of an emergency situation and in turn leading to faster diffusion of the critical situation.

KEYWORDS - Safety, good safety systems, gas detection, an alarm is generated, alert message, automated control system, prevent any mishap.

I. INTRODUCTION

Web of things attempts towards simplifying life and quicker. Today, everything is getting keen because of mechanical advancement like IoT. IoT is quickly denoting its essence in each field. There are numerous IoT gadgets and frameworks accessible in the current market for different purposes. One such is the IOT based gas spillage checking framework. This framework assumes an imperative part in different regions like businesses, families, cafés, and so on to evade any sort of setback that may occur because of the spillage of exceptionally combustible gases that are utilized.

As IoT is useful for mechanizing the errands, the upside of IoT can likewise be far reaching for upgrading the advantageous wellbeing strategies. Security assumes a huge part while developing homes, structures, businesses just as towns. The amplified focal point of specific gases in the climate can be especially hazardous, in late time, everybody needs an office which diminishes time and exertion and anticipates that their work should be pretty much as simple as could be expected. One such zone where man likes to get the work quicker and simpler is cooking.

Most regularly LPG is utilized for cooking purposes which were presented by Dr. Walter Snelling. It is a mixture of propane and butane alongside soaked substance notwithstanding unsaturated hydrocarbon substance. Gas endeavors use SMS, IVRS, or Online reserving for the LPG, which is a tedious technique in individuals' day by day life [1].

In any case, because of the quick nature and high rivalry, today individuals search for more astute methods of tasks than monotonous and mechanical just as manual everyday practice. All things considered, booking gas has likewise gotten one of the undertakings where one tends to either defer or fail to remember its booking because of a bustling timetable and absence of time.

Normally, in-home or businesses, the majority of the fiasco occurs because of gas spillages [10], which prompts a few mishaps and furthermore causes human existence. To deal with such a circumstance, the proposed gas spillage discovery and checking framework is created and advanced in this paper. In this design MQ-5 sensor is utilized to recognize and detect the gas spillage [5],

This proposed framework isn't just fit for Sensing or identifying the gas spillages just as

cautioning the client about the gas spillage by bell alert and sending a warning to the client in the opposite side programmed LPG booking is permitted this is finished by utilizing load cell[3], when the LPG comes to beneath the limit level it will send a notice about the low weightage of LPG by getting notice client can have the option to book a LPG simply by affirming message through the portable which is associated with Wi-Fi[4].

II. LITERATURE SURVEY

Creators of [6] have proposed a gas spillage framework and checking the LPG level where the gas spillage is distinguished naturally Authors of [3] have recommended that the spillage of the gas can be identified by utilizing different gas sensors. In any case, writers of [1] have dealt with gas spillage and said that gas spillage can be identified by utilizing the gas sensor and booking the gas is done naturally, when a modest quantity of gas is brought close to the sensor it begins cautioning the client about the spillage of the gas Author of [11] has proposed that the message or the notice can be shown by utilizing the LCD show for a visual sign of the LPG checking.

LPG gas spillage location utilizing IOT - Dr. Chetana Tukkoji and Mr. Sanjeev Kumar A. N, GITAM School of Technology, Bengaluru - This paper gives a pristine way to deal with find LPG release upheld microcontroller-based Arduino. To alarm on LPG spillage and forestalling any undesirable episode by checking the power of the LGP spillage. we need to apply a few alerts to find the release [13].

A Survey Paper on Gas Leak Detection Using IoT - proposed to build up an IoT innovation to make a Gas Leakage Detector for a general public which has Smart Alerting procedures including sending an instant message to the concerned position and a capacity performing information examination on sensor readings [14].

Arpitha, T. and Kiran, Divya and Gupta, V. and Duraiswamy, Punithavathi. (2016). FPGA-GSM-based gas spillage location framework. 1-4. 10.1109/INDICON.2016.7838952.-

This framework was created to supplant the ordinary framework that lone had an on location caution framework with a framework that produces ready messages to the main reaction group through remote media. This guarantees preventive activities promptly even without individuals on location [15].

LPG Leakage and Flame Detection with SMS Notification and Alarm System: Rule-Based Method - Mon Arjay F. Malbog; Honeylet D. Grimaldo; Luisito Lolong Lacatan; Rhowel M. Dellosa; Yolanda D. Austria - Their thought was to

build up a gadget that can recognize gas, smoke, and fire from the LPG chamber and can inform the proprietor through instant messages applying a standard based methodology.

The framework can show additionally an admonition message and can caution the proprietor utilizing a bell. The analysts directed usefulness testing with twenty (20) preliminaries in checking the exactness of the framework were acquired a 100% precision. This demonstrates that the framework is dependable and productive when utilizing at home by buyers [16].

III. EXISTING SYSTEM

The current framework is costly and all the overall population can't manage the cost of it we are wanting to build up a framework that has a moderate expense, a long lifetime, and exceptionally delicate in recognizing gas spillage and alarming.

We are wanting to make an IoT observing framework that can be utilized in different territories like ventures, families, eateries, and so on to maintain a strategic distance from any sort of incident that may occur because of the spillage of profoundly combustible gases that are utilized.

There are numerous IoT observing gadgets accessible in the current market that have a different module for checking and alarming. Our thought is to join them and furthermore if conceivable, to program it to deal with the ventilation framework after the gas spillage is identified.

IV. PROPOSED SYSTEM

We proposed the framework as a shrewd and cost-productive framework that can be utilized for both family and mechanical purposes. The framework is outfitted with a gas sensor which can be set by the gas utilized in the climate. The framework additionally naturally controls the fundamental wellbeing convention for gas spillages consequently. The cautioning framework alarms are security faculty. The framework consequently assumes responsibility for the bell, LED, exhaust framework, and valve framework.

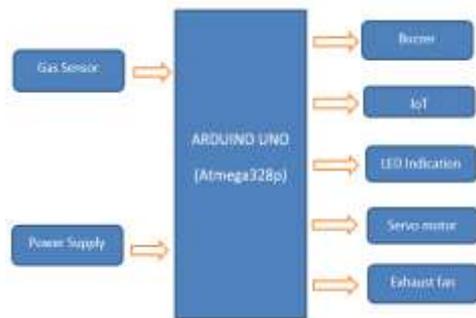


Fig 1: Block Diagram

V. WORKING PRINCIPLE

This brilliant IoT gadget will be outfitted with a gas sensor that will assemble moment data or the situation with the climate and the information is sent through a Wi-Fi module. In the event of any gas spillage occasion, the alarm message will be shipped off the approved individual through the mail, this will be finished with the assistance of IoT, and information is additionally naturally put away in the worker data set which is seen utilizing a worker side Web application.

The sensor checks for the centralization of the combustible gas in the air intermittently and if any anomaly happens it triggers the ready framework and control framework. The ready framework deals with sending the alarm messages and furthermore triggers the on-location ready framework. The control framework controls the essential security conventions followed when there is gas spillage.

Gas Sensor

Gas sensors are electronic gadgets that distinguish and recognize various sorts of gases. They are generally used to identify poisonous or undesirable gasses and measure gas focus. Gas sensors differ generally in size, reach, and detecting capacity. They are frequently essential for a huge implanted framework, like hazardous materials and security frameworks, and they are ordinarily associated with a discernible caution or interface. Since the gas sensor is continually interfacing with air and other gasses, they must be adjusted more frequently than numerous different kinds of sensors.

Contingent upon their planned surroundings and capacities, the actual cosmetics and detecting cycle can differ remarkably between sensors. The metal oxide-based framework is the most normally utilized sensor to distinguishing undesirable gases in the climate. This sort of sensor utilizes a semi resistor which

comes and responds with target gasses. Metal oxide gas sensor increment their electrical obstruction really contact with gasses like carbon monoxide. Hydrogen, methane, and butane. For the most part oxide-based sensors or utilized in the locally situated framework.



Fig 2: Gas Sensor

Buzzer

A buzzer is a small yet sufficient component to add sound features to our project system. It is a compact 2-pin structure. So that it is used on a breadboard, perf-board, and even on PCBs. It is also known as a widely used component in most electronic applications.

There are two types of buzzers. The one shown here is a simple buzzer that powered will make a continuous sound, the other type is called a readymade buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound is due to an internal oscillating circuit present inside it. But the one shown here is most widely used because it can be customized with help of other circuits to fit easily in our application.

This buzzer can be used by DC power supply ranging from 4V to 9V. A 9V battery can also be used, but it is recommended to use a +5V or +6V DC supply. The buzzer is normally associated with a switching circuit to turn ON or OFF the buzzer at the required time and require interval.



Fig 3: Buzzer

LED

A little 5mm Red LED bulb is appended alongside the ringer to reproduce the Onsite caution framework with bell and red light in this venture after the gas leakage is identified.



Fig 4: Red LED

Servo Motor

A servo motor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity, and acceleration. It comprises of an appropriate engine coupled to a sensor for position input. It additionally requires a moderately modern regulator, frequently a devoted module planned explicitly for use with servomotors.

A large portion of the interest Servo engines work from 4.8V to 6.5V, the higher the voltage higher the force we can accomplish, however, most generally they are worked at +5V. Practically all side interest servo engines can pivot just from 0° to 180° because of their stuff game plan so ensure your venture can live with the half-circle assuming no, you can like for a 0° to 360° engine or alter the engine to make a round trip. The pinion wheels in the engines are effortlessly exposed to mileage, so if your application requires more grounded and long-running engines you can go with metal cogwheels or simply stay with ordinary plastic stuff.



Fig 5: Servo Motor

Servo Motor Working Mechanism comprises of three sections:

1. Controlled gadget
2. Output sensor

3. Feedback framework

It is a shut circle framework where it utilizes a positive criticism framework to control movement and the last situation of the shaft. Here the gadget is constrained by a criticism signal produced by looking at yield sign and reference input signal.

Here reference input signal is contrasted with the reference yield signal and the third sign is created by the criticism framework. What's more, this third sign goes about as an information sign to control the gadget. This sign is available as long as the criticism signal is produced or there is a distinction between the reference input signal and the reference yield signal. So the principle errand of servomechanism is to keep up the yield of a framework at the ideal incentive within the sight of clamors.

The servo engine is joined to the framework to reenact the valve turning ON and OFF.

Exhaust Fan

An exhaust fan is attached to the system to simulate the Exhaust Fan system in the basic safety protocol for gas leakage. The fan is triggered when the alert buzzer system is triggered.



Fig 6: Exhaust Fan

Internet of Things

An IoT system is equipped with the sensor, which communicates with the cloud. The data which are gathered by the sensor are stored in the cloud, the stored data are processed, based on the processed data and then the desirable action is performed. The user can make action on the other side without any physical contact with it and the changes is done through the system which is on the user interface. The network of the sensor, data processing and a user interface are the some important of the IoT system.

Arduino UNO

Arduino is an open-source electronics platform based on easy-to-use hardware and software which acts as microcontroller controlling the data flow and actions in the system.



Fig 7: Arduino UNO

Arduino Uno is a microcontroller board dependent on an 8-bit ATmega328P microcontroller. Alongside ATmega328P, it comprises different segments like gem oscillator, sequential correspondence, voltage controller, and so on to help the microcontroller.

Arduino Uno has 14 advanced info/yield pins (out of which 6 can be utilized as PWM yields), 6 simple information sticks, a USB association, A Power barrel jack, an ICSP header, and a reset button.

Arduino can be utilized to speak with a PC, another Arduino board, or other microcontrollers. The ATmega328P microcontroller gives UART TTL (5V) sequential correspondence which should be possible utilizing computerized pin 0 (Rx) and advanced pin 1 (Tx).

An ATmega16U2 on the board channels this sequential correspondence over USB and shows up as a virtual com port to programming on the PC. The ATmega16U2 firmware utilizes the standard USB COM drivers, and no outside driver is required. Nonetheless, on Windows, a .inf record is required.

The Arduino programming incorporates a chronic screen that permits basic literary information to be shipped off and from the Arduino board. There are two RX and TX LEDs on the Arduino board which will streak when information is being sent through the USB-to-sequential chip and USB association with the PC (not for sequential correspondence on pins 0 and 1).

A Software Serial library takes into account sequential correspondence on any of Uno's advanced pins. The ATmega328P likewise underpins I2C (TWI) and SPI correspondence. The Arduino programming incorporates a Wire library to work on the utilization of the I2C transport.

At the point when the ATmega328 chip is utilized instead of Arduino Uno or the other way around, the picture beneath shows the pin planning between the two:

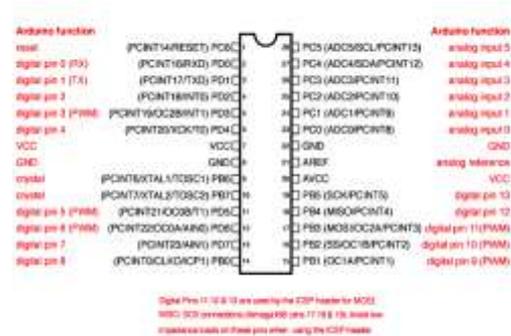


Fig 8: Arduino Uno and ATmega328 pin mapping

ESP8266

The ESP8266 is a self-contained Wi-Fi networking solution which offer a bridge from existing micro controller to Wi-Fi and is capable of running self-contained application.

The ESP8266 Wi-Fi module provides network connection to the microcontroller which shares the sensor readings periodically to the server database which is a major part of the IOT system and processing the readings and sending the alert messages when an abnormality is detected.

VI. EXPERIMENTAL SETUP

In this experiment, the device which is equipped with all the sensors are connected through Wi-Fi, and the data from the sensors are easily transmitted. There will be a user login in which all the data from the sensors are viewed by the webpage. If any sudden changes happen in the environment the buzzer will get activated and a small text message will be sent through the mail.

VII. RESULTS

As a result, our device can able to fetch all the values from the sensor and they can be viewed by the authorized person.

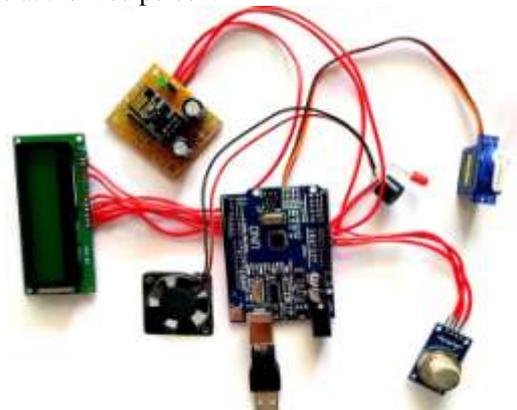


Fig 9: Project output

In the above Figure, the sensor and hardware are connected to the Arduino UNO and Wi-Fi module for data transfer, and for power supply is connected to the USB port of the computer. The USB port of the computer provides it with a 5V power supply to the microcontroller. The readings from the MQ-9 gas sensor are periodically monitored and the data is transmitted to the server through the ESP8266 Wi-Fi module.

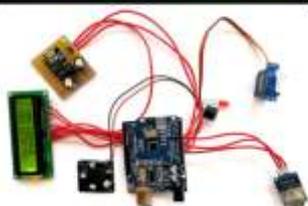


Fig 10: Gas leakage not detected

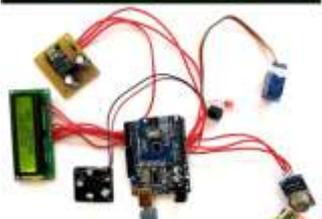


Fig 11: Gas Leakage detected

The above figures describes that if there is any leakage of gas like methane, butane, etc., The Gas leakage detection status is displayed in the LCD display and also in the local server web page.

If any leakage is detected the safety protocol system is triggered and the data is sent to the server through the ESP8266 module, where the data is processed and displayed in the server page.



Fig 12: Admin Login



Fig 13: Admin dashboard – Gas leakage not detected alert



Fig 14: Admin dashboard – Gas leakage detected alert



Fig 15: Admin dashboard – Add new user



Fig 16: Admin dashboard – User details and manage users



Fig 17: User Login



Fig 18: User dashboard – Gas leakage not detected alert



Fig 19: User dashboard – Gas leakage detected alert

For viewing the sensor values, the user is registered in the system by the admin in his dashboard with user details like name, phone number, email, username and password. After successful login, the user or admin can be able to see the values which is fetched from the sensors in underground by clicking the sensor value page. Any abnormality in the sensor reading the alert is also shown in the server page and an email notification is sent to the authorized personnel's email id.



Fig 20: Email notification

VIII. CONCLUSION

Generally, there are systems that are proposed for detecting the LPG gas leakage and alerting the authorities regarding the event and the authorities has to take actions regarding the issues and take care of the safety procedures to avoid any further accidents due to it. And there are separate systems that are used for controlling and preventing further accidents after the gas leakage is detected. Our idea is to develop a system that also detects LPG leakage and alerting the authorities and controlling the leakage and also taking the initial preventive measures.

Our main focus is to develop a system that is easy and cost efficient and plays a vital role in the safety and security of the employees those who work in places involving the use of flammable gases. Our system identifies the leakage of the gases and triggers the alert system which ensures the safety of the employees and also control and prevent the mishap from happening due to the leakage of combustible gases. Also, our focus is to develop a feasible and simple system that can be used by anyone and anywhere. The main advantage in this system is its sensitivity in detection and automatic preliminary safety protocol control managed by the system itself. A disadvantage is that all the components and connected through wires, which leads to wiring complexity and the device is confined to a single working location where it is installed.

IX. FUTURE WORKS

In future we would like to improve the accuracy of the device in LPG detection and make the whole device to transfer data within them wirelessly avoiding wiring complications. The mail will go to nearby fire service to take any necessary actions if there is any uncontrolled leakage of gases. Scalability will also be increased.

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