GSM BASED FIRE ALERT & GAS LEAKAGE DETECTOR SYSTEM

A Project and Thesis submitted in partial fulfillment of the requirements for the Award of Degree of
Bachelor of Science in Electrical and Electronic Engineering

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FACULTY OF ENGINEERING

DAFFODIL INTERNATIONAL UNIVERSITY

November 2018

Certification

This is to certify that this project and thesis entitled "GSM BASED FIRE ALERT & GAS LEAKAGE DETECTOR SYSTEM" is done by the following students under my direct supervision and this work has been carried out by them in the laboratories of the Department of Electrical and Electronic Engineering under the Faculty of Engineering of Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science in Electrical and Electronic Engineering. The presentation of the work was held on Oct 2018.

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Dedicated to

Our Parents

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List of Abbreviations

GSM	Global System for Mobile
LPG	Liquefied Petroleum Gas
LCD	Liquid Crystal Display
NGV	Natural Gas Vehicle
SMS	Short Message Service
LED	Light Emitting Diodes
MD	Material Dispersion
RMS	Root Mean Square
IoT	Internet of Things
IDE	Integrated Development Environment
WSN	Wireless Sensor Network
SMD	Surface Mounted Device
VCC	Voltage Common Collector
ADC	Analog-to-Digital Converter
DO	Digital Out
AO	Analog Out
EEPROM	Electrically Erasable Programmable Read Only Memory
UART	Universal Asynchronous Receiver-Transmitter
CMOS	Complementary Metal-Oxide-Semiconductor
GPRS	General Packet Radio Service

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ABSTRACT

This project is about designing a fire alert and gas leakage warning system via GSM. In this project microcontroller system, sensors, GSM module and several other devices are used by me. The detector is based on the commercial gas sensor from Hanwei Electronics Co. Ltd, Temperature Sensor by National Semiconductor and LCD alphanumeric display. This system uses Microchip microcontroller as a tool to collect input data, process and release output data. Microcontroller system is connected with input and output devices consist of LCD display and GSM module. This project will be a reference material to the future student or consumer in order to understand usage of a microcontroller and make use of its features. Reprogramming function of the microcontroller is enabled in order to allow user to explore and experience how to program a microcontroller. Output and input device are presented in such interactive way to actually show how microcontroller does the controlling part of the project.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Fire accident is a common incident in factories, houses, markets in every country. Due to poor fire extinguishing arrangement, lack of adequate fire alarm and emergency exit, it increases death and wreck. When it comes to security issues, we cannot take it for granted. Security is the level of protection against danger and loss. Nowadays, in a world that full of technology, people needs the help of technology to provide early warning alert to ensure they have enough time to avoid danger. In designing this project, the dangerous sources that have been highlighted are about gas leakage and fire. This is because both of these can become a huge disaster if the security procedure is not taken early. To minimize fire accident our project will act as a sentinel which is control from a central console room. For detection we used a high sensitive smoke detector by which microcontroller will get high pulse at input pin which is preprogrammed for our desired output signal.

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 as well as fire. Whenever gas leakage or fire occurs, the sensors used in the circuit will detect it and the GSM modem will send out an SMS alert to the user and also to the nearest fire station. 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, near the Natural Gas Vehicle (NGV) tank in mobile cars or any places thinks required.

1.2 OBJECTIVES :

- Specific fire location monitoring from central control room;
- To save unwanted accident due to careless movement for fire;
- To reduce fire damages;
- The presence of natural Gas as well as fire;
- Send an SMS alert to the user and nearest fire station;

1.3 APPLICATION

At any factory, hoses, housing area as well as markets it is necessary to aware about fire incident. Home security-can be used in homes (especially kitchen area) to prevent accidents due to gas leakage and fire. Industrial security- can be used in sensitive areas to prevent any accidents

Enhancement – can be enhanced to measure specific gas levels to use in industrial application.

Automation – can be enhanced to automate electrical cut off process to prevent short circuit.

1.4 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

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 as well as fire. Besides that, it is also capable to send out an SMS alert automatically to the owner and also to the nearest fire station.

1.5 SCOPE OF PROJECT

- The circuit is basically on the gas sensor, temperature sensor and the Programmable Integrated Circuit (PIC). The gas sensor and temperature sensor could be treated, basically as variable resistor which value depends on gas concentration in air and temperature changes respectively. Both of these sensors have high sensitivity.

- The gas sensor chosen is MQ2. It can detect gas concentration in the air from 300 to 5000ppm. 1000 ppm will be set as the dangerous level.

- The sensor used to detect the fire is LM35 heat sensor. It can detect temperature changes from -55°C up to 150°C. After calibrating the sensor, it will only measure from 0°C to 100°C. 55°C will be set as fire burning starting temperature.

- These sensors will be connected directly and controlled by a microcontroller. PIC16F1938 is chosen to makes the detector much simpler.

1.6 CONCLUSION

This project focuses more on the study case and the project development based on the gas and temperature sensor. The microcontroller will continuously receive the data from both of the sensor in analog packet of data. It will process the data and convert it to ppm and degree Celsius respectively. The converted data will be displayed by the LCD. Whenever the reading of the sensors 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 project methodology shows the step by step taken in order to complete the project. The methodology includes the planning, the development of the design and the management of the project.

1.7 PROJECT OUTLINE

This project is organized by follow:

Chapter 1 introduces the project "GSM BASED FIRE ALERT AND GAS LEAKAGE DETECTOR". Also explain its objective, problem and future scope.

Chapter 2 reviews the literature of the fire alert & gas leakage detector using microcontroller and gsm module.

Chapter 3 analyzes and deals with the monitoring components the circuit diagram gives an overview of the whole system. Then each of the component is studied individually. Their purpose in the system is explained along with connection.

Chapter 4 describes the hardware development part of the different unit of the project. Also describe the basic operation GSM module.

Chapter 5 we discussed about MQ2 gas sensor which we use in this project as a significant component.

Chapter 6 presents the result and its discussions. How it's works and discussed working principle of our project. It summarizes the logic involved in the complete operation of the microcontroller. In this chapter we discussed about advantage of our project.

CHAPTER 2

LITERATURE REVIEWS

2.1 Introduction

The combination of gas and heat sensors 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 or fire occurred. 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.

2.2 Design / Analysis

First the sensor will sense the temperature and then other leakage on the basis of gas density which is then sent to the microcontroller in the form of electrical signal and further through programming/coding fed in arduino, a signal will be sent to the peripheral components and a specific message will be mobile number and also a buzzer will be activated. This fault randomly occurred the system will be action is to give a piezo alarm on and cell phone call to the security panel members.

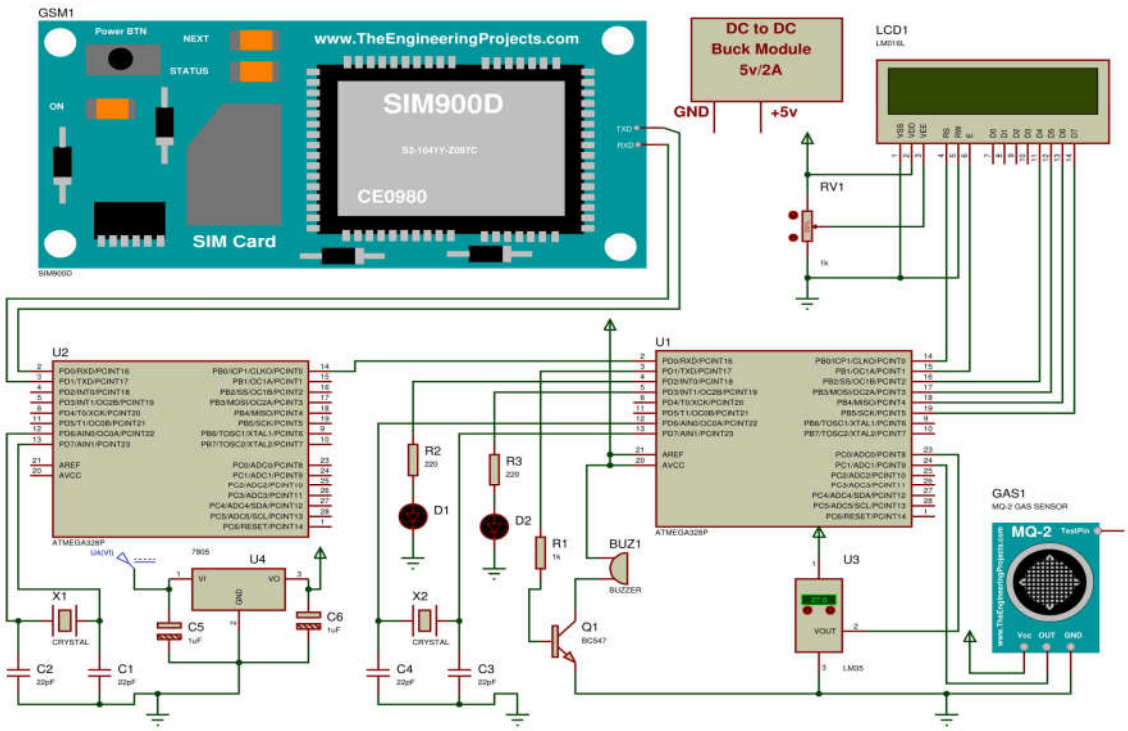


Fig. 2.1 GSM based fire alert & gas leakage detector system circuit diagram

2.3 Block Diagram

ATmega328:

The Atmega has high performance and function with simplicity. That can be reprogrammed. That is why it is called the brain of arduino board. It stores the code. It take 5V to operate.

LIQUID CRYSTAL DISPLAY:

The measured values are shown with the LCD. LCD is used for displaying the value of voltage, current, power and sunlight.

A6 GSM Module

The A6 GSM Module is a mini GSM/GPRS core development board based on GPRS A6 module. It supports dual-band GSM/GPRS network, available for GPRS and SMS message data remote transmission. The board features compact size and low current consumption. With

power saving technique, the current consumption is as low as 3mA in sleep mode. It communicates with microcontroller via UART port, supports command including GSM 07.07, GSM 07.05 and Ai-Thinker enhanced AT Commands.

MQ-2 Gas Sensor

Sensitive for LPG, propane, hydrogen Output voltage boosts along with the concentration of the measured gases increases. Fast response and recovery. Features boost circuit. Adjustable sensitivity. Signal output indicator.

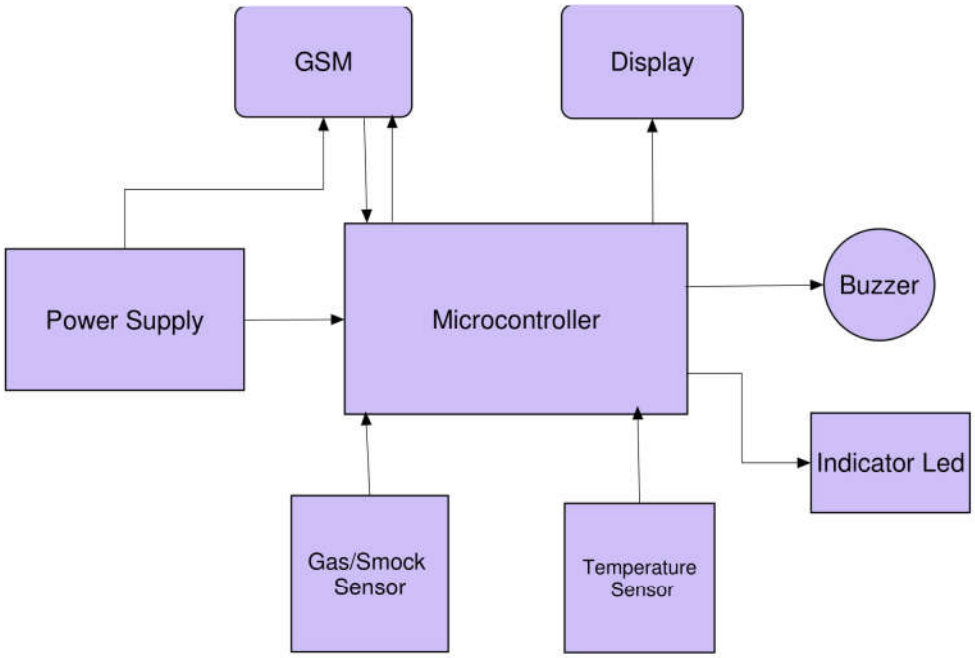


Fig. 2.2 GSM based fire alert & gas leakage detector system circuit diagram

LM35 Temperature Sensor

The LM35 temperature sensor is used to detect precise centigrade temperature. The output of this sensor changes describes the linearity. The o/p voltage of this IC sensor is linearly comparative to the Celsius temperature. The operating voltage range of this

LM35 ranges from-55˚ to +150˚C and it has low-self heating. This is operated under 4 to 30 volts

2.4 Summary

It is about the introduction of the GSM based fire alert and LPG gas leakage detector using microcontroller with SMS alert. The hardware used in the project and writing the information about the specifications of the each module is been used to make in a systematic format. Specifies about the description of the software tools used in the project, thus giving the clear view of the design procedure.

CHAPTER 3

HARDWARE IMPLEMENT

3.1 ATMEGA 328P MICROCONTROLLER

3.1.1 Introduction

The Atmel® picoPower® ATmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR® enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega328/P achieves throughputs close to 1MIPS per MHz. This empowers system designed to optimize the device for power consumption versus processing speed

3.1.2 Feature

High Performance, Low Power Atmel®AVR® 8-Bit Microcontroller Family

• Advanced RISC Architecture

– 131 Powerful Instructions

– Most Single Clock Cycle Execution

– 32 x 8 General Purpose Working Registers

– Fully Static Operation

– Up to 20 MIPS Throughput at 20MHz

• High Endurance Non-volatile Memory Segments

– 32KBytes of In-System Self-Programmable Flash program Memory

– 1KBytes EEPROM

– 2KBytes Internal SRAM

– Write/Erase Cycles: 10,000 Flash/100,000 EEPROM

– Data Retention: 20 years at 85°C/100 years at 25°C(1)

• In-System Programming by On-chip Boot Program

• True Read-While-Write Operation

– Programming Lock for Software Security

Atmel-42735B-328/P_Datasheet_Summary-11/2016• Peripheral Features

– Two 8-bit Timer/Counters with Separate Prescaler and Compare Mode

– Real Time Counter with Separate Oscillator

– Six PWM Channels

– 8-channel 10-bit ADC in TQFP and QFN/MLF package

• Temperature Measurement

– 6-channel 10-bit ADC in PDIP Package

• Temperature Measurement

– Two Master/Slave SPI Serial Interface

– One Programmable Serial USART

– One Byte-oriented 2-wire Serial Interface (Philips I2C compatible)

– Programmable Watchdog Timer with Separate On-chip Oscillator

• Special Microcontroller Features

– Power-on Reset and Programmable Brown-out Detection

– Internal Calibrated Oscillator

– External and Internal Interrupt Sources

Extended Standby

• I/O and Packages

– 23 Programmable I/O Lines

– 28-pin PDIP, 32-lead TQFP, 28-pad QFN/MLF and 32-pad QFN/MLF

• Operating Voltage:

– 1.8 - 5.5V

• Temperature Range:

– -40°C to 105°C

• Power Consumption at 1MHz, 1.8V, 25°C

– Active Mode: 0.2mA

– Power-down Mode: 0.1µA

– Power-save Mode: 0.75µA (Including 32kHz RTC

3.1.3 Description

The Atmel AVR® core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in a single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers.

The ATmega328/P provides the following features: 32Kbytes of In-System Programmable Flash with Read-While-Write capabilities, 1Kbytes EEPROM, 2Kbytes SRAM, 23 general purposes I/O lines, 32 general purpose working registers, Real Time Counter (RTC), three flexible Timer/Counters with compare modes and PWM, 1 serial programmable USARTs, 1 byte-oriented 2-wire Serial Interface (I2C), a 6- channel 10-bit ADC (8 channels in TQFP and QFN/MLF packages), a programmable Watchdog Timer with internal Oscillator, an SPI serial port, and six software selectable power saving modes. The Idle mode stops the CPU while allowing the SRAM, Timer/Counters, SPI port, and interrupt system to continue functioning. The Power-down mode saves the register contents but freezes the Oscillator, disabling all other chip functions until the next interrupt or hardware reset. In Power-save mode, the asynchronous timer continues to run, allowing the user to maintain a timer base while the rest of the device is sleeping. The ADC Noise Reduction mode stops the CPU and all I/O modules except asynchronous timer and ADC to minimize switching noise during ADC conversions. In Standby mode, the crystal/resonator oscillator is running while the rest of the device is sleeping. This allows very fast start-up combined with low power consumption. In Extended Standby mode, both the main oscillator and the asynchronous timer continue to run.

Atmel offers the QTouch® library for embedding capacitive touch buttons, sliders, and wheels functionality into AVR microcontrollers. The patented charge-transfer signal acquisition offers robust sensing and includes fully denounced reporting of touch keys and includes Adjacent Key Suppression® (AKS™) technology for unambiguous detection of key events. The easy-to-use QTouch Suite toolchain allows you to explore, develop and debug your own touch applications.

The device is manufactured using Atmel's high-density non-volatile memory technology. The On-chip ISP Flash allows the program memory to be reprogrammed In-System through an SPI serial interface, by a conventional nonvolatile memory programmer, or by an On-chip Boot program running on the AVR core.

The Boot program can use any interface to download the application program in the Application Flash memory. Software in the Boot Flash section will continue to run while the Application Flash section is updated, providing true Read-While-Write operation. By combining an 8-bit RISC CPU with In-System

Self-Programmable Flash on a monolithic chip, the Atmel ATmega328/P is a powerful microcontroller that provides a highly flexible and cost-effective solution to many embedded control applications.

The ATmega328/P is supported with a full suite of program and system development tools including C Compilers, Macro Assemblers, Program Debugger/Simulators, In-Circuit Emulators, and Evaluation Kits.

3.1.4 Configuration Summary

Table 3.1: Description of ATmega328p microcontroller

Features	Quantity
Pin Count	28/32
Flash (Bytes)	32K
SRAM (Bytes)	2K
EEPROM (Bytes)	1K
Interrupt Vector Size (instruction word/vector)	1/1/2
General Purpose I/O Lines	23
SPI	2
TWI (I2C)	1
USART	1
ADC	10-bit 15kSPS
ADC Channels	8
8-bit Timer/Counters	2
16-bit Timer/Counters	1

And support a real Read-While-Write Self-Programming mechanism. There is a separate Boot Loader

Section, and the SPM instruction can only execute from there. In , there is no Read-While-Write support

and no separate Boot Loader Section. The SPM instruction can execute from the entire Flash.

3.1.5 BLOCK DIAGRAM

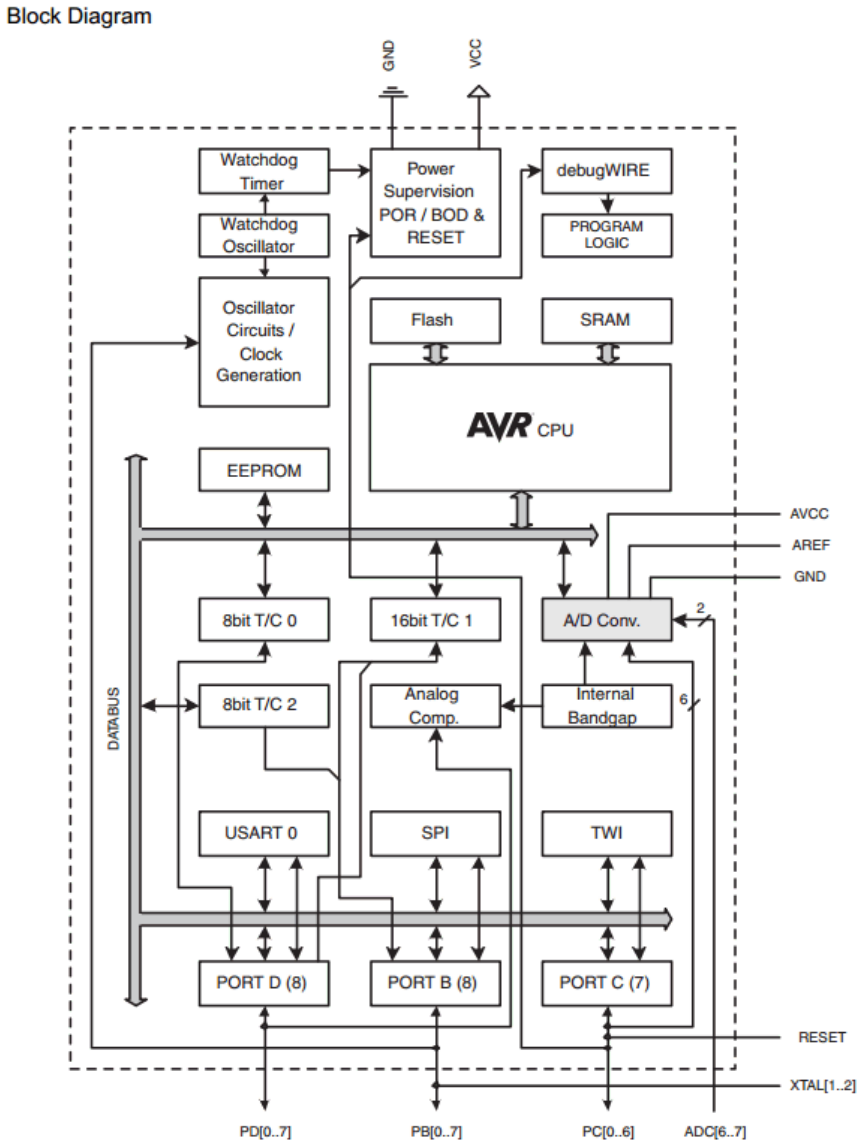


Fig 3.1: ATmega328p Microcontroller Block Diagram

3.1.6 Pin Configuration

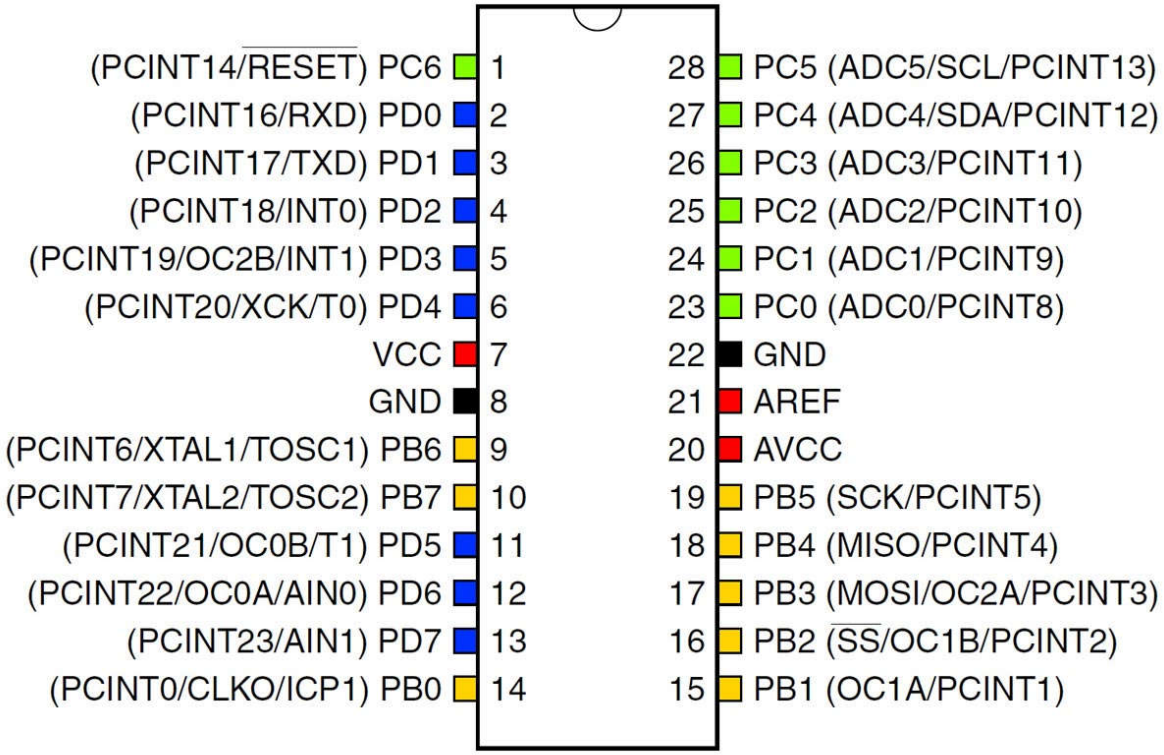


Fig 3.2: ATmega328p Microcontroller Pin Diagram

3.1.7 Pin Description

VCC

Digital supply voltage.

GND

Ground.

Port B (PB[7:0]) XTAL1/XTAL2/TOSC1/TOSC2

Port B is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port B output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port B pins that are externally pulled low will source current if the pull-up resistors are activated. The Port B pins are tri-stated when a reset condition becomes active, even if the clock is not running. Depending on the clock selection fuse settings, PB6 can be used as input to the inverting Oscillator amplifier and input to the internal clock operating circuit. Atmel ATmega328/P [DATASHEET] Atmel-42735B-328/P_Datasheet_Summary-11/2016 12

Depending on the clock selection fuse settings, PB7 can be used as output from the inverting Oscillator amplifier. If the Internal Calibrated RC Oscillator is used as chip clock source, PB[7:6] is used as TOSC[2:1] input for the Asynchronous Timer/Counter2 if the AS2 bit in ASSR is set.

Port C (PC[5:0])

Port C is a 7-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The PC[5:0] output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port C pins that are externally pulled low will source current if the pull-up resistors are activated. The Port C pins are tri-stated when a reset condition becomes active, even if the clock is not running.

PC6/RESET

If the RSTDISBL Fuse is programmed, PC6 is used as an I/O pin. Note that the electrical characteristics of PC6 differ from those of the other pins of Port C. If the RSTDISBL Fuse is unprogrammed, PC6 is used as a Reset input. A low level on this pin for longer than the minimum pulse length will generate a Reset, even if the clock is not running. Shorter pulses are

not guaranteed to generate a Reset. The various special features of Port C are elaborated in the *Alternate Functions of Port C* section.

Port D (PD[7:0])

Port D is an 8-bit bi-directional I/O port with internal pull-up resistors (selected for each bit). The Port D output buffers have symmetrical drive characteristics with both high sink and source capability. As inputs, Port D pins that are externally pulled low will source current if the pull-up resistors are activated. The Port D pins are tri-stated when a reset condition becomes active, even if the clock is not running.

AVCC

AVCC is the supply voltage pin for the A/D Converter, PC[3:0], and PE[3:2]. It should be externally connected to VCC, even if the ADC is not used. If the ADC is used, it should be connected to VCC through a low-pass filter. Note that PC[6:4] use digital supply voltage, VCC.

AREF

AREF is the analog reference pin for the A/D Converter.

ADC[7:6] (TQFP and VFQFN Package Only)

In the TQFP and VFQFN package, ADC[7:6] serve as analog inputs to the A/D converter. These pins are powered from the analog supply and serve as 10-bit ADC channels. (Ref-4)

3.1.8 Applications

Atmega is started commonly used by us from the year of 2013 in many project and system. The chip called Arduino Uno models and Arduino pro mini is getting popular for different projects.

3.1.9 Summary

The 5v version can run by 16MHz and the 3.3v version is run by 8MHz. There is also a version with an adjustable regulator that support 3.3v and 5v via a jumper setting.

3.2 GSM MODULE A6

3.2.1 Introduction

With the blooming development of IoT (Internet of Things), more and more people are dedicated to pursue their own IoT dreams. However traditional IoT technologies are mainly evolved on the basis of Wi-Fi features, which leads to a barrier of development related to Geo-limitations that IoT projects cannot be implemented in to outdoor. In light of the popularity of bike-shared system, GSM Data Communication has been reconsidered as the best choice for outdoor IoT solution. The Gravity: A6 GSM & GPRS Module is a new GSM & GPRS communication module presented by DFRobot. Differ from traditional IoT developing modules, Gravity: A6 GSM & GPRS Module enables its functions depend on GSM instead of Wi-Fi. It can make a call and send text message with a small and portable GSM SIM card. This technological advantage expand the space of IoT application area, especially for the outdoor scene. In addition, you can DIY a telephone with a 3.5mm headphone port; it also works well in different situations with onboard 1500uF electrolytic capacitor and without any external power supplies even in the instantaneous high current . The module Uart port level is only 2.8V, which means it is compatible with Arduino, Raspberry-Pi and other controllers.

3.2.2 Feature

- Operating temperature -30 ℃ to + 80 ℃;
- 1KG peak suction
- Low standby current
- Operating Voltage 3.3V-4.2V;
- Power voltage> 3.4V;
- Standby average current 3ma less;
- Support the GSM / GPRS four bands, including 850,900,1800,1900MHZ;
- Support China Mobile and China Unicom's 2G GSM network worldwide;
- GPRS Class 10;
- Sensitivity <-105;

- Support voice calls;
- Support SMS text messaging;
- Support GPRS data traffic, the maximum data rate, download 85.6Kbps, upload 42.8Kbps;
- Supports standard GSM07.07,07.05 AT commands and extended commands Ai-Thinker;
- Supports two serial ports, a serial port to download an AT command port;
- AT command supports the standard AT and TCP / IP command interface;
- Support digital audio and analog audio support for HR, FR, EFR, AMR speech coding;
- Support ROHS, FCC, CE, CTA certification;
- SMT 42PIN

3.2.3 Specification

- Quad-band: 850/900/1800/1900 MHz
- GPRS multi-slot: 12, 1 to 12 may be configured
- GPRS mobile station: Class B
- Compatible with GSM Phase 2/2 +: Class 4 (2W @ 850/900 MHz) Class 1 (1W @ 1800 / 1900MHz)
- Supply voltage: 3.3 ~ 4.2V 4.0V typ.
- Current consumption: 1.3mA @ DRX = 5; 1.2mA @ DRX = 9
- AT command control: Standard GSM07.07,07.05 AT commands and extended commands Ai-Thinker
- SIM Application Toolkit
- GPRS Class 10: Up 85.6 kbps (upstream) & 42.8Kbps (downlink)
- PBCCH support
- Coding scheme: CS 1, 2, 3, 4
- Support CSD: Up 14.4 kbps Support USSD
- Stack: PPP / TCP / UDP / HTTP / FTP / SMTP / MUX

3.2.4 Pin Description

Table 4.1: Pin description of GSM Module A6

Pin number	Pin name	Function
1	NC	NC,
2	NC	NC
3	NC	NC, V3 version of hardware for GPIO16
4	NC	NC, V3 version of hardware for GPIO15
5	NC	NC, V3 version of hardware for GPIO14
6	NC	NC, V3 version of hardware for GPIO6,(As a
		network status indicator)
7	NC	NC, V3 version of hardware for GPIO3
8	PWR_KEY	Power button, >1.9V more than 2s to boot;
		After power on ,connecting and
		disconnecting,Both are ok.
9	GPIO1/INT	Used to control the module to enter
		low-power mode, high exit low level
		access, in this mode the standby current
		<1mA .(in this mode ,the serial port
		cannot be used,please note)
10	UART_CTS/GPIO5	UART _CTS pin
11	UART_RTS/GPIO7	UART_RTS pin
12	RST	Module hardware RESET pin, this PIN when
		using low level <0.05V, current is 70ma,
		recommends using NMOS control; Pull
		down mean the module hardware
		shutdown, the pin during normal work
		when there is leakage, will cause the
		module is not stable, it is difficult to

		register network
13	GND	GND
14	SIM_RST	SIM Card RST pin
15	SIM_CLK	SIM card CLK pin
16	VSIM	SIM power pin
17	SIM_DATA	SIM data pin
18	GND	GND
19	MIC-	MIC-
20	MIC+	MIC+
21	MIC2_P	Headphone MIC interface
22	GND	GND
23	EAR_L	Headphones left
24	EAR_R	Headphones right
25	GND	GND
26	REC+	Speaker positive
27	REC-	Speaker negative
28	GND	GND
29	VDD_1V8_OUT	External 1.8V Power pin
30	UART_TXD	UART_TXD,Pin level 2.8V
31	UART_RXD	UART_RXD,Pin level 2.8V
32	HST_RXD	Download serial port RXD Pin,pin level2.8V
33	HST_TXD	Download serial port TXD pin,pin level2.8V
34	GND	GND
35	GSM_RF	Antenna pin,can connect Antenna,if
		connect PCB lin,advice 50ohm cable.
36	GND	GND
37	NC	NC
38	NC	NC
39	GND	GND
40	GND	GND

41	VBAT	External power supply (3.5V-4.2V),
42	VBAT	maximum power supply current > 2A

3.2.5 Block Diagram

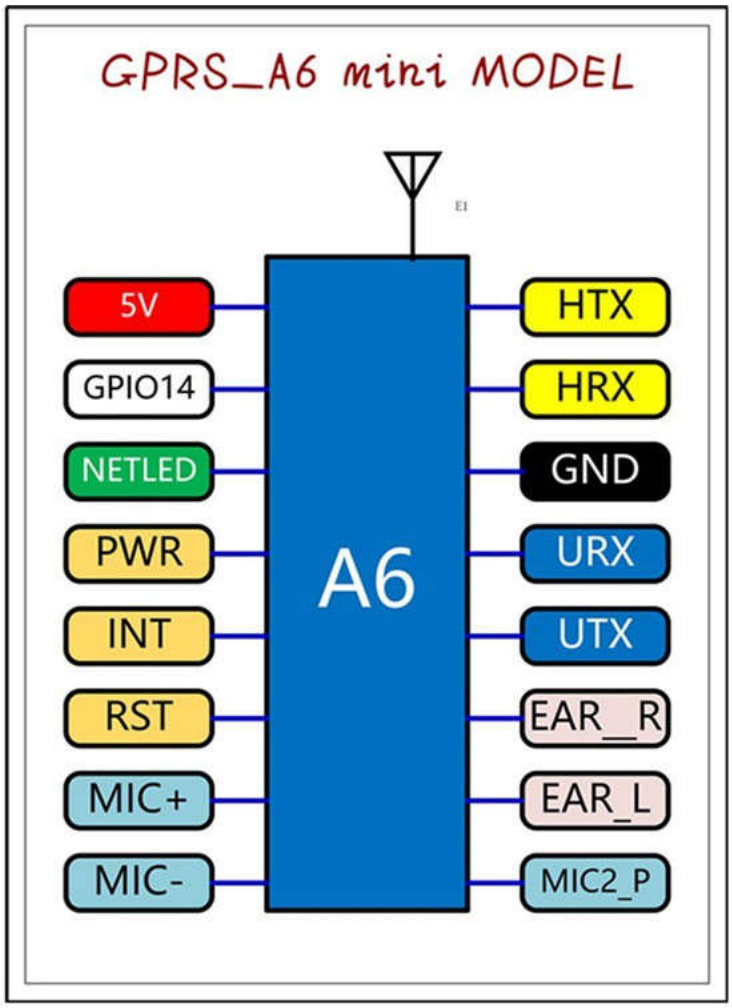


Fig 4.1: GSM Module A6 mini Block Diagram

3.2.6 Application

Wide area coverage: GPRS in 34 provinces have good coverage, it is the prevailing 2Gcommunication standard. Basically you can place phone call are available through the GPRS wireless network;

Always-on: GPRS is activated as long as the application, will remain online, similar to the wireless private line network services.

3.2.7 Summary

In this project we use "A6 mini GSM Module" to receive the signal from temperature sensor and Gas leakage detector. And we became success to apply it in our project

3.3 MQ 2 GAS SENSOR

3.3.1 Introduction

Arduino MQ-2 gas sensor module are used in gas leakage detecting equipment in family and industry, are suitable for detecting of LPG, i-butane, propane, methane ,alcohol, Hydrogen, smoke. [10]

Fig: 5.1: MQ2 SENSORS

Different concentration level for different gases:

Table 5.1: Different of gas level

400-1000ppm- LPG and Propane
300-5000ppm- Butane
5000-2000ppm-Methane
300-5000ppm-H2
100-2000ppm-Alcohol

3.3.2 Feature

1. Wide detecting scope
2. Fast response
3. High sensitivity to combustible gas wide range
4. Stable and long life
5. Simple drive circuit.
6. Low cost and compact size.[10]

The gas sensor senses the analog value according to the concentration of the gas level in the environment. The concentration range of MQ2 gas sensor is 400-1000ppm for LPG and use value of Load resistance (RL) about 20 KO (10KO to47KO). When accurately measuring, the proper alarm point for the gas detector should be determined after considering the temperature and humidity influence. The voltage that the sensor outputs changes accordingly to the smoke/gas level that exists in the atmosphere. The sensor outputs a voltage that is proportional to the concentration of smoke/gas. The resistance of the sensor is different depending on the type of the gas.

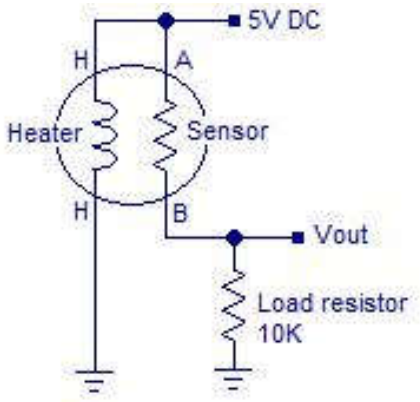


Fig 5.2: MQ2 Gas Sensor Circuit Diagram

MQ2 sensor senses the flammable gases by the increase in temperature when they are oxidized by the heating element. Consider the figure given above. If there is any flammable gas present in the sample, the oxidization of the same gas results in increased temperature and the resistance of the sensor resistor will drop. That means more current will flow through the load resistor and so the voltage across it will shoot up.

3.3.3 Specifications:

- Model: FC-22-A
- Operating voltage: DC 5V
- Analog Output (AO): 0~5V analog output voltage
- Digital Output (DO): 0V or 5V output
- Configuration: Through Potentiometer (adjusts the output level transition)
- Preheat Duration: 20s.[10]
-

3.3.4 MQ2gassensor pin description:

1. VCC (+5V)
2. GND (0V)
3. DO (Digital Out)
4. AO (Analog Out). **[10]**

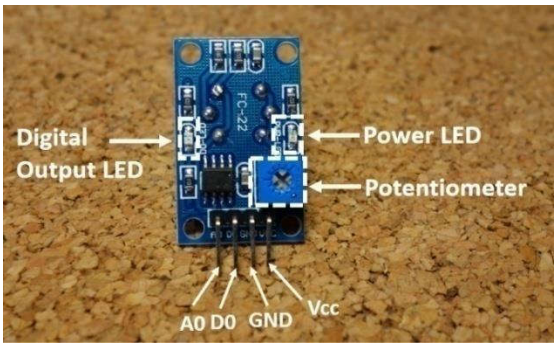


Fig 5.3: MQ2 Gas Sensor Pin description

3.3.5 GAS Sensors–Connection:

All Gas Sensors have 6 pins, whether it is MQ2 (smoke), MQ3 (alcohol), MQ6 (LPG) or MQ7 (carbon monoxide). So, the following details apply to all types of MQ sensors.

This sensor detects the concentrations of combustible gas in the air and output its reading as analog voltage.

MQ-2 gas sensor has high sensitivity to LPG, Propane and Hydrogen, also could be used to Methane and other combustible gas. Sensitive material of MQ-2 gas sensor is Tin Di-Oxide SnO2, which has lower conductivity in clean air. When the target combustible gas exist, MQ 2 senses and its conductivity is higher along with the gas concentration rising.

A simple electronic circuit is used to convert change of conductivity to corresponding output signal of gas concentration. MQ-2 has 6 pins, 4 of them are used to fetch signals, and other 2 are Heater coil used for providing heating current. I can use 5v DC or AC across H – H pins. And as you can see one of H pins goes to the power and the other one is connected to the

ground. The pin A (you can connect both pins A) is connected between the power and the ground. The pin B gets an analog voltage when the sensor is active.

Also across the output, you need the resistor RL. Before you connect the resistor use a potentiometer to tune and get accurate values. Generally RL value is between 20k and 200k.

Fig 5.4: MQ2 Gas Sensor.

Connecting five volts (AC or DC) across the heating (H) pins keeps the sensor hot enough to function correctly. Connecting five volts at either the A or B pins causes the sensor to emit an

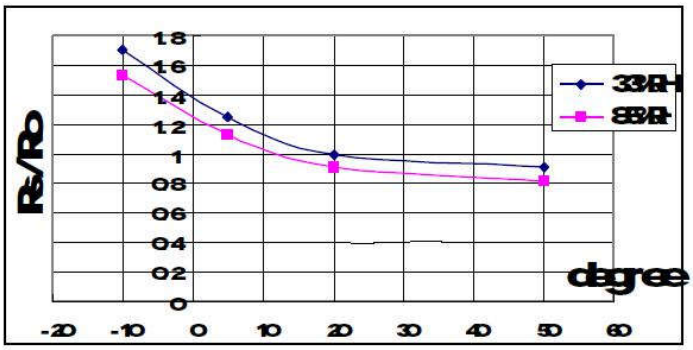
analog voltage on the other pins. A resistive load between the output pins and ground sets the sensitivity of the detector.

3.3.6 Standard Working Condition:

Table 5.2 condition of working sensor

Symbol	Parameter Name	Technical Condition	Remarks
Vc	Circuit voltage	5V±0.1	AC or DC
VH	Heating voltage	5V±0.1	AC or DC
RL	Load resistance	Adjustable	
RH	Heater resistance	33Kohm±5%	Room temperature
PH	Heating consumption	Less than 800mW	

3.3.7 SENSITIVECHARACTERISTICS OF MQ -2 GAS SENSOR:



shows the typical dependence of the MQ-2 on temperature and humidity.
Ro: sensor resistance at 1000ppm of H_2 in air at 33%RH and 20 degree.
Rs: sensor resistance at 1000ppm of H_2 at different temperatures and humidities.

Fig 5.5: The typical sensitivity characteristics of the MQ-2 temperature and humidity

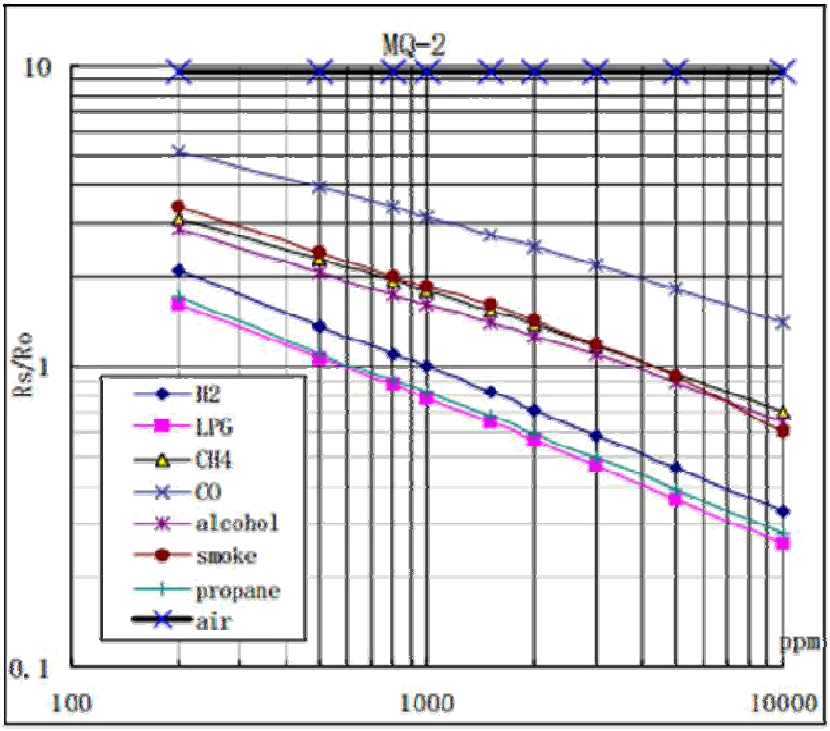


Fig 5.6: The typical sensitivity characteristics of the MQ-2

3.3.8 SENSITIVITY ADJUSTMENT:

Resistance value of MQ-2 is difference to various kinds and various concentration gases. So, when using these components, sensitivity adjustment is very necessary. Recommended that you calibrate the detector for 1000ppm liquefied petroleum gas<LPG>, or 1000ppm iso-butane concentration in air and use value of load resistance that about 20Kilo ohms. When accurately measuring the proper alarm point for the gas detector should be determined after considering the temperature and humidity influence.

3.3.9 APPLICATION OF MQ2 GAS SENSOR :

- Domestic gas leakage detector.
- Industrial combustible gas leakage detector.
- Portable gas leakage detector.

3.3.10 Summary:

The purpose of preset mechatronic system is to provide safe. Reliable, simple and cost effective LPG leakage detection system The circuit designed kit present mechatronic system is simple in comparison wilt other LPG leakage detection system available it market. The components which are used to build the circuit are cost effective and readily available it market. The working of the system is particularly depends on performance of the sensor. Working on the MQ2 sensor is this leakage detection system is irrespective of ambient temperature where the system is installed. The guidelines should be provided while imaging tie system that. Maximum distance between system and leakage site should be I fl. The system is cost effective and can be used in domestic applications Ike kitchens, hotels, Cafeterias, hospitals and trait patties**.**

CHAPTER 4

RESULT AND DISCUSSION

4.1 Introduction

The system is an intelligent system, as it does not create nuisance by continuously sounding alarm but the alarm stops beeping once the concentration of the gas in the atmosphere after leakage goes below the set point and opens the valve again for operations. This work will minimize losses occasioned by explosions due to gas leakages and improve safety of life. In particular gas sensor has been used which has high sensitivity for propane (C3H8) and butane warns by (C4H10sending) leakage However, system the consists former of fire incident gas leakage and sends SMS to the householder. This does not make provision for halting further fire incident and gas leakage. GSM module is used which alert the user by sending an SMS. Another approach uses a smart security phone attached gas leakage sensor that senses leakage and sounds an alert alarm as well as sending a SMS to the home owner and emergency services. The design of a wireless LPG leakage monitoring system is proposed for home safety. This system detects the leakage of the LPG and alerts the consumer about the leak by a SMS and as an emergency measure, the system will turn off the power supply, while activating the alarm. leak detection module consists of MQ-2 gas sensor to detect amount of combustible gas present in the surrounding.

4.2 Result

The experimental model was made according to the circuit diagram and the results were as expected. Testing was carried out by increasing heat around temperature sensor and releasing LPG into the atmosphere around the sensor. The Temperature sensor and gas detector response unit are there to detect it. The results of test carried out on the device at different times and days for concentration of fire or heat and gas in the air around the sensors. The last four values is the case of an endless loop due to high gas concentration. The device was tested placing near to heat and fire and the LPG device at different distances from the gas source. It was observed that when

the heat distance from the device and sensor not sense any heat it response decrease then previous time and the LPG device was test by placing it at different distances from the gas source, the response time of the LPG system decreased as the distance from the gas source increased. Also it was observed that the sensitivity of the temperature sensor and gas sensor was very high in clean air. The gas sensor sensitivity varied with temperature while the reference voltage remained constant over time.

4.3 Advantage of GSM Based Fire Alert Gas leakage Detector

1. It is also detect alcohol so it is used as liquor tester.
2. The sensor has excellent sensitivity combined with a quick fast response time.
3. The system is highly reliable, tamper proof and secure.
4. In the long run the maintenance cost is very less when compared to the present system.
5. It is possible to get instantaneous result and with the high accuracy.

CHAPTER 5

CONCLUSION

5.1 Introduction

conclusion Fire incident is totally unexpected but we could protect or minimize its happening freuency and devastating effect by using an automatic control system. Gas leakages resulting into fatal inferno has become a serious problem in household and other areas where household gas is handled and used. Gas leakage leads to various accidents resulting in financial loss as well as human injuries and loss. This system can be use in the industrial areas (Sub station, Boilar room, dying room, power control room), shopping malls, hospitals, housing areas, ships, universities, garments factories etc. The work aims at designing a system that detects Temperature and gas leakage and alerts this describer through alarm and cell phone message besides turning off the gas supply valve as a primary safety measure.

5.2 Advantage

- This project can be used in home and hotel utility (kitchen) area for safety purpose.
- Useful in domestic lpg water heater.
- Very useful in LPG/CNG fitted car to avoid measure accident.
- Prevent measure accident in gas agencies (gas station) where multi cylinder stored

.

5.3 Future Scopes of the Work

1. The circuit is basically on the gas sensor, temperature and the Programmable Integrated Circuit (PIC). The gas sensor and temperature sensor could be treated, basically as variable resistor which value depends on gas concentration in air and temperature changes respectively. Both of these sensors have high sensitivity.

2. The gas sensor chosen is MQ2. It can detect gas concentration in the air from 300 to 5000ppm. 1000 ppm will be set as the dangerous level.

3. The sensor used to detect the fire is LM35 heat sensor. It can detect temperature changes from -55°C up to 150°C. After calibrating the sensor, it will only measure from 0°C to 100°C. 55°C will be set as fire burning starting temperature.

4. These sensors will be connected directly and controlled by a microcontroller. PIC16F1938 is chosen to makes the detector much simpler.
5. The PIC16F1938 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 5 automatically send an SMS alert wirelessly by using the GSM Modem through GSM Network to the numbers as being set on the coding.

6. All of the circuit, simulations and coding are constructed and performed using Proteus

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Appendix

```
#include<LiquidCrystal.h>
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
int sensor=A1;
int sensor2=A0;
int led1=2
int led2=3
int buzz=3
void setup()
{
  pinMode(sensor,INPUT);
  pinMode(led1,output);
  pinMode(led2,output);
  pinMode(buzz,output);
  lcd.begin(16,2);
  delay(500);
}
void loop()
{
FLOAT temp=analogRead(sensor); // reads the sensor output (Vout of LM35)
FLOAT gas=analogRead(sensor2); // reads the sensor output (mq)
if (temp/2>40){
digitalWrite(led1,HIGH);
digitalWrite(buzz,HIGH);
}else{
digitalWrite(led2,HIGH);
digitalWrite(led1,LOW);
digitalWrite(buzz,LOW);
lcd. print("temp="(temp));
```

```
setcursor(2,1);
lcd. print("Gas="(gas));
}}
```

code.txt

```
#include <SoftwareSerial.h>

int sensor=A1;
float temp_read,Temp_alert_val,Temp_shut_val;
int sms_count=0,Fire_Set;


void setup()
{
  pinMode(sensor,INPUT);
  mySerial.begin(9600);
  Serial.begin(9600);
  delay(500);
}

void loop()
{
CheckFire();
CheckShutDown();
}

void CheckFire()
{
```

```
Temp_alert_val=CheckTemp();
if(Temp_alert_val>45)
{
 SetAlert(); // Function to send SMS Alerts
}
}

float CheckTemp()
{
temp_read=analogRead(sensor); // reads the sensor output (Vout of LM35)
temp_read=temp_read*5;    // converts the sensor reading to temperature
temp_read=temp_read/10;  // adds the decimal point
return temp_read; // returns temperature value in degree celsius
}

void SetAlert()
{
while(sms_count<3) //Number of SMS Alerts to be sent
{
SendTextMessage(); // Function to send AT Commands to GSM module
}
Fire_Set=1;

}

void CheckShutDown()
{
if(Fire_Set==1)
{

Temp_shut_val=CheckTemp();
```

```
if(Temp_shut_val<28)
{

sms_count=0;
Fire_Set=0;
}}}

void SendTextMessage()
{
 mySerial.println("AT+CMGF=1");    //To send SMS in Text Mode
 delay(2000);
 mySerial.println("AT+CMGS=\"+880xxxxxx\"\r"); // change to the phone number you using
 delay(2000);
 mySerial.println("Fire in NEW ROOM!");//the content of the message
 delay(200);
 mySerial.println((char)26);//the stopping character
 delay(5000);

 sms_count++;
}
```