

IoT-Based LPG Gas Detection and Prevention with Temperature Monitoring

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Abstract—As we know Gas Leakage is a crucial problem in various fields like Industries, Firms, gas powered vehicles like CNG buses, cars etc. LPG Gas is highly flammable and can cause major damage to life and property. Gas cylinder explosion may be a serious disaster when it occurs in our kitchen. So here, we are making an IoT- based gas leakage detection system which reduces the chances of such accidents in kitchen. This system detects the gas leakage, alerts the concerned person by sending SMS and Email, closes the valve of the cylinder, regulates the buzzer, exhaust fan evacuates all the leaked gases. With the help of Temperature sensor, the cylinder's temperature is continuously monitored. The former gas leakage system does not provide the facility of temperature monitoring.

Keywords : [Internet of Things (IoT), MQ-6 Gas Sensor, Wi-Fi Module, C2000 Piccolo MCU, Liquid crystal display (LCD), Infrared Temperature sensor].

1. INTRODUCTION

LPG consists of mixture of gases like Propane and butane. These gases can catch fire easily. LPG is currently the most used gas in our home for cooking purpose. It is odorless in its natural state. The smell that we notice when there is a leak is actually from an entirely different agent called **Ethyl Mercaptan**. LPG is highly flammable and it can cause a major damage to life and property. Therefore it should be used with additional care so that any possible leakage could be prevented.

The number of deaths occurring due to explosion of gas cylinder has increased. So the leakage should be controlled to protect people from danger. There are numerous instances of living misfortune because of gas leakage. A little while back we heard that in Visakhapatnam, the poisonous gas named styrene was leaked, the resulting vapour cloud spread over a radius of 3km, affecting the nearby areas and villages, total 11 people were dead and more than 1000 people became sick after being exposed to the gas.

The proposed system will not only makes aware of gas leakage but also stops the gas leakage by revolving OFF the node of the gas cylinder. Furthermore this system briefs the user by sending them Email and messages. The gas setup environment is pledged with more security with these additional traits.

By using Temperature sensor, we can monitor the changes in heat condition of the cylinder. Before filling up the cylinder with LPG, the Temperatures calculated but there is no provision for monitoring it, when the cylinder is used. So the proposed system is facilitated with this additional provision of temperature monitoring.

Nowadays, as people have very busy lifestyle, they are involved at multiple places at a time, in such situations people might fail to remember to get hold of all the required actions at the time of cooking or can leave the knob of the regulator lose, or the stove's burner on, this carelessness could be very dangerous and can turn into a big disaster also. The proposed system will play an efficient role in automatic detection and prevention from gas leakage.

2. LITERATURE REVIEW

A variety of papers are published [2][3] for gas leakage where GSM module is used to aware the concerned person for giving the facility of SMS but here, in this paper we are using IoT to making the users attentive. The notion of IoT is used to establish connection between mobile and gas sensor by sending Email on user's mobile. Although the researchers used high sensitivity sensors for gas leakage detection also used GSM Module and IoT for sending Email and messages [1][2][3][4] but none of them used temperature sensor so this paper is aimed to temperature monitoring with gas leakage detection and prevention.

3. METHODOLOGY USED

Block Diagram

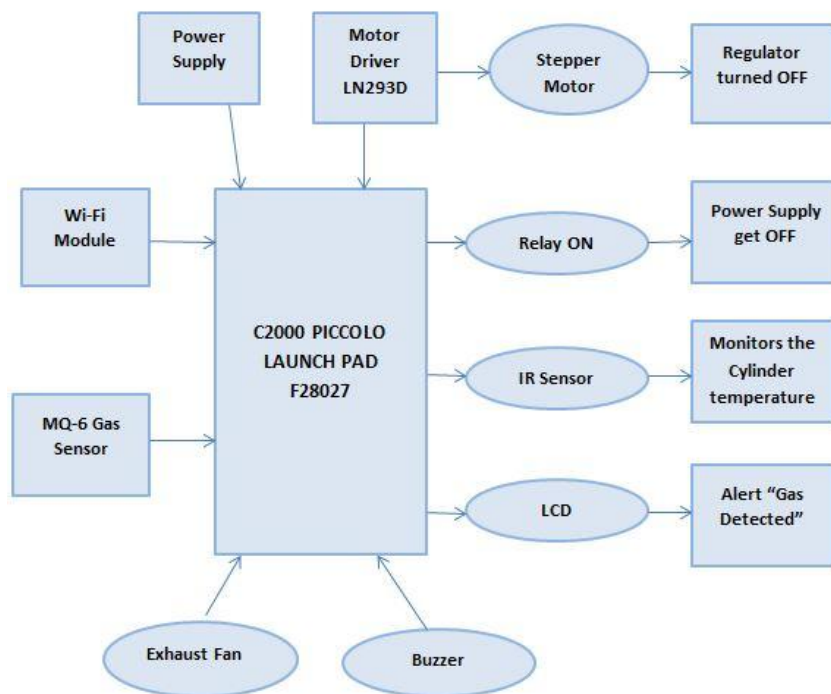


Fig.1.The Proposed System

To prevent fire accidents, the electric power supply is also shut down by above system. The highly sensitive MQ-6 gas sensor has been used. The gases like propane and butane are called to be highly sensitive to this sensor. Infrared temperature sensor helps in measuring the temperature of the cylinder and IoT helps in sending Email and message about gas leakage.

This system is a closed-packed type for providing security and with the involvement of a number of great features makes this system more significance. When there is no human being in gas leakage area, the automatic gas shutting feature will play a beneficial role.

4. COMPONENTS DESCRIPTION

C2000 PICCOLO MCU

The C2000 Piccolo MCU F28027 is an advanced version of MCU manufactured by Texas instruments. The MCU is convenient for closed-loop control applications such as industrial drives and servo motor control; solar inverters and converters; digital power; transportation; and power line communications, here MCU is used for-

- A threshold value is prefixed for the gas sensor and this value is continuously observed and checked by MCU. If the value exceeds, the system acts according to the program, buzzer is instructed by MCU to beep and alert the people in gas leaked place.
- Stepper motor is also powered by MCU for start rotation.
- MCU also sends an Email and SMS on the mobile phone of the concerned person about the gas leakage by using the concept of IoT[1][4].
- As under instruction of MCU, LCD, relay, exhaust fan all starts performing their tasks.
- Infrared sensor gives its value, instructed by MCU for temperature monitoring.

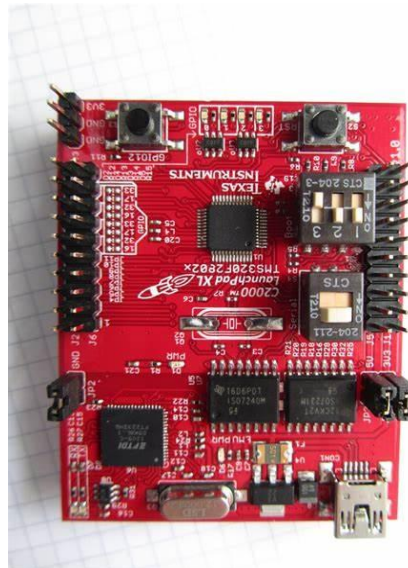


Fig.2. C2000 piccolo MCU

LCD

The LCD starts displaying the message of gas leakage detection after the buzzer starts ringing.



Fig.3. LCD

BUZZER



Fig.4. Buzzer

A buzzer or beeper is an audio signalling device which may be mechanical, electromechanical etc. here in our system, when MCU powers the buzzer with the required voltage, it starts ringing and alerts the nearby people.

WI-FI MODULE

- Wi-Fi module helps in connecting all devices with microcontroller. this module establish connection and send Email/SMS by using IoT.
- As it has its own server which possible the one end connection to the other.



Fig.5.Wi-Fi Module

EXHAUST FAN

If gas is being leaked in large amount then this could be dangerous, an exhaust fan is placed which fan outs all the leaked gases.



Fig.6.Exhaust Fan

MQ-6 GAS SENSOR

MQ-6 is a type of semiconductor gas sensor which discovers the gas leakage. This sensor gives high retaliation time. This sensor is very subtle for LPG, propane and butane. The range for detecting gas concentration lies between 100 to 10000ppm. MQ-6 is highly sensitive sensor for gas leakage detection.



Fig.7.MQ-6 Gas Sensor

STEPPER MOTOR

The stepper motor is performing the most important task in this project, as the MCU gives instruction, the motor starts rotating by an angle of 90^0 and revolve the knob of the regulator which stops the gas leakage.



Fig.8. Stepper Motor

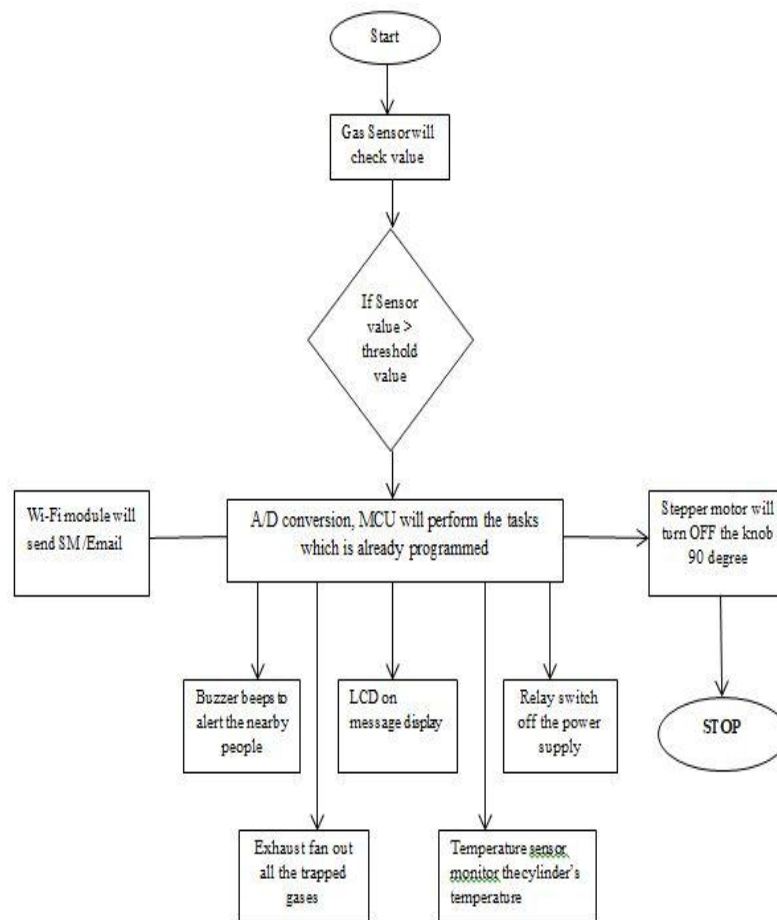
INFRARED SENSOR

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object and also detects its motion. As all the objects radiate some form of thermal radiations which can only be seen in infrared spectrum and not visible by our eyes. The detector used is Infrared or IR sensor and the emitter used is an IR LED. As IR light falls on photodiode, these values like resistances, voltage, change in proportion to the magnitude of IR light are received which are shown on the LED.



Fig.8. IR sensor

5. FLOW DIAGRAM



6. RESULTS

For calculating the results, we are using a lighter very close to the gas sensor to measure the gas which has leaked, if sensor value is greater than the prefixed threshold value, MCU performs following functions -

- Instantly turns OFF the knot of the regulator so that further gas leakage could be stopped.
- IR sensor value is checked after gas leakage, the temperature value will be higher than usual at the time of gas leakage.
- Buzzer starts ringing and alerts the nearby people and LCD start display the gas leakage message.
- Using data from cloud, the Wi-Fi module sends Email/SMS to the concerned person.
- The gas leaked area is evacuated by the exhaust fan.it throws all the gases out.
- The system will get refreshed when reset button of MCU is pressed.

7. CONCLUSION

This is a cost- effective and multi featured gas leakage detection and prevention system and also provides larger degree of safety to the user. This system performs multiple operation altogether in efficient manner.

8. REFERENCES

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