

Home and Industrial Safety Using Gas and Fire Detection System Using GSM Technology

S. Pandiaraj¹, B. Prasanth², Karthik Kembai³, Animesh Singh⁴, Yashketan Patra⁵

¹ Assistant Professor (SG), Department of CSE, SRM Institute of Science and Technology, Chennai, Tamil Nadu, India

^{2, 3, 4, 5} Third Year, B.Tech, CSE Dept, SRM Institute of Science and Technology, Chennai, Tamil Nadu, India

Abstract – The Internet of Things IOT is an upcoming domain which is already ruling the computer world. Its main feature is connecting the electronic stuff with a nonelectric stuff. Stuffs like vehicles, home appliances and kind of physical stuff are embedded with electronic components or software components etc. the main of the project is to detect the liquid petroleum gas (LPG) leakage to avoid the fire accidents in home and in the industry and increase the safety feature with more accuracy and with more efficiency as we know that security is an important issue. The system detects the leakage using the sensors we have used the gas sensor to detect the leakage of the gas and we have also used the flame sensor to detect the flames. We have also included the GSM module so that the system alerts the consumer about the gas leakage by sending an SMS to user using the GSM module which is connected to the micro controller which is preprogrammed.

Index Terms – Sensors, micro-controller, flame sensor, gas sensor, GSM modem.

1. INTRODUCTION

In this world of urbanization security has been an important issue to safe guard the people from the LPG leakage and to decrease the fire accidents in home and also at the industry level. we all know that the LPG is a mixture of propane, butane and ethane, at home level fire accidents occur due to leakage of the gas from gas cylinders which when released in excess can lead to huge catastrophe, these accidents can also occur at the time of filling of gases in the gas cylinder, in order to minimize this gas pipelines have been introduced to each and every home, but, even because of the gas pipelines the gas is leaked from the pipes either due to the low quality of the pipes or due to the environmental conditions or it might sometimes even happen because of the human errors in designing and also in laying of the pipes.

At the industry level fire accidents occur due to the short circuit or due to the human errors or maybe because of any Environmental situation. So, these type of accidents leads to many injuries, causes severe burns, loss of life and also loss of property. Many measures have been taken to arrest these fire accidents but they occur either of the way. So, we need to be more cautious and hence we have introduced the GSM technology which includes the GSM, modem serial communication and power supply. By using this GSM technology, we can send the SMS alert to the consumer about

the gas leakage and we can alert the people about the gas leakage. AT commands are used to control the modem we have also used a micro controller which is a small computer on a single integrated chip. We have interfaced the GSM modem with the micro controller so that it can be used to send the sensed information from the sensors that alert the user or the consumer about the gas leakage by an SMS sent by the GSM modem. We have used the gas sensor to detect the leakage of the gas and we have also used the flame sensor to detect the flames.

2. EXISTING SYSTEM

In the existing system PIC16F876A micro controller-based circuit has been used whose sensitivity of gas detection is very high and response time lower in the clean air. Another system has the ATmega 328 micro controller-based Arduino control circuit has been used which can easily connect the smart phones from any location. In another existing system we find ATMEL LPG based gas monitoring system where the user or consumer is notified immediately whenever something happens, this system has a disadvantage, and this system can bear a load up to a maximum of 10kg.

In another system where GSM technology and MQ5 sensor using the Arduino Uno have been used, it gives the precautionary measures like switching on of exhaust fan will take place automatically but this system has a disadvantage that is, the sensors which have been used in this system are very sensitive to the temperature.

3. PROPOSED SYSTEM

In this proposed system we have used the GSM technology which consists of the GSM modem and micro controller that helps in sending an SMS to user or the consumer we have used the different kinds of the sensors which contribute to decrease the fire accidents and alert the user quickly. We have used the MQ6 Gas sensor which detects the gas leakage from the gas cylinders or from the gas pipelines and we have introduced the flame sensor in our project to detect the flames.

We also have a micro controller to control, process the data. This micro controller which belongs to the 8051family is interfaced to the GSM modem that helps in sending an SMS to

the user with the help of this micro controller and GSM modem.

It works in the following way, whenever there is a leakage in the Gas cylinder this leakage is detected by the gas sensor if it exceeds the certain level the data is then sent to the micro controller and the micro controller sends the message to the user using the GSM modem. And then the micro controller activates the audio-visual alarm and it displays the message on the LCD screen and switches on the exhaust fan to let the gases out. The brief description about the sensors and the function of 8051 micro controller is as follows:

- MQ-6 Gas sensor
- Flame sensor
- GSM Module
- 8051 micro-controller

3.1. MQ-6 Gas sensor

This MQ-6 gas sensor is used to detect the harmful gases leakage from the room which contains the gas cylinder; this MQ-6 gas sensor has a very high sensitivity to propane, butane, methane and LPG. This sensor is very sensible to the SnO₂ (Tin oxide) which has the lowest conductivity to the clean air. When the target combustion gases exist, the sensor conductivity is directly proportional to the gas concentration.

3.2. Flame sensor

This flame sensor is very sensitive to the flames and radiation. This sensor is used to detect the flames and presence of fire in the surroundings. It can detect the light waves in the wave length of region 760nm – 1100nm

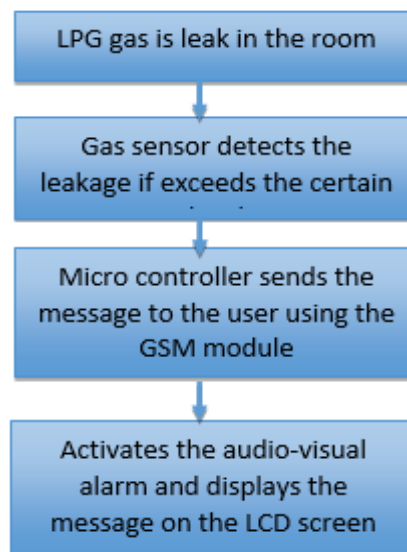
3.3. GSM Module

This GSM module consists of GSM modem, power supply and serial communication. It also contains a SIM card which operates over a subscription to a mobile operator. AT commands are used to control the modem and this GSM modem is interfaced to the 8051 micro-controller that can be used to send the sensed information from the sensors to the user or the consumer to alert about the leakage of the gas in a particular room.

3.4. 8051 micro-controller

This micro-controller belonging to the 8051 family has a RAM of 128 bytes, ROM of 4 kilo bytes, 2 timers, 4 ports and 1 serial port which are located on a single chip, it is an 8bit processor and it can process 8 bits at a time. This Micro-controller plays an important role as it activates the audio alarm and displays the message on the LCD screen and also it activates the exhaust fan to let the harmful gases out.

4. SYSTEM ARCHITECTURE



5. MODULE IDENTIFICATION

Our system automatic gas and flame detection system using the GSM technology has been divided into the following modules

- Gas sensor detects the leakage if exceeds the certain level
- Micro controller sends the message to the user using the GSM module
- Activate the alarm and display the message on the LCD display
- Switch on the exhaust fan so that the leaked gas goes out of the room

5.1. Gas sensor detects the leakage if exceeds the certain level:

MQ-6 GAS SENSOR: it senses the LPG leakage and the output of the sensor is high at the normal conditions. It is very sensitive to the SnO₂ (TIN OXIDE) this material has very low conductivity to the clean air. When the target combustion gases exist then the conductivity of the sensor is directly proportional to the concentration of the gas. The sensor is very sensitivity to methane, butane, ethane, propane and LPG

FLAME SENSOR: these sensors are sensitive to the flame and radiations and these are used to detect the existence of fire in our surroundings and this sensor can also detect the light waves in the region 760nm – 1100nm

5.2. Micro controller sends the message to the user using the GSM module

We have used the 8051 8bit micro controller which processes the 8 bits at a time, it has 4 I/O ports and it controls the exhaust

fan, LED buzzer, and also sends an SMS to the user or the consumer through the GSM module whenever a leakage occurs.

5.3. Activate the alarm and display the message on the LCD display

Activates the alarm when the LPG gas is detected and the message is displayed on the LCD display or any mobile phone using the GSM module. This GSM module consists of GSM modem, serial communication and power supply. A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator.

AT commands are used to control the modem. The advantage of this GSM modem is that it is compact, and it consumes low power and high-quality SMS function. The interfacing of GSM module with 8051 microcontroller can be used to send the sensed information from the sensors that alert the user through an SMS sent by GSM modem.

5.4. Switch on the exhaust fan so that the leaked gas goes out of the room

The microcontroller then switches on the exhaust fan to send out the LPG to space and then the concentration of LPG is reduced.

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