

AUTOMATIC GAS LEAK DETECTION AND PREVENTION USING ARDUINO AND GSM MODULE

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ABSTRACT:

So many systems are available in the market which are designed with different types of controller, but they are expensive as well as they are not much effective and efficient. By considering these issues, we have designed a system which automatically detects and prevents gas leak with instant SMS alerting system. This system gives alert for the blast or any hazardous intimation during gas leakage condition to user mobile phone through SMS. And automatic prevention is done by using exhaust fans which are used as in-let and out-let. And a buzzer is used to alert the surrounding people. Our system consists of gas sensor to detect any gas leakage as soon as it is encountered. The gas sensor which senses the harmful gas sends a signal to the arduino so that microcontroller can process it further. Once the arduino receives signal from the sensors, it processes the input and then sends a signal to the GSM modem to send an SMS to the intended authorities so that they may take appropriate action. Here the gas is prevented by the exhaust fans and alert the people by buzzer sound.

INDEX TERMS: GSM Module, Arduino Atmega, MQ135 Gas Sensor.

1. INTRODUCTION

The liquefied petroleum gas is finding wide ranges in homes, industries and in automobiles as fuel because of its desirable properties which include high calorific value, produces less soot, produces very less smoke and does not cause much harm to the environment. Natural gas is another widely used fuel in homes. Both burn to produce clean energy, however there is a serious treat about their leakage. The gases being heavier than air do not disperse easily and may lead to suffocation when inhaled: also the leaked gases when ignited may lead to explosion. The number of deaths due to the explosion of gas cylinders has been increasing in recent years. There is a need for a system to detect and also prevent leakage of LPG.

2. SYSTEM ARCHITECTURE

. The leakage of gas in the environment is monitored by using MQ135 sensor which has 4 pins and provides either digital or analog output. The sensor is connected to Arduino Atmega microcontroller. After that Arduino microcontroller receives the signal which has been send by the gas sensor. Then the microcontroller sends the activation signal to the external attached devices like buzzer, exhaust fan and activation of GSM which sends the SMS to the specified mobile.

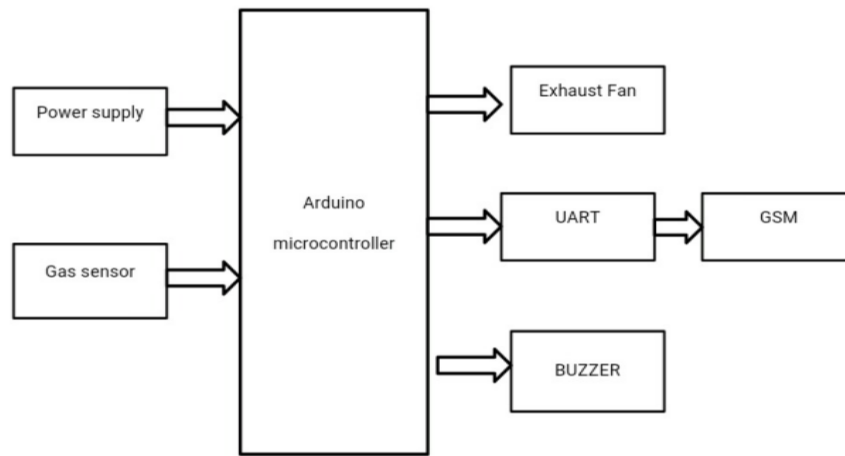


Fig.1: System Architecture implementation

The objective is to collect the data from the sensor (gas leakage level (MQ135)) and send this data to the microcontroller. The microcontroller acts as an gateway to external devices. It acts as a network having control over the sensor which give the updates of the gas leakage in the premises.

3. HARDWARE DESCRIPTION

a. Gas Sensor:

MQ135 gas sensor has high sensitivity to LPG, Propane and Hydrogen, also could be used to Methane and other combustile gas. Sensitive material of MQ135 gas sensor is Tin Dioxide SnO_2 , which has lower conductivity in clean air. When the target combustile gas exists, MQ 135 senses and its conductivity is higher along with the gas concentration rising. MQ135 has 4 pins, 2 of them are used as data pins, and other 2 are used as power supply and ground. The operating voltage of this gas sensor is +5V.



Fig.2: MQ135 gas sensor

b. Arduino:

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative

Commons Attribution Share-Alike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform. The ATmega on the Arduino Uno comes pre-programmed with a boot loader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. The Uno also differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it uses the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter.



Fig.3: Arduino Board

c. GSM Module:

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services. GSM digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1,800 MHz frequency band. It supports voice calls and data transfer speeds of up to 9.6 kb/s, together with the transmission of SMS.



Fig.4: GSM Module

4. HARDWARE AND SOFTWARE ASPECTS

As shown in the below figure, gas sensor MQ135 is connected to Arduino. The MQ135 gas sensor data pin is connected to the analog pins of Arduino board which is used to measure gas leakage. GSM module is connected to port (P0.1 & P1.31) corresponding to transmit and receive signals. Buzzer is connected to P0.1.

In the proposed system, the open source Arduino IDE software tool is used to write and compile the source code, which has been written on the bases of JAVA, C/C++ language.

5. RESULTS AND DISCUSSION

The GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. In the initial step MQ135 gas sensor senses the gas leakage of the system.

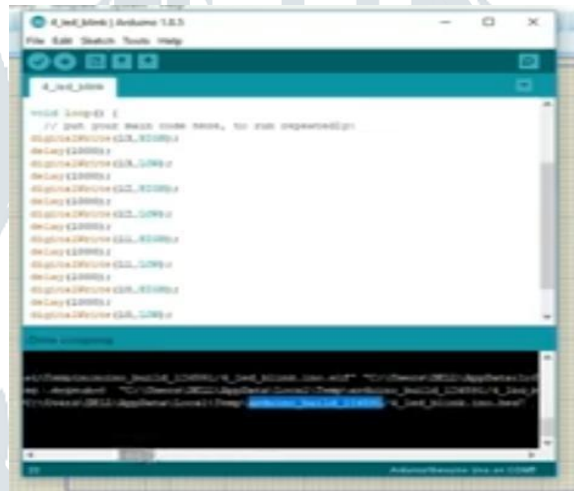


Fig.5: Arduino Simulation

After that in second step Arduino microcontroller receives the signal which has been send by the gas sensor and send the alert SMS to a particular person whose number is registered in the system and simultaneously turn on the exhaust fan and produces a buzzer sound also. Then the microcontroller sends the activation signal to the external attached devices.

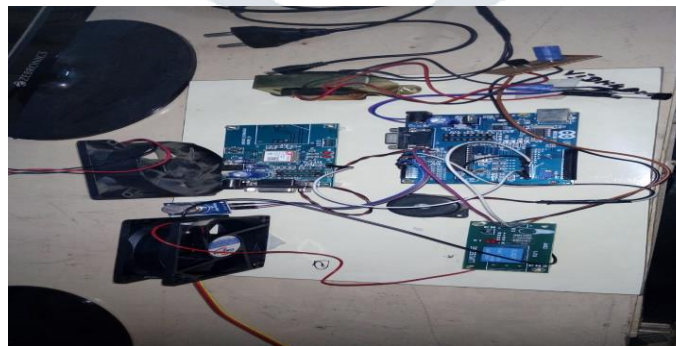


Fig.6: Gas Leakage Detection and Prevention.

6. MESSAGE ALERT THROUGH SMS

- If gas leaks lightly, message comes as 101.
- If gas leaks moderate, message comes as 102.
- If gas leaks high\more, message comes as 103.

19-2 8:09 PM

Gas Alert
103

2-3 5:47 PM

Gas Alert
101

Fig.7: Message to Registered Mobile Number

7. CONCLUSION

The proposed gas leakage system is based on Gas sensor MQ135, Arduino Atmega microcontroller, GSM. By using Arduino Atmega, Gas sensor MQ135, exhaust fan and GSM module, buzzer are implemented with low cost, portable, and easy to operate. It automatically detects and prevents the gas leakage for explosions and sends an alert SMS regarding gas leakage. Experimental work has been carried out carefully. This made the project more user-friendly and reliable.

8. REFERENCES

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