

IOT based Identification and Detection of Gas Leakage and Preventing Kit Provision.

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Abstract— In the today's living world, as we know that the security is more important in everywhere. The Gas leakage accidents are increasing day by day. So all the social duties keeping in mind & in focus the life-threatening instances of blasts and injuries due to leakage of gas in industries, vehicles and houses, a gas leakage system has been designed whereby application of embedded systems and involvement of Internet of things (IoT). Now a day's, LPG Gas leakage detector's comes in the market with the LPG sensor that only senses any gas leakage and sends a SMS to the emergency number concerned person but also seize any leakage of gas. One of the important preventive methods to stop mischance related with the gas spillage is to introduce gas leakage detector at vulnerable places. The main focus of this paper is to present such an outline that can consequently identify and remove gas spillage in defenseless premises. Gas sensors have been specifically utilized which has high affectability for propane (C₃H₈) and butane (C₄H₁₀). Gas leakage system consists of GSM (Worldwide System for versatile communication) module, which sends SMS as soon as gas leakage is detected.

Keywords— MQ-6 Gas Sensor, IOT, Arduino, GSM, LPG, Servo Motor, Buzzer, GSM, Exhaust Fan Microcontroller (MCU), C2000 Piccolo MCU, LCD (Liquid crystal display), Wi-Fi module, USP (Unique Selling Point), Stepper.

I. INTRODUCTION

In the development of the IoT Application system safety in the new Era, the technology is enhanced day by day with the realistic projects and efficient work. In this we are using MQ-6 semiconductor sensor to detect combustible gas.

The main objective of the work is designing microcontroller based toxic gas detecting and alerting system. Embedded systems described as, 'a computer system with a dedicated function within a larger mechanical and electrical systems, often with real-time constraint are being employed to detect the excess of gas in the marked environment. This gas detection and alert system will not only alert us of the leakage but will also mechanically turn off the knob of the gas cylinder to seize any leakage of gas. Moreover, this system informs the concerned person by emailing and dropping a message on their mobile.

This gives a larger degree of safety to any gas setup in any circumstances.

The advantage of this automated detection and alerting system over the manual method is that it offers quick response time and accurate detection of an emergency and in turn leading faster diffusion of the critical situation. If the gases exceed the normal level then an alarm is generated immediately and also an alert message. The LCD screen shows the current gas value, the system puts on the buzzer when the level of gas crosses the set limit and to outlet the gas exhaust fan gets on.

A GSM module is used to send SMS to the user if gas leakage is detected and the status is displayed on an LCD. The Node MCU carries out all the processing of the signal received from the MQ6gas sensor and activate the GSM module and LCD to inform the user. Internet of Things (IoT) is the networking of 'things' by which physical things can communicate with the help of sensors, electronics, software, and connectivity

This system is a compact version for the facilitation of safety as it involves many mini-features of mega significance and holds a USP of automatic gas shutting feature, in case of absence of any human help in the area of leakage this feature is of great significance. There are many examples of life accidents due to leakage of gases.

For the communication of mobile and email with the gas sensor, the concept of IOT comes into the picture, is the network of physical devices, vehicles, home appliances and other items embedded with electronics, software, sensors, actuators, and connectivity which enables these objects to connect and exchange data. This gas detection and alert system will not only alert us of the leakage but will also mechanically turn off the knob of the gas cylinder to seize any leakage of gas. The app is designed for the purpose of intimating the user with the gas values as the values will be updated continuously in the app and to know the status of the system.

Many papers are published on gas leakage detection in which gas sensors are used for detection of leakage and also providing an alert to users by SMS using GSM. In this paper, the users are alerted by using the Internet of things (IoT) which is a new concept in clouding, it is a network of physical devices, vehicles, home appliances, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to connect and exchange data

II. LITERATURE SURVEY

Ch. Manohar Raju and N. Sushma Rani, 2008; they introduce an android based automatic gas detection and indication robot. They proposed prototype depicts a mini mobile robot which is capable to detect gas leakage in hazardous places. Whenever there is an occurrence of gas leakage in a particular place the robot immediately read and sends the data to android mobile through wireless communication like Bluetooth. We develop an android application for android based smart phones which can receive data from robot directly through Bluetooth. The application warns with an indication whenever there is an occurrence of gas leakage and we can also control the robot movements via Bluetooth. by using text commands as well as voice commands. The previous mobile robots are based on heterogeneous technologies like GSM, GPS, internet based etc., but the main disadvantage of those prototypes were the

absence of communication in particular areas. So, with the rapid developments and tremendous changes in technology we have lots of techniques to eradicate previous problems. Wireless communication protocols play a vital role in present trends. Bluetooth, WI-Fi, Zigbee etc., we use one of the best feature of smart phone, i.e., the Bluetooth technology to control and monitor parameters driven by a robot.

III. ARCHITECTURE



Fig1. Architecture

3.1. Sensing Circuit The sensing circuit consists of an MQ6 sensor MQ-6 which has high sensitivity to Propane, Butane and LPG, also response to Natural gas. The sensor could be used to detect different combustible gas, especially Methane, it is with low cost & suitable for different application. ESP8266 DESIGN The ESP8266 is the name of a micro controller designed by Espressif Systems. The ESP8266 itself is a self-contained WiFi networking solution offering as a bridge from existing micro controller to WiFi and is also capable of running self-contained applications. Flash memory attachable: 16MB max (512K normal). Analog to Digital: 1 input with 1024 step resolution.

3.2. GSM Transmit Circuit We are be using SIM300 GSM Module in our Project. SIM300 is a Tri-band GSM/GPRS engine from SIMCOM Ltd.,that works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS 1900MHz. The physical interface between SIM300 and the mobile application is through a 60 pins board-to-board connector, which provides all hardware interfaces from module to customer's boards except the RF antenna interface. THREAT AWARENESS AND MITIGATION CIRCUIT This consists of the buzzer and the fan.

IV. PROPOSED METHODOLOGY

4.1. C2000 Piccolo MCU

1. Observing and checking the exceeding threshold value via a gas sensor which is prefixed. As the threshold values cross, the program is executed and MCU instructs the buzzer* to ring and alert the livings in that vicinity.
2. Along with this MCU also sends an emailv (concept of IOT) to the concerned about the leakage of gas and a message is dropped on the mobile phone of the needy, these all tasks are initiated and are done under control of MCU.
3. MCU also powers the stepper motor to begin rotating.v LCD, exhaust fan, and relay all begin to come in actionv in accordance to MCU(as inscribed over the RAM of MCU).



Fig2. Programming C2000 Piccoloc MCU.

4.2. MQ6 Sensor

MQ-6 gas sensor has high sensitivity to Propane, Butane and LPG, also response to Natural gas. The sensor could be used to detect different combustible gas, especially Methane, it is with low cost and suitable for different application.

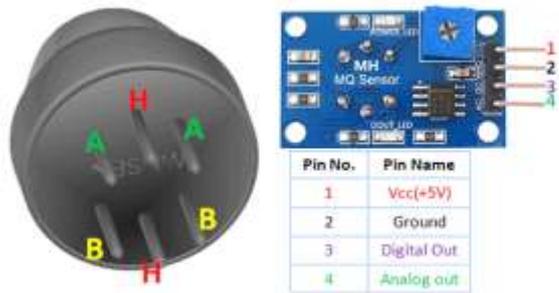


Fig3. MQ6 Sensor.

4.3. Wi-Fi Module

Most important work is served by this component. This module connects MCU with our devices andv contributes to the overall connection as it is responsible for sending the email and message on mobile. It sets up a server by itself and opens the door for onev end to connect to the other.

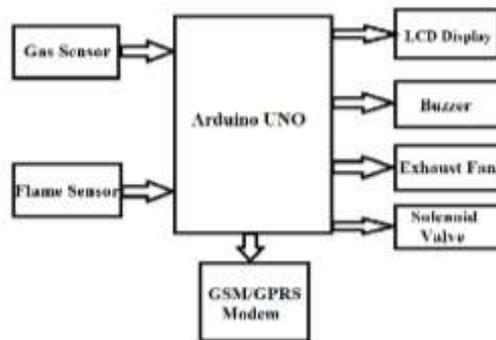


Fig4. wifi module with Arduino

4.4. LCD.

LCD with Node MCU Connect adapter's SCL pin with NodeMCU D1 pin Connect adapter's SDA pin with NodeMCU D2 pin Connect adapter's GND, VCC pins with NodeMCU GND, Vin accordingly LCD with I2C Serial Adapter on NodeMCU v2 using ArduinoIDE and available libraries.

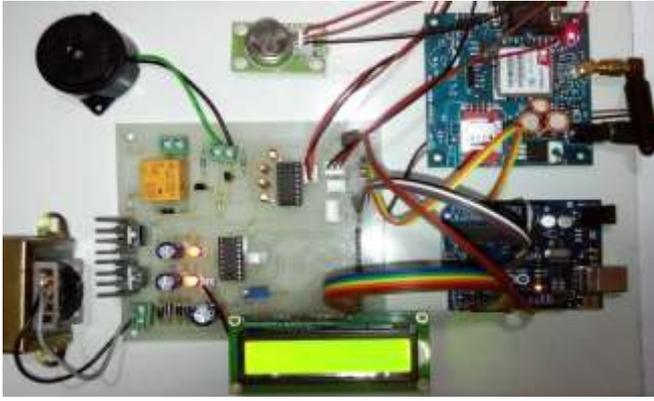


Fig5. Complete diagram of System with LCD

4.5. Stepper Motor

This motor is employed into accomplishing the unique task of this alert system that is, in the appropriate scenario the MCU instructs the motor to begin rotating by an angle of 90° and turn off the knob of the regulator.

4.6. Exhaust Fan

In case of excess of gas being leaked already the chances of misshapen increases relatively to combat this, an exhaust fan is employed to evacuate the place.

4.7. Buzzer

When the buzzer gets the required voltage, which actually is monitored and instructed by MCU it begins to buzz and alerts the nearby.

V. ADVANTAGES

- This system, as its 50% profile of work is meant to alert the user, even the dumb can identify the leakage as the LCD(prototype) screen turns ON and begin to flash a message 'Gas detected Alert ON'.
- Even the blind or ones away from the site for sight are able to be informed and accounted by means of the ringing of the buzzer.
- In case of absence of any mobile lives in the premises of gas leakage or the presence of any paralyzed or movement disabled handicapped, the feature of mechanical knob OFF switch is of great service.

VI. FUTURE SCOPE AND CONCLUSION

Provided with the given features this system can be made more serviceable by adding few more basic small inputs like Temperature:

1. To monitor the temperature of the cylinder as well as the environment and program the system to act accordingly. (Note: Piccolo comprise of on-chip temperature sensors and LEDs).
2. Although this system is benefited by IOT for emailing and messaging this can be made huge by supplementing it with Android and GSM for emailing and messaging.

3. LED: can also add-up to its indicating credibility by flashing indicating gas leakage.
4. Sensors: Continuous and productive involvement and the addition of relevant and upcoming new technology based sensors would affect largely to the credibility of the system. The research and development would hit new dimensions in case of introduction of any impurity detection sensors of new gas detectable sensors.
5. Here IOT is limited to emailing and messaging nevertheless an app can be developed featuring many more viable services. This gas system is successfully able to perform all the stated functions and has shown to be a great tool from a gas safety point of view.

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