

# WHITE KNIGHT MESSENGER

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## **ABSTRACT**

*The project involves both Software and Hardware fields. It mainly focuses on creating an accident free home by giving alerts to the people who live in the house about any of the hazards that is about to take place through sensor detection, so that proper precautions could be taken in immediately to prevent loss. Sensors used to detect LPG Gas leak. Communication between these sensors and the user through internet and a hand device (A message to the user). This project is about producing an alert warning system based on Global System for Mobile (GSM) network. It will be used to detect the presence of natural gases. Whenever gas leakage occurs, the sensors used in the circuit will detect it and the GSM modem will send out an SMS alert to the user. With the system that provides a real-time notification, it increases the response time of the owner. This will provide the immediate aid to the situation occur. This system can be installed in kitchens, Liquefied Petroleum Gas (LPG) storage rooms.*

*The combination of gas sensors and GSM module can make a valuable contribution to the safety of these processes. The detectors can be used to trigger alarms if a specified concentration of the gas is exceeded. This can provide an early warning of a problem and help to ensure people's safety. However, a detector does not prevent leaks occurring or indicate what action should be taken. It is not a substitute for safe working practices and maintenance.*

*It mainly focuses on creating an accident free home by giving alerts to the people who live in the house about any of the hazards that is about to take place through sensor detection, so that proper precautions could be taken in immediate affect to prevent loss.*

## **INTRODUCTION**

### **Overview**

The project involves both Software and Hardware fields. It mainly focuses on creating an accident free home by giving alerts to the people who live in the house about any of the hazards that is about to take place through sensor detection, so that proper precautions could be taken in immediately to prevent loss. Sensors used to detect LPG Gas leak. Communication between these sensors and the user through internet and a hand device (A message to the user). This project is about producing an alert warning system based on Global System for Mobile (GSM) network. It will be used to detect the presence of natural gases. Whenever gas leakage occurs, the sensors used in the circuit will detect it and the GSM modem will send out an SMS alert to the user. With the system that provides a real-time notification, it increases the response time of the owner. This will provide the immediate aid to the situation occur. This system can be installed in kitchens, Liquefied Petroleum Gas (LPG) storage rooms.

The combination of gas sensors and gsm module can make a valuable contribution to the safety of these processes. The detectors can be used to trigger alarms if a specified concentration of the gas is exceeded. This can provide an early warning of a problem and help to ensure people's safety. However, a detector does not prevent leaks occurring or indicate what action should be taken. It is not a substitute for safe working practices and maintenance.

Arduino Board UNO, a micro Controller which gets input from LPG gas detector sensor which is MQ-5 ,and gives output using GSM module which is used to send the warning message .

The Equipment's does the following functions:

- Micro Controller – ARDUINO UNO
- Sensor – MQ-5
- Network Transmission – GSM Module
- Interface system – LED lights
- Application – C++

ARDUNINO Board is a physical programmable circuit board and integrated development environment that runs on computer ,used to write and upload computer code to physical board .

MQ-5 is a sensor which used to detect the presence of gas in an area .this sensor interacts with a gas to measure its concentration .each gas has unique breakdown voltage .This sensor detects the presence of various gases such as hydrogen ,carbon monoxide, methane and LPG ranging from 100ppm to 3,000ppm.

GSM Module is a wireless module .it is a complete dual band GSM/GPRS solution in a SMT Module which can be embedded in the application

### **Problem Statement**

Natural gases such as Liquefied Petroleum Gas (LPG) are widely used in the whole world. LPG is used for cooking in home or hotel. It is also used in certain gas-based industry. As for now, the use of natural gases instead of petroleum as the alternative fuel for mobile cars also has been increased. Although the procedure of installing LPG-based system is very tight, we could not give 100% guaranteed that the LPG-system will not having leakage.

Every Household might become a victim for any accidental LPG Gas fire hazard. There might be gas leaks which might lead to huge fire hazards, due to improper checking while leaving the house, or due to natural activities. To prevent this from happening, sensor are being connected to power supply which can communicate to the user when there is any gas leaks, where it sends a message or an alert to the user through a personal application created and programmed for the hand device.

Even though human is a perfect creation of God, they still have certain weakness. Human cannot detect the presence of natural gases as fast as the sensor do. Thus, the use of gas sensing system is hugely needed to give real-time monitoring of the gas system.

In certain cases, gas leakage can cause fire that will destroy human property. The large scale of fire also could contribute to serious injury or death. This is due to the fire station got delay information about the fire occurred.

Therefore, this project shall be able to resolve the problem stated. This is because this project is able to sense the presence of natural gases. Besides that, it is also capable to send out an SMS alert automatically to the owner.

### **Objective of Project**

- The objective of this project is to design a system that can detect the presence of methane gases and send an SMS alert to the user if gas leakage.
- Detect Gas Leakage (LPG) using MQ5 Sensor and Arduino.
- Setup an SMS based Alert Mechanism using GSM Module.
- Send an alert messages to more number of mobile numbers.

## **LITERATURE SURVEY**

### **Introduction**

Gas sensor is use to detect the presence of a dangerous LPG leak in your car or in a service station, storage tank environment. This unit can be easily incorporated into an alarm unit, to sound an alarm or give a visual indication of the LPG concentration. The sensor has excellent sensitivity combined with a quick response time. The sensor can also sense iso-butane, propane, LPG. Another object of the present invention

is to provide a novel safety means for detecting the leakage of gas into the area of an appliance when the appliance is in a shutdown condition and not in operation. Yet another object of the present invention is to provide a novel gas detection and monitoring system which is economical to manufacture and which may be readily installed in conventional trailers, boats or the like which are normally dependent upon a stored supply of pressurized gas. Typical installation areas being gas yards (Bullets), gas banks with multi cylinders in manifold, user production departments / utility areas like kitchens. Ideal sensor for use to detect the presence of a dangerous LPG leak in your car or in a service station, storage tank environment.

### **Existing System**

This system helps you to upgrade your safety standards, comply statutory requirements on environmental commitments and most important and basic function being prevent accidents and protect life and property from disaster. In the past, it has been a conventional practice to employ combustion apparatus such as a furnace, heater, stove or LPG kit in cars, which utilizes a combustible vapor or gas to produce heat energy when properly ignited. In the use of combustible apparatus in which a combustible gas such as natural or liquid propane gas is burned in heating boilers, domestic water heaters, ovens, stoves and the like, the apparatus or appliance is generally of an automatic recycling type. That is to say, the equipment is generally in operation for short periods of time after which is shut down for a short period of time. The equipment has intermediate operation and the appliance is generally started and stopped at the signal of an automatic controller, such as a thermostat, which may be actuated by temperature, pressure, or the like. The LPG Kit installed is many times installed inside the car creating possibilities of large accidents. This type of appliance/Kits is normally unattended by any operating personnel, since it is automatic in operation and, therefore, one hazard encountered in the use of such an appliance is the possibility that during a standby period or a period in which it is not in operation, a gas leak may occur thereby resulting in a large accumulation of combustible gas which can produce an explosion if the detection is not quickly noticed. Although some sophisticated detector means have been provided, it is contemplated that the indicator means should be simple and economical so that the entire system may be readily incorporated into mobile trailers, campers, boats and other vehicles or living quarters having appliances dependent upon storage of pressurized gas.

### **Issues in Existing System**

- Does not send any SMS indication. Do not detect LPG properly.
- Only one gas can be measured with each instrument.
- When heavy dust, steam or fog blocks the laser beam, the system will not be able to take measurements. This is also the case when a person or vehicle blocks the path.

### **Summary of Literature survey**

#### **Multi-functional secured smart home**

Enhancing the home security by remote control means is a cutting-edge research area in the domain of Internet of Things (IoT's). The necessity of security is increasing these days, ranging from thefts, burglary, accidents, LPG gas leakage and fire detection etc, which all are important aspects of a Home Security System. In this paper, a prototype Multi-Functional Secured Smart Home (SSH) model is developed. Generally a home security system uses signals in terms of alarm of intruder detection. However, the proposed Multi-Functional Secured Smart Home uses a mobile communication (GSM) based Home Security System, which helps to provide a better security to have systems that can be globally connected. In the proposed system a text message is sent, whenever an event from any sensor is detected, so that immediate actions could be taken by the home owner. The proposed SSH sends SMS using GSM-Module and mail through Raspberry Pi micro-controller. The prototype SSH based smart system also uses an Arduino micro-controller board for commands processing and control. The system uses GSM technology, which provides global access to the Smart Home Security System. The prototype SSH, developed at a low cost, can be used for converting existing homes into smart homes at relatively affordable cost and with convenience. The performance testing results of the prototype SSH are encouraging.

### **Proposed work**

The existing system contains two working microcontrollers such as the Raspberry-pi and the Arduino. Which performs various functions with the IOT concept. The proposed system constitute only of

a local home-safety application. Using a GSM module, the network is linked to a user and the arduino. This is very well a cost efficient than IOT and for a small scale use.

### **Development of leakage detection system**

Leakage in a system makes resource losses occur at thermal power plants, water distribution systems, overhead tanks, boilers etc. Leakage can occur due to ageing infrastructure and environmental conditions, which should be detected. Due to these losses it is required to develop a system which can detect leakage in water, gas, oil etc. This paper presents a wireless leakage detection system using various sensors and microcontroller which makes system portable and Non-Destructive techniques (NDT). In this system the parameters like humidity, temperature, pressure, sound detection and gas detection around leakage areas are detected using sensors and arduino microcontroller. The sensed data is acquired and transmitted via ZigBee and processed over GUI developed in LabVIEW transferred to a webpage.

### **Proposed work**

The working and the concept are very similar to the proposed abstract. This project isn't made complicated and includes only one factor that involves the detection of Gas. Gas leakage holds as the motive to prevent any hazard through the leak. A GUI is yet to be developed which will constitute on the improvised system. In this system, a message is delivered to the user through the GSM Module which works on an active and registered user mobile network.

### **ROBODEM Remote Monitoring System Using Web/Mobile Applications**

This paper presents a remote monitoring system using website and mobile application for detecting explosive gases. The ROBODEM (ROBOt Detection Explosive Materials) system aims to develop a remotely controlled explosive gas detection system handled by a LEGO Mindstrom NXT robot. The main controller has been designed using arduino uno microcontroller. This robot comes with an IP camera for live video streaming, Gas detection system using MQ6 and MQ5 sensors, as well as GPS receiver for live tracking. This robot can be controlled either indoor using Bluetooth or outdoor using the Internet. The system provides information regarding ROBODEM such as sensors results, current location of the robot, current time and date. This system produces an alarm and a popup window appears in the website if there is leakage of explosive gases. ROBODEM has a live tracking of the robot's path that shown in Google map. The prototype has been tested experimentally and the results are analyzed and discussed.

### **Proposed Work**

This project consists of an Arduino board as taken on the previous abstract. This system does not work on the internet, but works with a network implementation. It consists of an MQ5 Sensor that detects the presence of the methane gas. This sensed gas, sends a message to the user through the GSM module network concept. The improvised version of this project will work on the use of internet and an application and also location tracking.

## **SPECIFICATON**

### **Introduction**

#### **Purpose**

It mainly focuses on creating an accident free home by giving alerts to the people who live in the house about any of the hazards that is about to take place through sensor detection, so that proper precautions could be taken in immediate affect to prevent loss

#### **Project Scope**

The circuit is basically on the gas sensor and the Programmable Integrated Circuit (PIC). The gas sensor could be treated, basically as variable resistor which value depends on gas concentration in air .This sensor have high sensitivity. The gas sensor chosen is MQ5. It can detect gas concentration in the air from 100 to 3000ppm. 500 ppm will be set as the dangerous level. This sensor will be connected directly and controlled by a microcontroller. Arduino Board UNO is chosen to make detector highly efficient. Arduino Board UNO also will be integrated to the GSM modem by using MAX232 as the connector. Whenever the reading of the sensors exceeding the limit set, it will automatically send an SMS alert wirelessly by using the GSM Modem through GSM Network to the numbers as being set on the coding.

### **Overall Description**

#### **Project features**

SMS based LPG gas leakage detection system using GSM has application in various areas like home, industries, hotels, hospitals. This project has a gas leakage detector implemented by using an LPG Gas sensor. When there is a gas leak detected by the sensor and there are chances of any hazards, the Sensor reports an input to the GSM module. The module then sends a message as programmed. The user can get remote indication through SMS sent from the project. This SMS is sent from GSM modem which is connected to the microcontroller.

#### **User classes and characteristic**

- This project can be used in Industries, Home and Hospitals.
- This project is easy to use and it gives a remote indication to the user about the LPG leakage with the help of SMS indication.

#### **Operating Environment**

Gas sensor is use to detect the presence of a dangerous LPG leak in your home, hotel, car or in a service station, storage tank environment. This unit can be easily incorporated into an alarm unit, to sound an alarm or give a visual indication of the LPG concentration. The sensor has excellent sensitivity combined with a quick response time. The sensor can also sense iso-butane, propane, LPG.

#### **Design and implementation constraints**

The designing constraints can be specified in such a way that this project cannot include more external devices such as a buzzer, since the board does not contain enough ports and cannot withstand more power load. The system does not have much User info security since this sends only a simple text message without the use of internet. The improvised version of this project will include high user security and a proper Android application which can uphold the information.

#### **External Interface Requirements**

##### **User Interface**

User receives SMS indication in their mobile with the help of GSM modem connected to the Arduino Uno board. To receive the message, user does not require any internet connectivity, and hence can be worked in any mobile platform.

##### **Hardware Interface**

- Installing the Arduino to the PC
- Interfacing LPG sensor to Arduino
- Interfacing GSM module to Arduino
- Interfacing LED to Arduino

##### **Software Interface**

Develop code in the Arduino Software for app and message delivery in C++ and Upload code to Arduino using a system.

##### **Communication Interface**

GSM Module is a wireless module .it is a complete dual band GSM/GPRS solution in a SMT Module which can be embedded in the application. It will compute a SIM of a registered network which will thus send the message as per the requirements of the user.

## Other Function Requirements

### Performance Requirements

This project focuses more on the project development based on the gas sensor. The microcontroller will continuously receive the data from the sensor in analog packet of data. It will process the data and convert it to ppm respectively. The converted data will be checked continuously by the Microcontroller. Whenever the reading of the sensor exceeding the limit set, it will automatically send an SMS alert wirelessly by using GSM Network to the numbers as being set on the source code. The detection system the MQ5 gas sensor is used which is sensible to LPG, isobutene and propane gases. This sensor sends a signal (digital pulse) to the microcontroller when gas is being leaked. An alert message is sent through the GSM to the user.

## MODULE DESCRIPTION

### Introduction

MQ-5 Semiconductor Sensor for Combustible Gas Sensitive material of MQ-5 gas sensor is SnO<sub>2</sub>, which with lower conductivity in clean air. When the target combustible gas exist, the sensors conductivity is higher along with the gas concentration rising. We use simple electrocircuit, convert change of conductivity to correspond output signal of gas concentration. MQ-5 gas sensor has high sensitivity to Methane, Propane and Butane and could be used to detect both Methane and Propane. The sensor could be used to detect different combustible gas especially Methane, it is with low cost and suitable for different application.

Ideal gas sensor is used to detect the presence of a dangerous LPG leak in your car or in a service station, storage tank environment. This unit can be easily incorporated into an alarm unit, to sound an alarm or give a visual indication of the LPG concentration. The sensor has excellent sensitivity combined with a quick response time. The sensor can also sense iso-butane, propane, LNG and cigarette smoke. If the LPG sensor senses any gas leakage from storage the output of this sensor goes low. This low signal is monitored by the microcontroller and it will identify the gas leakage. Now the microcontroller is turn on LED and Buzzer. After few milliseconds delay, it also turn on exhaust fan for throwing gas out and continue send messages as „GAS LEAKAGE“ to a mobile no. written in c-code.

### Installation of Arduino to the PC

Installation of Arduino to the PC is done using an USB cable which is compatible for the port in the board. Download the latest version of the Arduino IDE for your operating system from the following link: <http://arduino.cc/en/Main/Software>. Please note that if you will be using the LabVIEW Interface for Arduino toolkit that the last supported IDE version for the toolkit is 1.0.5. Extract the downloaded files to C:\Program Files. Attach the Arduino Uno to the PC using a USB cable.

Windows will attempt to install drivers for the Arduino but will not be able to find the correct drivers. To confirm if the driver was installed or not, open the Windows Device Manager. In Windows 7, this can be done on clicking on Start, selecting Control Panel, and selecting Device Manager. Right click the Arduino Uno and select Properties. Click the Driver tab on the Arduino Uno properties window, then click Update Driver... Choose Browse my computer for driver software. Browse to C:\Program Files\Arduino-xxxx\drivers. The Arduino Uno should now be listed under Ports(COM&LPT) in the

### Interfacing of LPG Sensor to Arduino

There are different kinds of GSM modules available in market. We are using the most popular module based on Simcom SIM900 and Arduino Uno for this tutorial. Interfacing a GSM module to Arduino is pretty simple. You only need to make 3 connections between the gsm module and arduino. So lets get to business.

A GSM Module is basically a GSM Modem (like SIM 900) connected to a PCB with different types of output taken from the board – say TTL Output (for Arduino, 8051 and other microcontrollers) and RS232 Output to interface directly with a PC (personal computer). The board will also have pins or provisions to attach mic and speaker, to take out +5V or other values of power and ground connections. These type of provisions vary with different modules. Lots of varieties of GSM modem and GSM Modules are available in the market to choose from. For our project of connecting a gsm modem or module to arduino and hence send and receive sms using arduino – its always good to choose an arduino compatible GSM Module – that is a GSM module with TTL Output provisions.

### **Interfacing the GSM Module to Arduino**

There are two ways of connecting GSM module to arduino. In any case, the communication between Arduino and GSM module is serial. So we are supposed to use serial pins of Arduino (Rx and Tx). So if you are going with this method, you may connect the Tx pin of GSM module to Rx pin of Arduino and Rx pin of GSM module to Tx pin of Arduino. GSM Tx → Arduino Rx and GSM Rx → Arduino Tx. Now connect the ground pin of arduino to ground pin of gsm module. So in our code, pin number 9 will act as Rx of Arduino and 10 will act as Tx of Arduino. Lets get to the configuration part of program inside setup. The first task is to set baud rates of SoftwareSerial library to communicate with GSM module. We achieve this by invoking mySerial.begin function. Our second task is to set the baud rate of Arduino IDE's Serial Monitor. We do this by invoking Serial.begin function. Both should be set at the same baud rate and we use 9600 bits/second here in our tutorial. Configuration part is over with setting baud rates and its good to give a small delay of 100 milli seconds.

### **Developing code to the Board**

CheckGas() – is the function which monitors occurrence of a gas leak 24×7. This function fetches the gas level measured by MQ35 (by reading digital out of MQ35 using digitalRead() command) and stores it to the variable Gas\_alert\_val for comparison. If there is no 'gas leak' – the sensor out will be HIGH. If there occurs a 'gas leak' at any point of time, the sensor out will immediately change to LOW status. The statement if(Gas\_alert\_val==LOW) checks this and if a gas leak occurs, then an inner subroutine SetAlert() will be invoked.

SetAlert() is the function that controls number of SMS alerts sent to each mobile number loaded in the program. The number of SMS alerts sent can be altered by changing the stopping condition of while loop. The stopping condition sms\_count<3 – means 3 SMS alerts will be sent to each mobile number.. In addition to sending SMS alerts, this subroutine also controls the sound alarm. The alarm is invoked using command digitalWrite(speaker,HIGH) – which will activate the speaker connected at pin 8 of arduino.

## **CONCLUSION AND FUTURE WORKS**

### **Conclusion**

The system provides control action by closing the regulator knob, after that the system sends a alert message to the user and fire station within short time of leakage. It has more advantageous function than the existing system thus the real-time automatic approach is proposed in case of rebooking of cylinder. This monitoring and detection system is proposed mainly to meet the safety standards and to avoid fire accidents because of leakage.

### **Future Works**

This monitoring system can be further enhanced by using Bluetooth in place of GSM to send the alert messages to user, which supports the another real-time application. For industrial purposes mobile robot can be developed for detecting multiple gas concentrations. Addition to gas sensor temperature sensor can also be used which detects the high pressure gas in cylinder pipe, display the alert SMS when high temperature is reached. For a high data security and storage of user information, an android application can be developed which will increase user interfacing and data safety. This can be done by using a raspberry-pi board which can work with the internet as well. This can help to build up the efficiency and usability.