A MAIN PROJECT REPORT

ON

FIRE AND GAS DETECTION SYSTEM FOR HOME AND INDUSTRY SAFTEY USING ARM7 THROUGH ESP8266 WIFI MODULE

Submitted In partial fulfillment of the requirements for the award of

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS & COMMUNICATION ENGINEERING

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Certified by ISO 9001-2015

2022

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CERTIFICATE

This is to certify that project work entitled **"FIRE AND GAS DETECTION SYSTEM FOR HOME AND INDUSTRY SAFTEY USING ARM7 THROUGH ESP8266 WIFI MODULE"** is a bonafide work done and submitted by **M. GOPI (18761A0492), M. SYAM KUMAR (18761A0491), M. NIKITA (18761A0493)** in partial fulfillment of requirement for the award of Bachelor of Technology in Electronics and Communication Engineering in Lakireddy Bali Reddy College Of Engineering, Mylavaram during the academic year 2021-2022.

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ABSTRACT

Now a days development of industries has increased rapidly, due to which the accidents related to industries are also increased. These industrial accidents are caused mainly due to the lack of safety protocols, human interference causing delay while generating safety alarms and these leads to death of many people inside the industry and also the people who stays near by the industry. Similarly accidents at home are also caused due to gas leak, flames occurred at home etc. So, in order to overcome these problems sustainable monitoring and the advanced gas and fire detection of the machines builds the efficient process control in the industrial automation and also for the home safety.

In this project we are developing a system by using LPC2148 which will automatically monitor and generates alerts/alarms without any interference of humans while generating safety alarms. And few sensors are deployed in our project they are fire sensor, smoke sensor and temperature sensor. As soon as the parameters such as fire, smoke and high temperatures are occurred in the industry then the sensors we use in our project will detect them immediately and causes to controls these parameters, such that the preventive measures will be taken so that the workers inside the industries can be evacuated and also here in this respective project we are using ESP8266 so that the people living near the industries can get safety messages about the accident as soon as it occurs in the industry.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

In in this world of expansion security has been an main issue to protect the people from the leakage of harmful gases and to reduce the fire accidents at home and also in the industries. The increasing mechanisation, electrification, chemicalisation and sophistication have made industrial jobs more and more complex and intricate. This has led to increased dangers to human life in industries through accidents and injuries. In fact, the same underlines the need for and importance of industrial safety.

Let us first understand what industrial accident actually means. An accident (industrial) is a sudden and unexpected occurrence in the industry which interrupts the orderly progress of the work. According to the Factories Act, 1948: "It is an occurrence in an industrial establishment causing bodily injury to a person who makes him unfit to resume his duties in the next 48 hours". In other words, accident is an unexpected event in the course of employment which is neither anticipated nor designed to occur. Thus, an accident is an unplanned and uncontrolled event in which an action or reaction of an object, a substance, a person, or a radiation results in personal injury. It is important to note that self-inflicted injuries cannot be regarded as accidents. An industrial injury is defined as "a personal injury to an employee which has been caused by an accident or an occupational disease and which arises out of or in the course of employment and which could entitle such employee to compensation under Workers' Compensation Act, 1923".

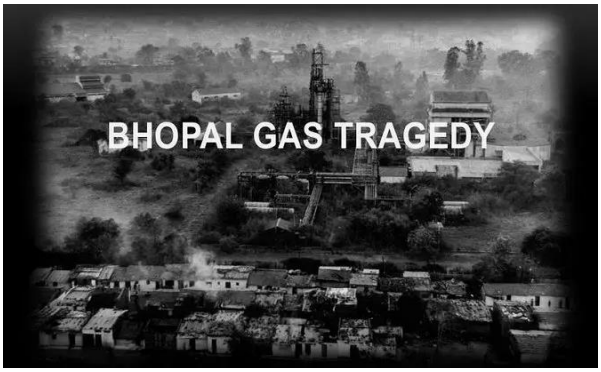


Fig 1.1.1: Bhopal gas tragedy.

In the industrial sector process monitoring and fault determination are important for the safety and reliability of the industrial processes. Now a days only monitoring is performed in most of the super vision system. In the earlier days in the year 1984 Bhopal disaster, also referred as Bhopal gas tragedy which is the first industrial disaster. It is also known as the worst industrial accident in the history killed more than 15,000 people and also affected over 6,00,000 workers. Few months before the occurrence of the tragedy MIC (Methyl Isocyanate) was in the process of production and was being filled in the tanks. None of the tanks were allowed to be filled than half of its capacity. The pressurization led to the liquid MIC to be pumped out of each tank about 30 tonnes of MIC from the tank has escaped into the atmosphere within a hour. Due to this there were many side effects and are still continuing to this year 2022.

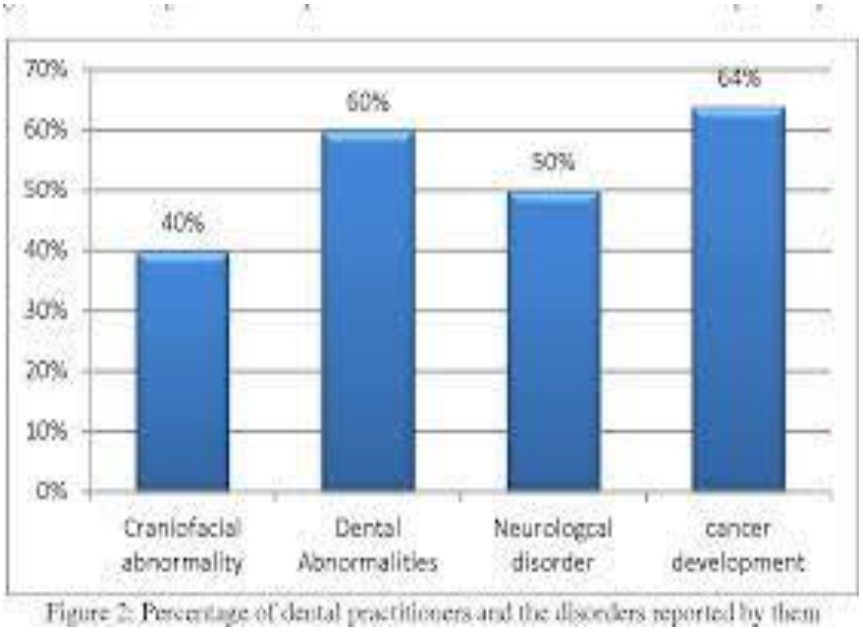


Figure 2: Percentage of dental practitioners and the disorders reported by them

Fig: 1.1.2 Graph of side effects caused due to the tragedy.

Recently we came across a gas leak at LG Polymers, Visakhapatnam in the year 2020. There were two chemical tanks that had been left unattended, due to Covid-19 lockdown. Since March 2020 these malfunctioning of the tanks refrigerating unit has led to rapid increase in temperature caused chemical to evaporate and caused the death of 11 people also due to the

exposure of the gas more than 1000 people became sick. Absence of safety protocol, emergency response has led to LG Polymers gas leak. Alarm system in the plant was present but they were not used.

Fig 1.1.3: Vizag gas leak

1.2 CAUSES OF INDUSTRIAL ACCIDENTS:

The industrial safety experts have classified the various causes of accidents into three broad categories:

1. Unsafe Conditions

2. Unsafe Acts

3. Other Causes?

These are discussed, in brief.

1. Unsafe Conditions (work-related):

Unsafe working conditions are the biggest cause of accidents. These are associated with detective plants, tools, equipment's, machines, and materials. Such causes are known as 'technical causes'. They arise when there are improper guarded equipment's, defective equipment's, faulty layout and location of plant, inadequate lighting arrangements and ventilation, unsafe storage, inadequate safety devices, etc. Besides, the psychological reasons such as working overtime, monotony, fatigue, tiredness, frustration and anxiety are also some

other causes that cause accidents. Safety experts identify that there are some high danger zones in an industry. These are, for example, hand lift trucks, wheel-barrows, gears and pulleys, saws and hand rails, chisels and screw drivers, electric drop lights, etc., where about one-third of industrial accidents occur.

2. Unsafe Acts:

Industrial accidents occur due to certain acts on the part of workers. These acts may be the result of lack of knowledge or skill on the part of the worker, certain bodily defects and wrong attitude.

Examples of these acts are:

(a) Operating without authority.

(b) Failure to use safe attire or personal protective equipment's,

(c) Careless throwing of material at the work place.

(d) Working at unsafe speed, i.e., too fast or too low.

(e) Using unsafe equipment, or using equipment's unsafely.

(f) Removing safety devices.

(g) Taking unsafe position under suspended loads.

(h) Distracting, teasing, abusing, quarrelling, day-dreaming, horseplay

(i) One's own accident prone personality and behaviour.

3. Other Causes:

These causes arise out of unsafe situational and climatic conditions and variations. These may include excessive noise, very high temperature, humid conditions, bad working conditions, unhealthy environment, slippery floors, excessive glare, dust and fume, arrogant

behaviour of domineering supervisors, etc. Industrial accidents have become common happening in our country. A brief catalogue of major accidents in the recent past in India is produced here:

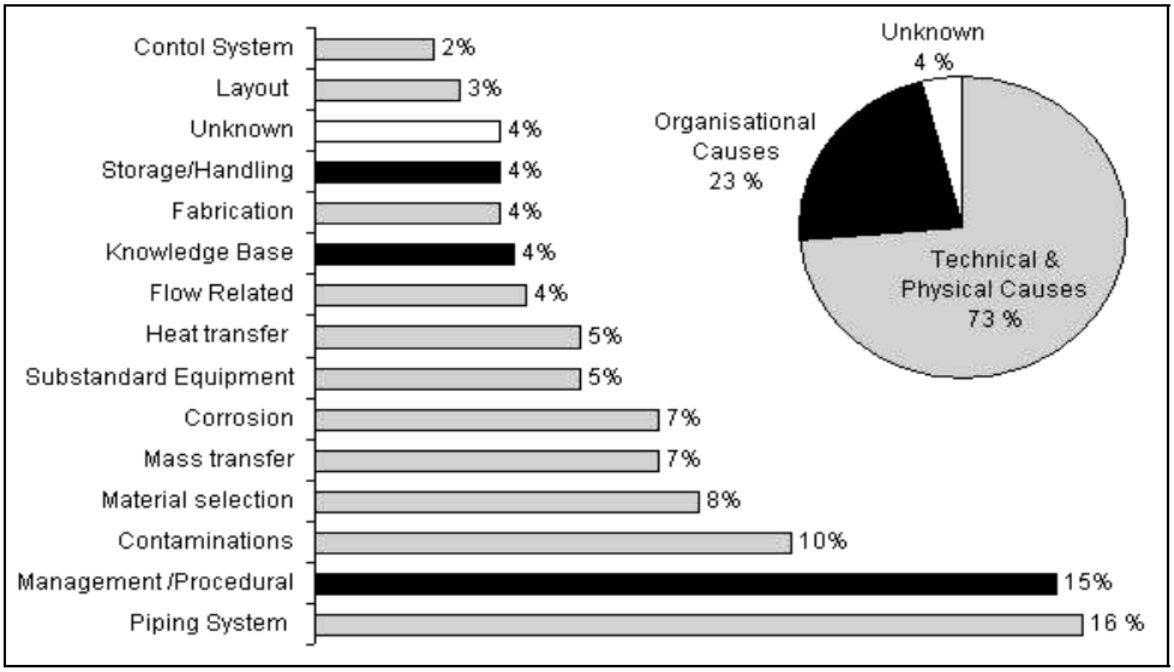


Figure1: The general (pie chart) and immediate (bar chart) causes of accident.

Fig 1.2.1: Pie chart and bar chart for the causes of accidents

Major Accidents in the Last Decade:

- Bhopal, December 1984: In world's worst chemical disaster, a methylisocyanate gas leak from the Union Carbide plant in the city killed over 4000 people. Thousands suffered irreversible health damage.

- Delhi, December 1985: An oleum gas leak from the Sriram Foods and Fertilisers Plant in Delhi severely affected workers and those living in the neighbourhood.

- Rourkela, December 1985: Blast furnace accident in Rourkela Steel Plant. 18 workers affected.

- Durgapur, June 1987: Chlorine leak at Durgapur Chemical Factory created panic all around. Long distance trains were halted. Over 100 were affected.

- Bombay, November 1988: Fire at the Bharat Petroleum Refinery at Mahul, north-east Bombay, killed 32.

- Ramagunaam, September 1989: Major gas leak at Fertilisers Corporation of India unit at Ramagundam, killed 7.

- Nagothane, November 1990: Explosion at the Indian Petrochemicals, Nagothane complex, 35 persons killed, over 50 suffered 70 per cent bums.

- Bombay, July 1991: Accident in a Hindustan Organic Chemicals unit near Bombay kills 7 workers.

- Gwalior, December 1991: Blast at the dyeing department of GRASIM unit at Gwalior. 14 Killed and 22 severely injured.

- Panipat, August 1992: Ammonia leak at the National Fertilisers Plant, Panipat killed 11, many injured.

- Kahalgaon, October 1992: Boiler explosion in the National Thermal Power Corporation (NTPC), 11 killed and several injured.

It is reported that in every twenty seconds of every working minute of every hour throughout the world, someone dies as a result of an industrial accident. Industrial accidents cause losses to the employees and organisations as well. Table 1.2.2 gives an idea about the enormous losses that accidents have caused to the industrial establishments in our country.

Date of Occurence	*Name of the Organisation*	*Estimated Loss (Rs in crore)*
29-01-87	Madras Ref. Manali	4.85
11-11-87	HPL Refinery, Vizag.	3.40
09-01-88	JK Synthetics	6.92
20-09-88	Monica Electronics	3.86
05-05-88	Zenith Chem., Tarapur	4.00
30-08-88	IOC, Mathura	4.63
07-09-88	IEL, Gomia	5.00
09-11-88	BPCL	9.00
02-02-89	IPCL, Baroda	41.82
09-02-89	IAAI, Bombay	43.00
23-02-89	Voltas, Warora	5.00
08-01-95	ONGC, Pasarlapudi well blowout	41.44

Table 1.2.2: Accidents—Estimated Loss:

Accidents causing losses to the industrial establishments need to be avoided. Adequate safety measures can avoid accidents.

1.3 PROBLEM DEFINITION:

As the technology has increased the development of the alarm systems in the industry has also increased. Due to the lack of immediate safety protocols and alarms different industrial disasters has occurred. To avoid this, we are introducing smart industrial automation and fault detection system this leads to the reduction of the human interference while generating safety alarms. Introduction of set of devices for monitoring and fault detection systems can reduce the damage in the industries and also the deaths that occur in the industry due to leakage of harmful gases, fire, harmful smoke these parameters are detected by using different sensors such as fire sensor, smoke sensor, temperature sensor and to turn on the alarms as soon as they are detected.

1.4 OBJECTIVE:

The main objective of our project is

- To detect toxic gas leakage, fire and smoke
- To reduce the probability of the human error.
- To provide financial and time savings for the business.
- To prevent major accidents that causes any huge damages.
- To send alert messages when disaster occurs

1.5 HARDWARE SPECIFICATIONS:

- LPC2148 ARM Microcontroller
- Temperature Sensor
- LM35 Sensor
- MQ2 Sensor
- Fire Sensor
- Water pump
- Cooling fan
- Buzzer
- Motor driver
- Esp8266 Wi-fi Module

1.6 SOFTWARE SPECIFICATIONS:

- Think speak cloud
- Embedded Language in c

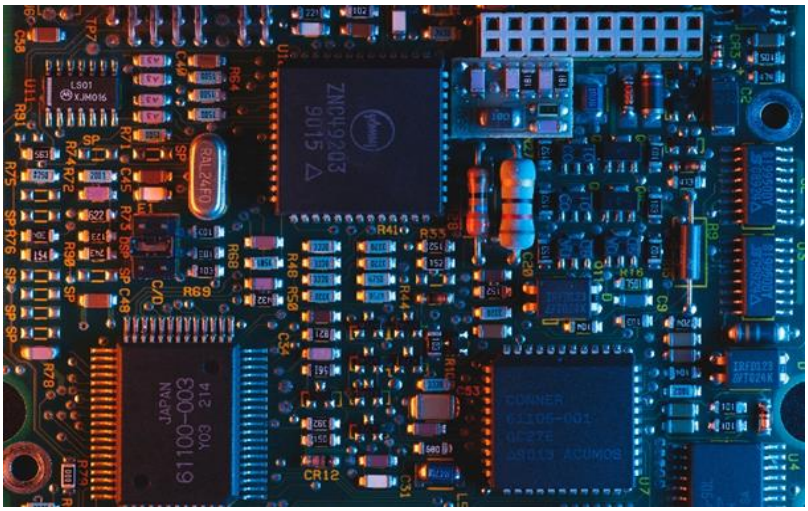
1.6.1 INTRODUCTION TO EMBEDDED SYSTEM:

Embedded systems are small, fast, and very powerful tools and types of equipment. It is a combination of computer software and hardware which is either fixed in capability or programmable. It is mainly designed for functions within a larger system.

As the name tells, Embedded means nothing but which is attached to another thing. An embedded system can be as similar as computer hardware system which is having software already embedded in it. An embedded system either called as an independent system or it is a part of a larger system. An embedded system can be a microcontroller or microprocessor based system which is designed to perform some specific tasks. For example, let us take a fire alarm, it is an embedded system which will sense only smoke.

An embedded system consists of three components -

- It has hardware.
- It has application software
- It has Real Time Operating system (RTOS) which will supervises the application software and then it will provide mechanism to let the processor run as per the schedule by following a plan to control the latencies. RTOS are nothing but which defines the way the system works. It will set the rules during the execution of application program. RTOS may not be present in small scaled embedded system.



- Embedded programming **s**oftware is used to program special-purpose computer systems which are designed to perform one task or several dedicated functions. So by

using the embedded systems application software in the project it will be more beneficial for the working of the circuit by means of all the instructions given which are embedded in the software programming part.

- So an embedded system can be defined as a Microcontroller based, software driven, reliable, real-time control system.

1.6.2 ADVANTAGES OF EMBEDDED SYSTEMS:

- Customizable is very easy
- Power consumption is very low
- Highly enhanced performance
- Size is very small
- Real time device
- The devices are portable
- It has very high speed in which it completes the given task in nano seconds
- Delivers constant reaction

1.6.3 BASIC STRUCTURE OF AN EMBEDDED SYSTEM:

Fig 1.6.3: Basic structure of an embedded system

- **Sensor:** A device which is used to measure the physical quantity and made it to be converted to an electric signal. This signal is being read by using an observer and few electronic instruments such as A/D Converter.
- **A/D Converter:** A/D means Analog to Digital Converter. The sensor will send some Analog signals in which these Analog signals will be converted into digital signals by using the A/D Converter.
- **Processor and ASICs:** Processor is used to process the required data which is used to measure the output and is stored in the memory.
- **D/A Converter:** D/A means Digital to Analog Converter. The processor will fed some digital signals, these digital signals are converted into Analog signals with the help of D/A Converter.
- **Actuator:** Output will be generated at the D/A converter. This generated output is compared with the actual or expected output stored in it with the help of actuator and stores the approved output.

1.6.4 CHARACTERSTICS OF EMBEDDED SYSTEMS:

- Low cost
- Task specific which means it is designed for one specific task
- Time specific
- Minimal user interface
- High efficiency
- High reliability
- Highly stable
- Power consumption is very minimal
- Secondary memory in a computer is not required
- To connect input and output devices, they must be connected with peripherals
- It consists of easy and diskless operations

By means of all these features and Characteristics, embedded systems came into picture to develop the project in which it is the main and core part of the project in order to get the desired results after building the project. And also the cost of the ARM7 microcontrollers used in the project are low of and cost and highly efficient. All these terms are made into consideration for building the project and the outcome that was expected is as much as replicable with the outcome that came out of using the embedded systems.

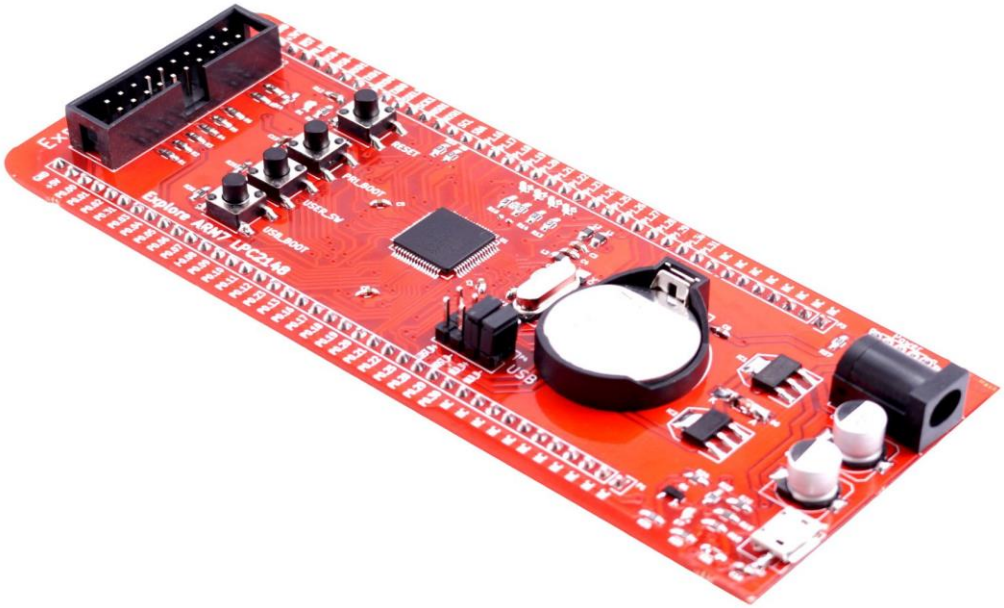


Fig 1.6.4: Image of LPC2148 Microcontroller.

- A microcontroller is necessary to carry the input data from different sensors.
- Cost and power consumption in microcontrollers are very low.
- A microcontroller will make the entire circuit more compact.
- Nowadays most of the electronic devices consists of microcontrollers.

CHAPTER 2
LITERATURE SURVEY

In this section will discuss about the existing research work implemented based on fire and gas detection system for home and industries.

[1] Industrial accidents or accidents at home related to fire, smoke and high temperatures which may lead to fire accidents causes death of many people. According to the research paper published in the year 2019 in IEEE conference paper titled "GAS LEAK AND FIRE DETECTION SYSTEM USING RASPBERRY PI" This paper presents the growth in the industrial monitoring system's design using Internet of Things (IoT). The sensor used for the development of this system is MQ-2 which detects the leak age of gas at any atmospheric condition and fire sensor as a simple and compact device for protection against fire. In gas sensor system, Raspberry pi plays an important role such that all the components are interfaced to it. This avails the observer to notice the changes from anywhere in the world. The requirement of a gas detection system is to monitor the surroundings continuously. When gas and smoke is detected then system will send short message service (S MS) to the user then user will take respective action. This paper mainly focuses on the detection of gas leak and fire. The main disadvantage of using this technique is there are no control measures and only gas leakage and fire is detected. So this paper is mainly focusing on the detection of fire as well as gas leak.

[2] According to the research paper published in the year 2017 in IEEE conference paper titled "HOME BASED FIRE MONITORING AND WARNING SYSTEM" Fire warning system is important system towards securing homes and organization. Lot of research work and system developed towards Fire warning system which includes vision, image processing and so. But all these systems are not economical and affordable by every home owner in developing countries. So according to this we here have developed an Arduino based Fire monitoring and alarm system for home owner's primarily as to protect homes from any property loss, human loss from fire incident. This system driven by Arduino is economical and cheaper which can be deployed in all homes, but this paper

mainly focuses on the detection of fire accidents that occur at home using Arduino and sends the alert message using GSM. Main disadvantage is that there is no temperature sensor and there are no control measures. It may lead to economical loss as there are no control measures.

[3] Control measures also plays a key role for the purpose of safety. According to the research paper published in the year 2021 in IEEE conference paper titled "HOME & INDUSTRIAL SAFTEY USING FIRE & GAS DETECTION SYSTEM" using Arduino uno leakage of harmful gases at home such as gas from the gas cylinders and in different chemical industries leakage of harmful gases such as sulfur dioxide, carbon monoxide all these harmful gases are detected, also fire accidents that occur at home or industries are also detected. 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. the MQ-2 and flame sensor simultaneously collect data from the environment and then transfer it to the Arduino UNO board in the form of analog inputs. The Arduino board then check the inputs and act according to it. The major disadvantage of this project is there are no control measures it mainly focuses only on detection of fire and harmful gases.

[4] According to this research paper named 'HOME SECURITY ALARM USING WEMOS D1 AND HC-SR501 SENSOR BASED TELEGRAM NOTIFICATION' Home Security Alarms in today's modern society only use CCTV that can only see the person without any notification that goes into the cellphone in dealing with the theft that occurred. To help the community in dealing with the theft that enters the house, a Home Security Alarm was made using WEMOS D1 and HC-SR501 Sensor with Telegram Notification. The whole tool is divided into several parts which consist of HC-SR501 Sensor, WEMOS D1 and Buzzer. This tool works when the WEMOS D1 microcontroller processes the pear sensor as a motion detector and buzzer as a sound alarm if motion is detected, then the notification automatically enters into the Telegram Application, with this tool can monitor directly if anyone enters the house while being left.

[5] According to the research paper in IEEE conference paper titled 'DETECTOR LEAKAGE GAS LPG BASED ON TELEGRAM NOTIFICATION

USING WEMOS D1 AND MQ-6 SENSOR' in this paper Based on the test results of the National Standardization Agency (BSN), as much as 66% of the gas cylinders tested were found to be unfit for use was studied. Along with the increasing use of LPG gas, the quality of gas cylinder products has decreased, and the need for supervision of gas cylinder products from the manufacturer, so it cannot cause danger was studied. Gas leaks most often come from the gap between the mouth of the tube and the regulator so that it can cause pollution to the polluted room. LPG gas leak detection device can be made remotely. Created a LPG gas leak detection system based on Wemos D1 microcontroller using telegram notification. The whole tool is divided into several parts which consist of mq-6 sensor, ESP8266-01S module, wemos d1 microcontroller, and buzzer. This tool works when the ESP8266-01S module searches for the nearest internet network and the mq-6 sensor detects lpg gas, from the ESP8266-01S module and mq-6 sensor then to the Wemos D1 microcontroller to process, from the Wemos D1 microcontroller then activates the buzzer as a warning alarm that then transfer data through the ESP8266-01S module to the website and give notification of a gas leak to the smartphone of the user of the device. The mq-6 sensor functions if the gas content value is above 80. The results show that the gas content value is more than 80 as detected lpg gas, because it has tested the system and when there is no lpg gas the gas content value is less than 80.

CHAPTER 3

SYSTEM ANALYSIS AND DESIGN

3.1 BLOCK DIAGRAM

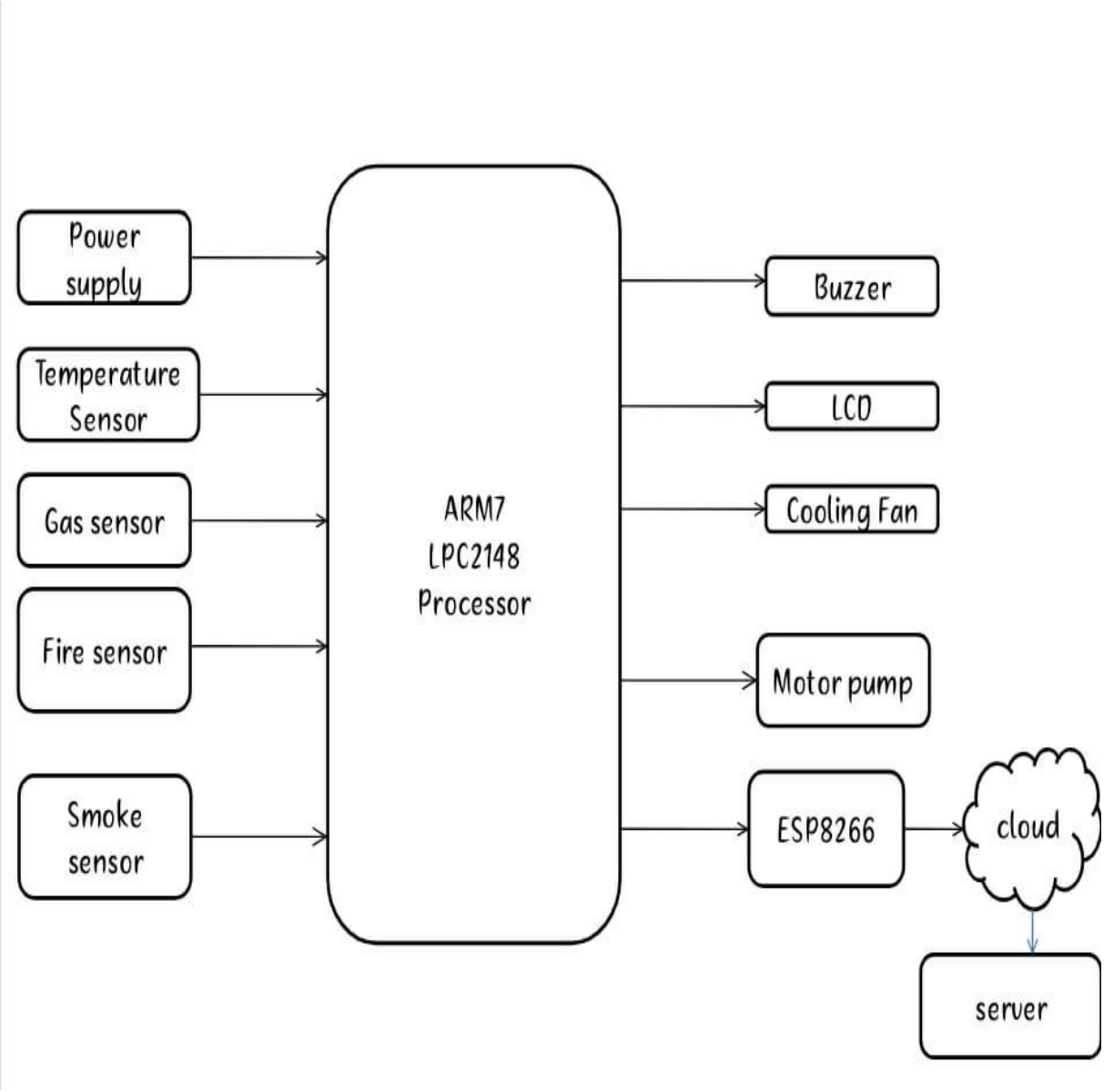


Fig 3.1: Block diagram

3.2 LPC2148 ARM Microcontroller

The LPC2148 microcontrollers depends on a 16-bit/32-bit ARM7TDMI-S CPU with constant copying and inserted follow support, that join the microcontroller with installed high velocity streak memory going from 32 kB to 512 kB. A 128-digit wide memory interface and remarkable gas pedal design empower 32-cycle code execution at the greatest clock rate. For basic code size applications, the elective 16-bit Thumb mode decreases code by more than 30% with insignificant execution punishment. Because of their minuscule size and low force utilization, LPC2148 are ideal for applications where scaling down is a key necessity, for example, access control and retail location. Sequential correspondences interfaces going from a USB 2.0 Full-speed gadget, different UARTs, SPI, SSP to I2C-transport and on-chip SRAM of 8 kB up to 40 kB, make these gadgets very appropriate for correspondence passages and convention converters, delicate modems, voice acknowledgment and low end imaging, giving both huge cushion size and high preparing power. Different 32-digit clocks, single or double 10-cycle ADC(s), 10-bit DAC, PWM channels and 45 quick GPIO lunes with up to nine egde or level delicate outside intrude on pins make these microcontrollers appropriate for mechanical control and clinical frameworks.

3.2.1 Features

- 16-bit/32-bit ARM7TDMI-S microcontroller in a tiny LQFP64 package.
- 8 kB to 40 kB of on-chip static RAM and 32 kB to 512 kB of on-chip flash memory. 128-bit wide interface/accelerator enables high-speed 60 MHz operation.
- Single power supply chip with POR and BOD circuits.
- In-System Programming/In-Application Programming (ISP/IAP) via on-chip boot loader software. Single flash sector or full chip erase in 400ms and programming of 256B in 1ms.
- Embedded ICE RT and Embedded Trace interfaces offer real-time debugging with the on-chip Real Monitor software and high-speed tracing of instruction execution.
- One or two (LPC2141/42 vs. LPC2148) 10-bit ADCs provide a total of 6/14 analog inputs, with conversion times as low as 2.44 ms per channel.

- Single 10-bit DAC provides variable analog output (LPC2142/44/46/48 only).
- Two 32-bit timers/external event counters (with independent power compare channels each), PWM unit (six outputs) and watchdog.
- Low power Real-Time Clock (RTC) with independent power and 32 kHz clock input.
- Multiple serial interfaces including two UARTs (16C550), two Fast I2C-bus (400 Kbit/s).
- Up to 21 external interrupt pins available.
- 60 MHz maximum CPU clock available from programmable on-chip PLL with settling time of 100ms.
- On-chip integrated oscillator operates with an external crystal from 1 MHz to 25 MHz
- Power saving modes include idle and Power-down.
- CPU operating voltage range of 3.0 V to 3.6 V (3.3 V+ 10%) with 5 V tolerant I/O pads.
- Individual enable/disable of peripheral functions as well as peripheral clock scaling for additional power optimization.

3.2.2 Ordering information

Type number	Package		
	Name	Description	Version
LPC2141FBD64	LQFP64	plastic low profile quad flat package; 64 leads; body 10 × 10 × 1.4 mm	SOT314-2
LPC2142FBD64			
LPC2144FBD64			
LPC2146FBD64			
LPC2148FBD64			

Table 3.2.2: Ordering Information

3.2.3 Block diagram

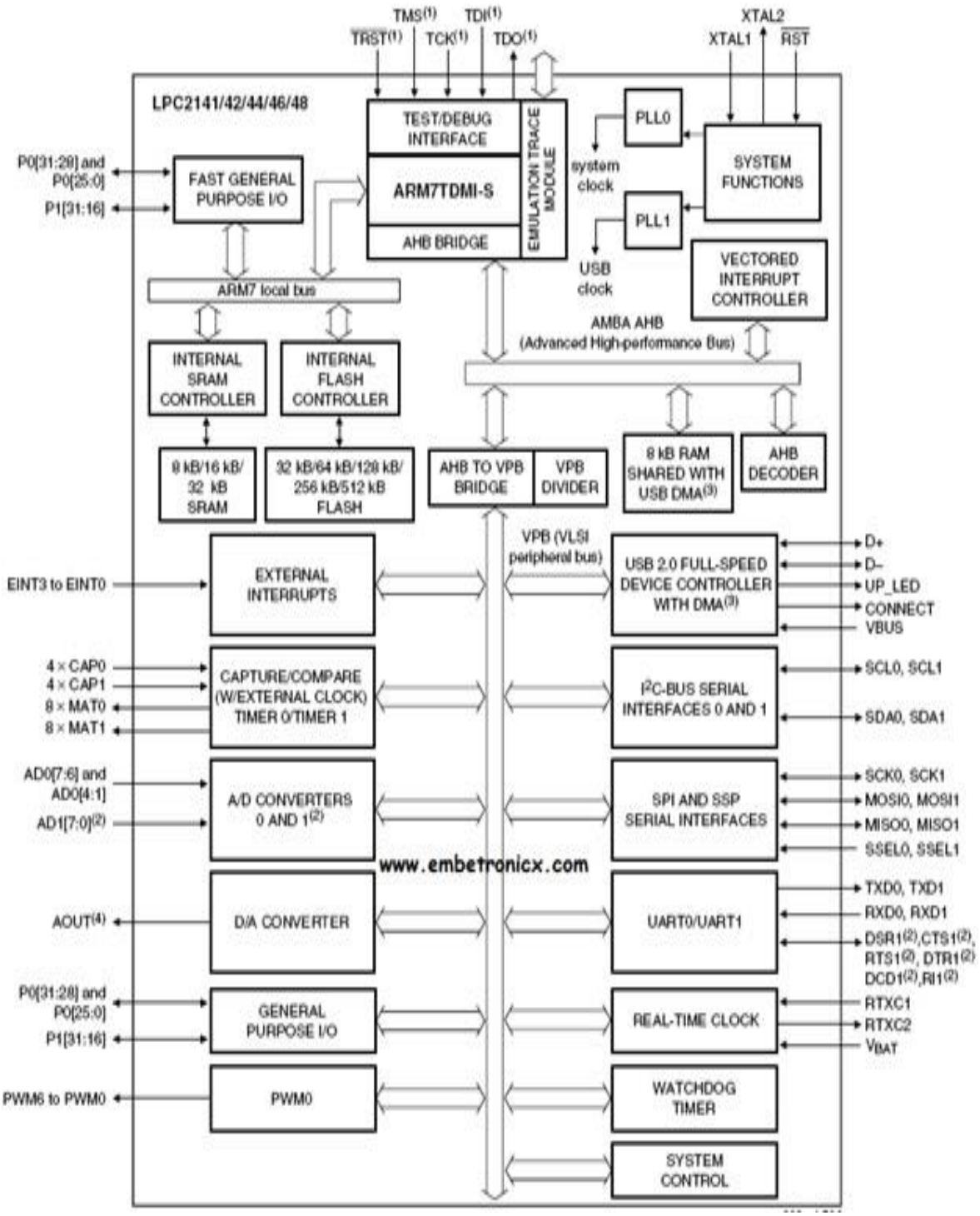


Figure 3.2.3 : LPC2148 Block Diagram

3.2.4 Pin diagram

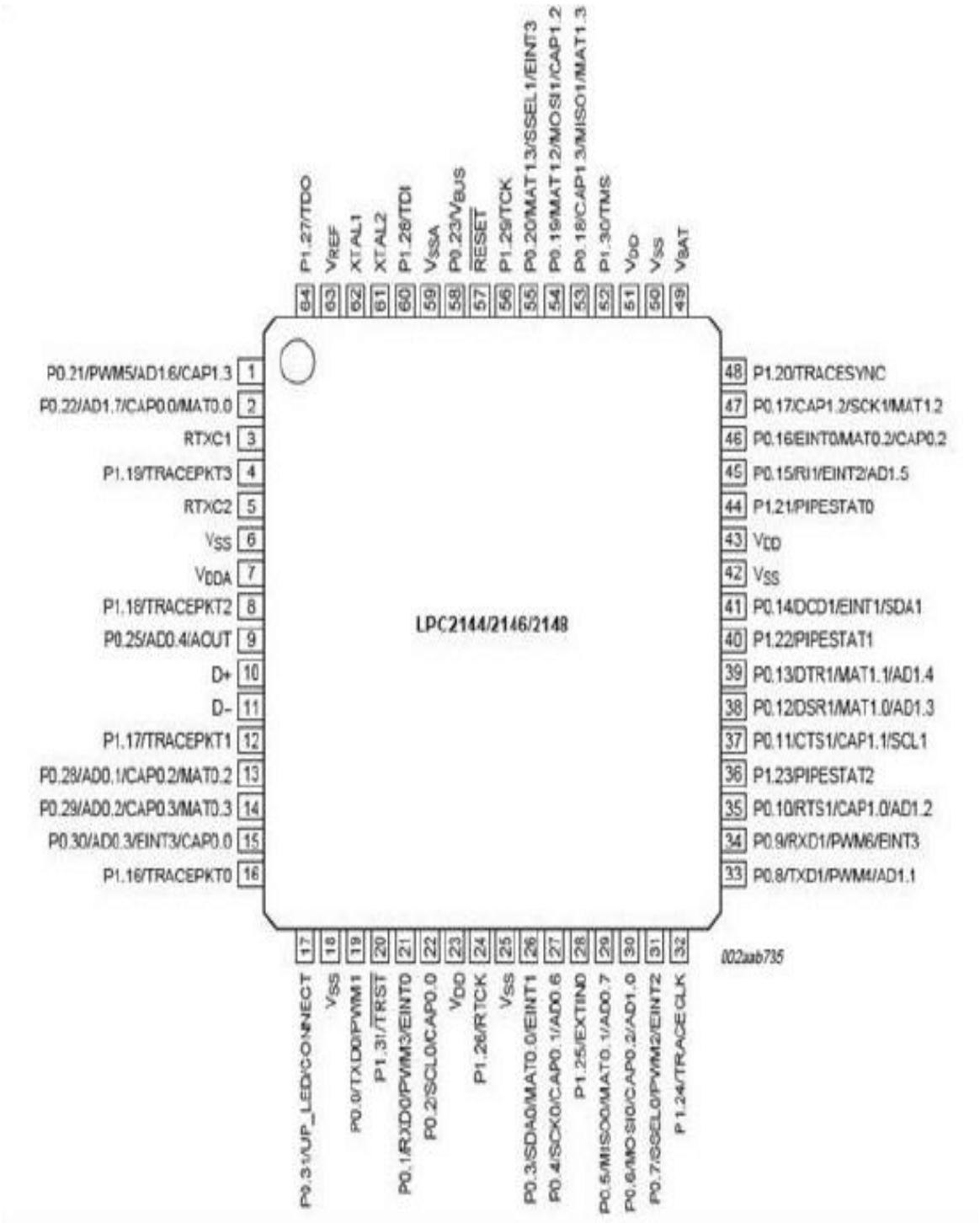


Figure 3.2.4: LPC2148 Pin Diagram

3.2.5 Pin description

Symbol	Pin	Type	Description
P0.0 to p0.31		I/O	Port0: port 0 is a 32-bit I/O port with the individual directions control each bit.
			Total of 31-pins of the port 0 can be used as general purpose bidirectional I/Os.
			Pins p0.24, p0.26 and p0.27 are not available
P0.0/TXD0/PVVM1	19	I/O	P0.0-General purpose input/output with digital pin (GPIO).
		O	TXD0- Transmitter output for the UART0
		O	PWM1-Pulse Width Modulator
P0.1/RXD0/PWM3/ EINT0	21	I/O I	P0.1-General purpose input/output (GPIO). RXD0-Receiver input for UART0.
		O	PWM3—Pulse width modulator output 3.
		I	EINT0-External interrupt 0 input
P0.2/SCL0/CAP0.0	26	I/O I/O	P0.3-General purpose input/output digital pin (GPIO). SDA0-I2C0 data input/output

		O	digital pin (GPIO). MAT0.0-Match output for Timer 0, Channel 0.
P0.4/SCK0/ CAP0.1/AD0.6	27	I I/O I/O I	EINT1-External interrupt 1input. P0.3-General purpose input/output digital pin. SCK0-Serial clock for SPI0, SOI clock output for Master slave CAP0.0-Capture input for Timer 0, interrupt 0.
P0.5/MISO0/ MAT0.1/AD0.7	29	I I/O I/O I	AD0.6-ADC 0, INPUT 6. P0.5-General purpose input/output for (GPIO). MISCO0-Master in slave out for SPIO CAP0.1-Capture input for timer 0, channel1.
P0.7/SSEL0/PVVM2/ EINT2	30	O I I/O I/O	MAT0.1-Match output for Timer 0, channel 1. AD0.7-ADC0, INPUT 7. P0.6-General purpose input/output. MOSI0-Master out slave in for SPIO.

Symbol	Pin	Type	Description
P0.8/TXD1/PWM4/ AD1.1	33	I/O	PO.8- general purpose GPIO digital pin
		O	TXD1-Transmitter o/p for UART1
		O	PWM4-pulse width modulator o/p 4
		I	AD1.1- ADC1, input 1, available in LPC244/46/48
P0.9/RXD1/PWM6/ EINT3	34	I/O	P0.9- general purpose GPIO digital pin
		I	RXD1-receiver i/p for UART1
		O	PWM6- pulse width modulator o/p 6
		I	EINT3-external interrupt 3
P0.10/RTS1/CAP1.1/ AD1.2	35	I/O	P0.10-- general purpose GPIO digital pin
		O	RTS1-request to send output to UART1
		I	CAP1.1-capture input for timer1, channel 0
		I	AD1.2 ADC1, input 2, available in LPC244/46/48

P0.11/CTS1/CAP1.1/ SCL.1	37	I/O I	P0.11- general purpose GPIO digital pin CTS1-clear to send input to UART1
		I	CAP1.1-capture input for timer1, channel 1
		I/O	SCL.1-I^2C clock input/output. open drain output
P0.12/DRS1/MAT1.0/ AD1.3	38	I/O	P0.12- general purpose GPIO digital pin
		I	DRS1-data set ready input for UART1. Available in LPC2144/46/48
		O	MAT1.0-Match output for timer 1, channel 0
		I	AD1.3-ADC1, input 3, available in LPC244/46/48
P0.13/DTR1/MAT1.0/ AD1.4	39	I/O	P0.13-- general purpose GPIO digital pin
		O	DTR1-data terminal ready output for UART1. available in LPC244/46/48
		O	MAT1.0- Match output for timer 1, channel 0

		I	AD1.4- ADC1, input 4, available in LPC244/46/48
P0.14/DCD1/EINT1/SDA1	41	I/O	P0.14- general purpose GPIO digital pin
		I	DCD1-data carrier detect input for UART1. available in LPC244/46/48
		I	EINT1-external interrupt 1 input
		I/O	SDA1--I^2C data input/output. open drain output
P0.15/RI1/EINT2/AD1.5	45	I/O	P0.15- general purpose GPIO digital pin
		I	RI1- Ring indicator input for UART1. available in LPC244/46/48
		I	EINT2- external interrupt 1 input
		I	AD1.5- ADC1, input 5, available in LPC244/46/48

Symbol	**Pin**	**Type**	**Description**
PO.16 /EINT0/ MAT0.2/CAP0.2	46	I/O	P0.16-General purpose input/output digital pin (GPIO).
		I	EINTO-External interrupt 0 input
		O	MAT0.2-Match output for Timer 0, channel 2.
P0.17/CAP1.2/ SCK1/MAT1.2	47	I	CAP0.2-Capture input for Timer 0, channel 2.
		I/O	P0.17-General purpose input/output digital pin (GPIO)
		I	CAP1.2-Capture input for timer 1, channel2
		O	MAT1.2-Match output for the timer 1 and channel2

P0.18/CAP1.3/ MISO1/MAT 1.3	53	I/O	P0.18-- general purpose GPIO digital pin
		O	CAP-1.3-Capture input for Timer 1, channel 3.
		I/O	MISO1-Master in Slave out for SSP. Data input to SPI master or data output from SSP slave
		I	AD1.2 ADC1, input 2, available in LPC244/46/48
		I/O	SCL.1-I^2C clock input/output. open drain output
P0.19/MAT 1.2/ MOSI1/CAP1.2	54	O	MAT1.3-Match output for Timer 1, channel 2.
		I/O	P0.19-General purpose input/output digital pin (GPIO)
		O	MAT 1.2-Match output for Timer 1, channel 3.
P0.20/MAT1.3/ SSEL1/EINT3	55	I	CAP1.2—capture input for timer1 and channel2.
		I/O	P0.20-General purpose input/output digital pin.
		O	MAT1.3 Match output for timer 1, channel 3
		I	EINT3-External interrupt 3 input.
P0.21/PVMS/ AD1.6/CAP1.3	1	I/O O	P0.21- general purpose GPIO digital pin PWM5-Pulse width modulator with output 5
		I	AD1.6-ADC 1, input 6 which was available in lpc2144.
		I	CAP1.3-Capture input for Timer 0and channel1.

P0.22/AD1.7/ CAP0.0/MAT0.0	2	I/O	P0.22- general purpose GPIO digital pin
		I	AD1.7-ADC1, input 7, available in The LPC2144
		I	CAP0.0-capture input for timer 0, channel 0.
		O	MAT0.0-Match output for timer0, output 0.
P0.23/AD0.4/AOUT	58	I/O	P0.23 - general purpose GPIO digital pin
P0.25/AD0.4/AOUT	9	I/O	P0.25 – General purpose input/output digital pin.
		I	AD0.4 – ADC 0, input 4.
		O	AOUT – DAC output. Available in LPC22142/44/46/48 only.
P0.28/AD0.1/ CAP0.2/MATO.2	13	I/O	P0.28 – General purpose input/output digital pin (GPIO)
		I	AD0.1 – ADC 0, input 1.
		I	CAP0.2 – Capture input for Timer 0, channel 2

Symbol	**Pin**	**Type**	**Description**
P0.29/AD0.2/ CAP0.3/MAT0.3	14	I/O I I 0	P0.29 – General purpose input/output digital pin (GPIO) AD0.2 – ADC 0, input 2 CAP0.3 – Capture input for Timer 0, channel 3.

			MAT0.3 – Match output for Timer 0, channel 3.
P0.30/AD0.3/ EINT3/CAP0.0	15	I/O I I	P0.30- General purpose input/output digital pin (GPIO) AD0.3 ADC 0, input 3. CAP0.0 – Capture input for Timer 0, channel 0.
P0.31/UP_LED/ CONNECT	17	O O O	P0.31 - General purpose input/output digital pin (GPIO) UP_LED – USB Good ink LED indicator. CONNECT – Signal used to switch an external 1.5k ohms resistor under the software control.
P1.0 to P1.31		I/O	Port 1 : Port 1 is a 32-bit bidirectional I/O port with individual direction controls for each bit. The operation of port 1 pins depends upon the pin function selected via the pin connect block. Pins 0 through 15 of port 1 are not available.
P1.16/TRACEPKT0	16	I/O O	P1.16 - General purpose input/output digital pin (GPIO). Standard I/O port with internal pull-up TRACEPKT0 – Trace packet, bit 0
P1.17/TRACEPKT1	12	I/O O	P1.17 - General purpose input/output digital pin (GPIO). Standard I/O port with internal pull-up. TRACEPKT1 – Trace packet, bit 1

P1.18/TRACEPKT2	8	I/O O	P1.18 - General purpose input/output digital pin (GPIO). Standard I/O port with internal pull-up. TRACEPKT2 – Trace packet, bit 2

P1.19/TRACEPKT3	4	I/O O	P1.19 - General purpose input/output digital pin (GPIO). Standard I/O port with internal pull-up. TRACEPKT3 – Trace packet, bit 3
P1.20/TRACESYNC	48	I/O O	P1.20 - General purpose input/output digital pin (GPIO). Standard I/O port with internal pull-up. TRACESYNC – Trace synchronization.
P1.21/PIPESTAT0	44	I/0 O	P1.21 - General purpose input/output digital pin (GPIO). Standard I/O port with internal pull-up. PIPESTAT0 – Pipeline Status, bit 0.
P1.22/	40	I/O O	P1.22 – General purpose input/output digital pin (GPI0). Standard I/O port with internal pull-up. PIPESTAT1- Pipeline Status, bit 1

Symbol	**Pin**	**Type**	**Description**
P1.23/ PIPESTAT2	36	I/O O	P1.23 – General purpose input/output digital pin (GPI0). Standard I/O port with internal pull-up. PIPESTAT2- Pipeline Status, bit 3

P1.24/ TRACECLK	32	I/O O	P1.24 – General purpose input/output digital pin (GPI0). Standard I/O port with internal pull-up. TRACECLK- Trace Clock
P1.25/EXTIN0	28	I/O I	P1.25 - General purpose input/output digital pin (GPI0). Standard I/O port with internal pull-up. EXTIN0 – External Trigger Input
P1.26/RTCK	24	I/O I/O	P1.26 - General purpose input/output digital pin (GPI0). RTCK – Returned Test Clock output. Extra signal added to the JTAG port. Assists debugger synchronization when processor frequency varies. Bidirectional pin with internal pull-up.
P1.27/TDO	64	I/O O	P1.27 - General purpose input/output digital pin (GPI0). TDO – Test Data out for JTAG interface.
P1.28/TDI	60	I/O I	P1.28 - General purpose input/output digital pin (GPI0). TDI - Test Data in for JTAG interface.
P1.29/TCK	56	I/O I	P1.29 - General purpose input/output digital pin (GPI0). TCK – Test Clock for JTAG interface. This clock must be slower than the CPU clock (CCLK) for the JTAG interface to operate.

Symbol	Pin	Type	Description
P1.30/TMS	52	I/O I	P1.30 - General purpose input/output digital pin (GPI0). TMS – Test Mode Select for JTAG interface.
P1.31/TRST	20	I/O I	P1.30 - General purpose input/output digital pin (GPI0). TRST – Test Reset for JTAG interface.
D+	10	I/O	USB Bidirectional D+ line.
D-	11	I/O	USB Bidirectional D- line.
RESET	57	I	External reset input: A LOW on this pin resets the device, causing I/O ports and peripherals to take on their defaults states, and processor execution to begin at address 0. TTL with hysteresis, 5V tolerant.
XTAL1	62	I	Input to the oscillator circuit and internal clock generator circuits.
XTAL2	61	O	Output from the oscillator amplifier
RTCX1	3	I	Input to the RTC oscillator circuit.
RTCX2	5	O	Output from the RTC oscillator circuit.
Vss	6, 18, 25, 42, 50	I	Ground: 0 V reference
VSSA	59	I	Analog ground: 0 V reference. This should nominally be the same voltage as Vss, but should be

			isolated to minimize noise and error.
VDD	23, 43, 51	I	3.3V power supply: this is the power supply voltage for the core and I/O ports.

Symbol	Pin	Type	Description
VDDA	7	1	Analog 3.3V power supply: This should be nominally the same voltage as VDD but should be isolated to minimize noise and error. This voltage is only used to power the on-chip ADC(S) and DAQ
VREF	63	1	ADC reference voltage: This should be nominally less than or equal to the VDD voltage but should be isolated to minimize noise and error. Level on this pin is used as reference for ADC(S) and DAQ.
VBAT	49	1	RTC power supply voltage: 3.3V on this pin supplies the power to the RTC.

Table 3.2.5 Pin description

3.2.6 Functional description

Details of the LPC2148 systems and peripheral functions are described in the following sections.

Architectural overview

The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers. This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core.

Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory. The ARM7TDMI-S processor also employs a unique architectural strategy known as Thumb, which makes it ideally suited to high-volume applications with memory restrictions, or applications where code density is an issue. The key idea behind Thumb is that of a super-reduced instruction set. Essentially, the ARM7TDMI-S processor has two instruction sets:

- The standard 32-bit ARM set.
- A 16-bit Thumb set.

The Thumb set's 16-bit instruction length allows it to approach twice the density of standard ARM code while retaining most of the ARM's performance advantage over a traditional 16-bit processor using 16-bit registers. Thumb code is able to provide up to 65 % of the code size of ARM, and 160 % of the performance of an equivalent ARM processor connected to a 16-bit memory system.

On-Chip Flash program memory

The LPC2148fuses a 128 kB and 256 kB Flash memory framework separately. This memory might be utilized for both code and information stock piling. Programming of the flash memory might be cultivated severally. It very well might be modified In System by means of the sequential port. The application program like wise delete and additionally program the Flash while the application is running, permitting an incredible level adaptability for information stockpiling field firmware updates, and so forth When on-chip boot loader is

utilized,120/248 kB of Flash memory is accessible for client code. The LPC2119/LPC2148 Flash memory gives atleast100,000 delete/compose cycles and 20 years of information maintenance. On-chip boot loader (as of amendment 1.60) gives Code Read Protection (CRP) for the LPC2148 on-chip Flash memory. At the point when the CRP is empowered, the JTAG investigate port and ISP orders getting to either the on-chip RAM or Flash memory are crippled. In any case, the ISP Flash Erase order can be executed whenever (regardless of whether the CRP is on or off). Expulsion of CRP is accomplished by eradication of full on-chip client Flash. With the CRP off, full admittance to the chip through the JTAG as well as ISP is re-established.

On-Chip static RAM

On-Chip static RAM may be used for code and/or data storage. The SRAM may beaccessed as 8-bits, 16-bits, and 32-bits. The LPC2148provide 16 kB of static RAM.

Memory map

The LPC2119/LPC2148 memory maps incorporate several distinct regions, as shown in the following figures. In addition, the CPU interrupt vectors may be re-mapped to allow them to reside in either Flash memory (the default) or on-chip static RAM.

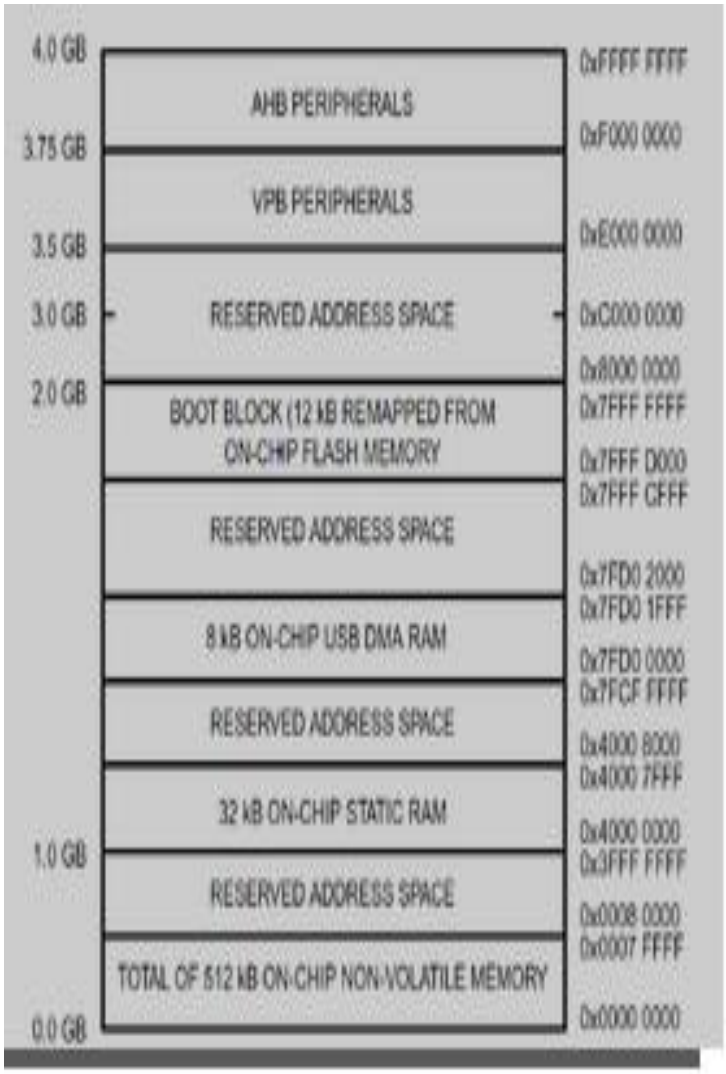


Figure 3.3: Memory Map

3.3 LPC2148 Development Board

LPC2148 Pro Development Board is an amazing advancement stage dependent on LPC2148 ARM7TDMI microcontroller with 512K on-chip memory. This board is fueled by USB port and needn't bother with outer force supply. It is ideal for creating installed applications including rapid remote correspondence (Zigbee/Bluetooth/Wi-Fi), USB based information logging, continuous information checking and control, intuitive control boards and so forth The on-chip USB regulator gives direct rapid interface to a PC/PC with speeds up to 12Mb/s. The UART boot loader disposes of need of an extra software engineer and permits you to program utilizing sequential port. The on board peripherals incorporate

SD/MMC card interface, USB2.0 interface, 4Kbit I2C EEPROM, Xbee/Bluetooth/Wi-Fi remote module interface, ULN2003 500mA flow sinking driver, L293D DC engine regulator, 16X2 person LCD and some more. The on-chip peripherals and the outer equipment on the improvement board are interconnected utilizing pin headers and jumpers. The I/O pins on the microcontroller can be gotten to from a 50 pin male header. This immediate admittance to I/O pins empowers you to associate your own gadgets effectively to the processor. The board is produced using twofold sided PTH PCB board to give additional solidarity to the connector joints for expanded dependability.

Figure 3.3.1: LPC2148 Development Board

3.4 COMPONENTS USED:

3.4.1 MQ2 Gas Sensor:

Fig 3.4.1 MQ2 Gas Sensor

Generally a sensor is an electronic device, it used to interact with the external environment. Different types of sensors are available to detect light, noise, smoke, proximity, etc. With the advent of technology, it is available in analog and digital form. One of such sensors used in security systems to detect harmful gases is the MQ2 gas sensor. The MQ2 Gas Sensor is an electronic sensor used to sense the concentration of gases in the air including LPG, Propane, Methane, Hydrogen, Alcohol, Smoke and Carbon Monoxide. MQ2 gas sensor is also known as chemical resistance. It contains sensitizers whose resistance changes when exposed to gas. This change in resistance is used for gas detection. The MQ2 is a metal oxide gas sensor. Concentrations in the stomach are measured using a sensor lattice. This sensor is supplied with 5V DC. It can detect gases in the range of 200 to 10,000 ppm.

WORKING PRINCIPLE OF MQ2 GAS SENSOR:

This sensor contains a sensing element, mainly aluminium-oxide based ceramic, coated with Tin dioxide, enclosed in a stainless steel mesh. Sensing element has six connecting legs attached to it. Two leads are responsible for heating the sensing element, the other four are used for output signals. Oxygen gets adsorbed on the surface of sensing material when it is heated in air at high temperature. Then donor electrons present in tin oxide are attracted

towards this oxygen, thus preventing the current flow. When reducing gases are present, these oxygen atoms react with the reducing gases thereby decreasing the surface density of the adsorbed oxygen. Now current can flow through the sensor, which generated analog voltage values. These voltage values are measured to know the concentration of gas. Voltage values are higher when the concentration of gas is high.

MQ2 Gas Sensor Features & Specifications

- Operating Voltage is +5V.
- Analog output voltage: 0V to 5V.
- Digital Output Voltage: 0V or 5V (TTL Logic)
- Preheat duration 20 seconds.
- Can be used as a Digital or analog sensor.
- The Sensitivity of Digital pin can be varied using the potentiometer.

3.4.2 LM35 Sensor:

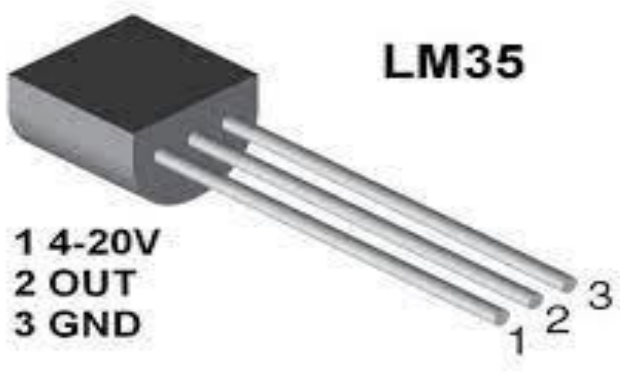


Fig 3.4.2 LM35 Sensor

A temperature sensor basically measures the heat/cold emitted by a connected object. We then provide a proportional output resistance, current or voltage, which is measured or processed depending on our application. The LM35 is a temperature sensor that provides an analog signal proportional to the instantaneous temperature. The output voltage can be easily interpreted to provide a temperature value in degrees Celsius. The advantage of the lm35 over thermistor is that it does not require external compensation. The coating also protects against self-heating. It is inexpensive and its excellent accuracy makes it popular. Many lower cost products use the LM35 in their products to enjoy lower cost, greater accuracy and usability. It's been about 15 years since it was first released, but the sensor is alive and well, and used in all sorts of products.

WORKING PRINCIPLE OF LM35 TEMPERATURE SENSOR:

LM35 sensor uses the basic principle of a diode, where as the temperature increases, the voltage across a diode increases at a known rate. By precisely amplifying the voltage change, it is easy to generate an analog signal that is directly proportional to temperature.

Features of LM35 Temperature Sensor

- Calibrated directly in Degree Celsius (Centigrade)
- Linear at 10.0 mV/°C scale factor.
- 0.5°C accuracy guarantee-able (at a25°C)
- Rated for full -55°C to a 150°C range.
- Suitable for remote applications.
- Low cost due to wafer-level trimming.
- Operates from 4 to 30 volts.

3.4.3 Fire Sensor:

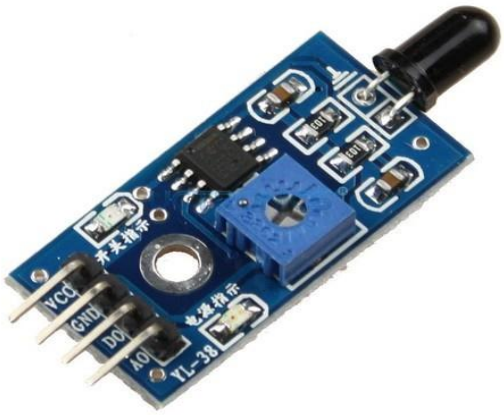


Fig 3.4.3 Fire Sensor

A flame detector is a type of detector designed primarily to detect and respond to the occurrence of a fire or flame. Flame detection reaction may vary by installation. These include alarm systems, natural gas lines, propane as well as fire suppression systems. This sensor is mainly used in industrial boilers. Its main function is to check whether the boiler is working properly or not. The response of this sensor is faster and more accurate than heat/smoke detectors due to its flame detection mechanism. This sensor/detector can be built with electronic circuitry using a receiver similar to electromagnetic radiation. The sensor uses an infrared flash flame method, allowing the sensor to operate through a coating of oil, dust, water vapor or ice.

WORKING PRINCIPLE OF FIRE SENSOR:

This sensor/detector can be built with an electronic circuit using a receiver like electromagnetic radiation. This sensor uses the infrared flame flash method, which allows the sensor to work through a coating of oil, dust, water vapor, otherwise ice.

Features of fire sensor

- Small and compact in size
- Adjustable threshold value

- 2 state binary output (logic high and low)
- Easy mounting with a screw hole

3.4.4 LCD: -

Fig 3.4.4 LCD Display

A text message should appear indicating that the algorithm is at a standstill. So the proposed system to install this setup will use the LCD to do the necessary work. As the name suggests, the liquid crystal display is used to show the required text content visible to the driver. While CRTs are good enough for the job, LCDs have become more popular due to their lighter weight and minimal power consumption. Enabling the backlight creates highlights on the screen where text might appear.

3.4.5 Buzzer: -

Fig 3.4.5 Buzzer

A buzzer is required to warn of a toxic gas leak. As soon as the gas sensor detects the release of toxic gas, the buzzer sounds automatically. The buzzer makes a buzzing sound. Buzzers dominate many audio devices due to their smaller size and ability to easily fit into the basic equipment used. Multiple buzzers are available depending on the time interval required to activate the buzzer. If a constant buzzing sound is required, a regular buzzer is used for this. The requirement is that off-the-shelf buzzers make this practical if the sound needs to be higher and shorter time intervals.

3.4.6 Dc motor:

Fig 3.4.6 DC Motor

DC motors take electrical energy and convert it into mechanical energy. It consumes the electric motor and thus provides the expected part of the mechanical movement. These small motors are used in many fun items such as toys, while large DC motors are used in elevators. There are basically three different types of DC motors. They are series DC motor, DC shunt motor, composite DC motor.

3.4.7 ESP8266:

Fig 3.4.7 ESP8266 WiFi module

The ESP8266 Wi-Fi module is a independently operating SOC within company of built-in TCP/IP protocol that can grant any microcontroller access to your Wi-Fi network. The ESP8266 is capable of hosting an application or managing all Wi-Fi network functions from one application processor.

This module has powerful onboard processing and storage capabilities allowing it to be integrated with sensors and other application specific peripherals through its GPIO with minimal beginning scale as well as minimal running expenses. Its high degree of on-chip integration permits minimal external circuitry, including the front-end module, to be designed to take up minimal PCB footprint. ESP8266 hold up APSD for VoIP applications as well as Bluetooth coexistence interface, it contains a self-calibrating RF allowing it to work under all operating conditions as well as it does not require any external RF components.

CHAPTER 4

METHODOLOGY

4.1 Working of Hardware:

Detection of fire accident occurred in home or industry.

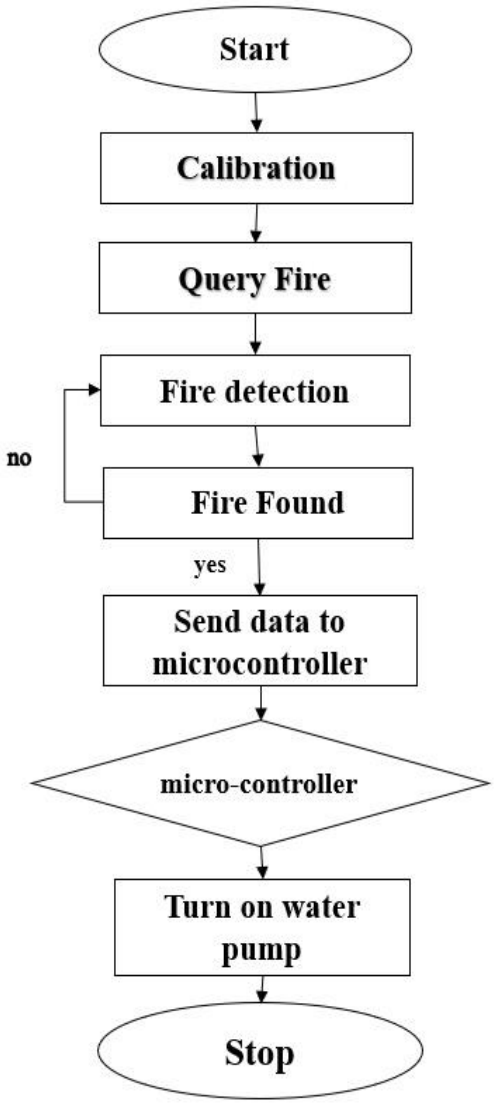


Fig 4.1.1 Flow chart for detection of flames occurred.

When any fire accident occurs in the industry the fire sensor immediately senses the fire and sends the information to the microcontroller and immediately turns on the water pump and

also sends the alert messages through ESP8266 wi-fi module in order to alert the people in the industries or home.

Detection of toxic gas leakage.

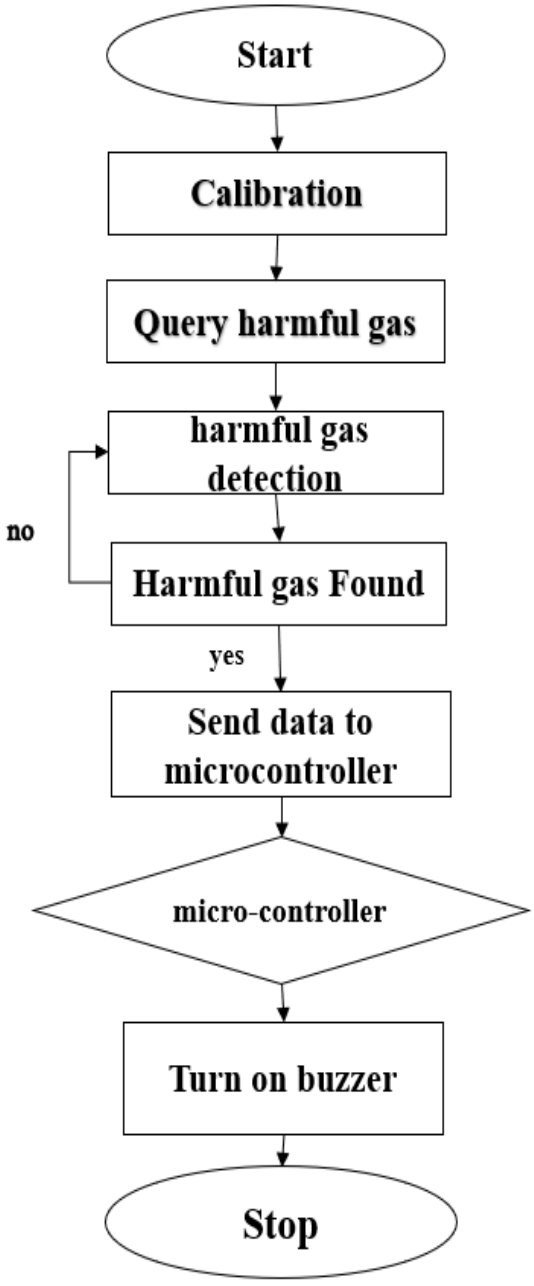


Fig 4.1.2 Flow chart for detection of harmful gas leakage

Detection of high temperatures.

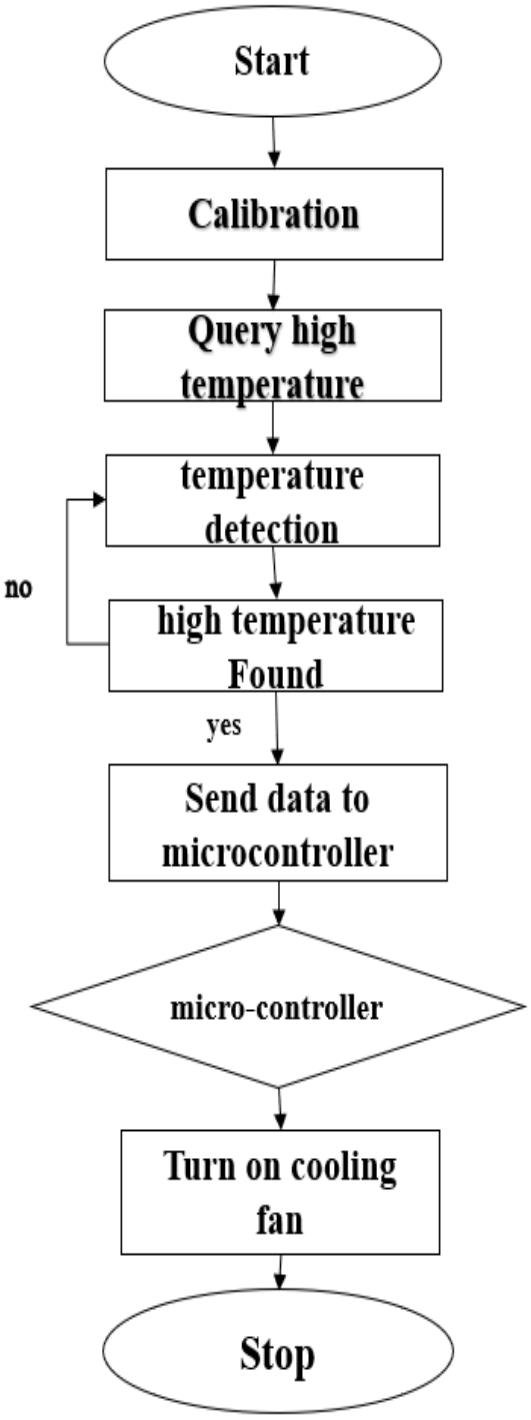


Fig 4.1.3 Flow chart for the detection of high temperatures.

4.2 SOURCE CODE:

```
#include <lpc214x.h>
#include "lcd.h"
#include "gpio.h"
#include "serial.h"
#include "gsm.h"
#include "adc.c"
#include "adc.h"
#define delay for(i=0;i<65000;i++);
unsigned int range=0,i,kk=0;
void Delay(unsigned int time)
{
 unsigned int i,j;
 for(i=0;i<time;i++)
 for(j=0;j<250;j++);
}
#include <stdint.h>
#include <stdio.h>
char receive_string[100];
int x,tval,sval,fval;
void delay_ms(uint16_t j) /* Function for delay in milliseconds */
{
   uint16_t x,i;
         for(i=0;i<j;i++)
         {
   for(x=0; x<6000; x++);    /* loop to generate 1 millisecond delay with Cclk = 60MHz */
         }
}
#define mask 0xffffffff
```

```
#define buz_off  (IOCLR0 = P0_6)
#define buz_on (IOSET0 = P0_6)
#define mot_on  (IOSET0 = P0_13)
#define mot_off  (IOCLR0 = P0_13)
#define fan_on  (IOSET0 = P0_12)
#define fan_off  (IOCLR0 = P0_12)
#define fire (IOPIN0 & (1<<4))
int main()
{
PINSEL0=0x00050005;
PINSEL1=0x15000000;
IODIR0 |=0x000FF840;
IODIR0 &=0xFFFFFF6F;
lcd_init();
delays(30);
ADC0_Init();
delays(30);
lcdcmd(1);
msgdisplay(" WELCOME ");
delays(1000);
ser_init_0(0x61,0x00);
ser_init_1(0x61,0x00); //serial initilization  9600
lcdcmd(0x01);
        while(1)
        {
                sval=adc0_channel_1();
                tval=60-adc0_channel_2()/3.3;
                if(!fire)
                {
```

```
fval=1;
}
else
{
fval=0;
}


lcdcmd(0x01);
msgdisplay("TEMP:");
convert(tval);
msgdisplay(" GAS:");
convert(sval);
lcdcmd(0xc0);
msgdisplay("FIRE:");
convert(fval);
if(!fire)
{
mot_on;
}
else
{
mot_off;
}
if(tval>40)
{

        fan_on;
}
```

```
        else
        {
                fan_off;
        }
 if(sval>100)
        {
                buz_on;

        }
        else
        {
                buz_off;
        }
delay_ms(500);
        send_0('@');
        if(tval<36)
        send_0('0');
        else
                send_0('1');
                        send_0(',');
        if(sval<101)
        send_0('0');
        else
                send_0('1');

        send_0(',');
        if(fval<1)
        send_0('0');
        else
```

```
                send_0('1');

            send_0('$');

}

}
```

4.3 WORKING AND IMPLEMENTATION:

Main moto of our project is to reduce the deaths of the people that occur in industries or at home due to leakage of harmful gases, high temperatures which might sometimes leads to fire accidents. Here in this project we are going to detect the high temperatures, fire accidents, leakage of harmful gases by using three different sensors they are LM35 sensor for the detection of high temperature, MQ-2 sensor for the detection of harmful gases and fire sensor for the detection of fire accidents. We are using an ARM7 which consists of microcontroller LPC2148 which monitors all these parameters and sends the output to buzzer, cooling fan, water pump and liquid crystal display (LCD).

The power supply of 9V DC is applied to the ARM7. All the sensors are connected to the ARM7 by the means of internal circuit. And also preventive measures are also taken in this project such as turns on the water pump as soon as the fire accident occurs, turns on the cooling fan as soon as the high temperature occurs, turns on the buzzer as soon as the leakage of harmful gas occur. We are also using ESP8266 wifi module which updates the information to the people in the industry, people living near industry. When the fire sensor detects the fire accident it automatically turns on the water pump and with the help of the ESP8266 all the updates will be intimated in the users mobile.

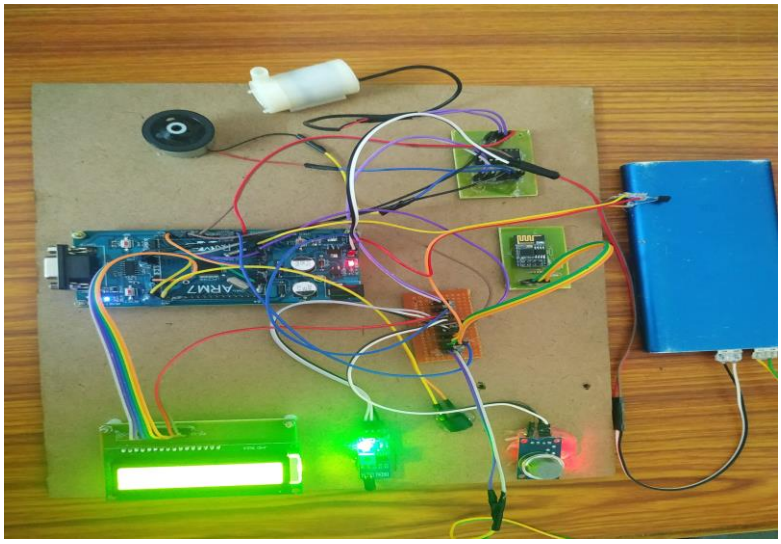


Fig 4.3 Hardware connections of our project

CHAPTER 5

RESULTS

5.1 RESULTS

The results are represented for various cases like

(I) When the temperature is beyond the limit.

(II) When the gas leaks is beyond the limit.

(III)When the fi is detected.

(IV) Above three cases are detected at once.

Case – I: When the temperature is beyond the limit.

Fig 4.1.1 Respective output when the temperature is beyond the given maximum limit.

Given maximum temperature limit is 40°c. whenever the temperature crosses maximum limit as shown in Fig, it will be displayed on the liquid crystal display (LCD) and automatically the preventive measure cooling fan will be turned on.

Case – II: When the gas leak is beyond the limit.

Fig 4.1.2 Respective output when the gas leak is beyond the maximum limit.

When the gas leak is beyond the given maximum limit then it is played on the liquid crystal display as shown in Fig. And the buzzer is automatically turned on.

Case – III: When the fire is detected.

Fig 4.1.3 Respective output when the fire occurs

Fire is represented in terms of binary data 0's and 1's. When fire is detected, it is displayed as '1' in the liquid crystal display as shown in Fig. and automatically the water pump is turned on.

Case – IV: Above three cases are detected at once.

Fig 4.1.4 Respective output when the three parameters high temperature, gas leakage and fire are detected.

CHAPTER 6

CONCLUSION AND FUTURE SCOPE

6.1 CONCLUSION

In this paper, we have discussed about the solution to reduce the deaths that occur in the industries or at home that occur due to the leakage of harmful gases, high temperatures which may lead to fire accidents. Now a days development of industries has increased rapidly, due to which the accidents related to industries are also increased. These industrial accidents are caused mainly due to the lack of safety protocols, human interference causing delay while generating safety alarms and these leads to death of many people inside the industry and also the people who stays near by the industry. Similarly accidents at home are also caused due to gas leak, flames occurred at home etc. So, in order to overcome these problems sustainable monitoring and the advanced gas and fire detection of the machines builds the efficient process control in the industrial automation and also for the home safety. By using this project we can reduce the deaths by detecting the respective parameters using fire sensor, MQ-2 gas sensor, LM35 temperature sensor and immediately taking the control measures such as turning on the water pump for fire, turning on buzzer for leakage of harmful gas, turning on the cooling fan for high temperature and intimating the nearby people by using ESP8266 wi-fi module.

6.2 FUTURE SCOPE

This project is basically very useful for the present era. Generally, a lot of accidents are taking place in industries as well as at home due to the leakage of harmful gases or due to increase in temperature which leads to the fire accidents. In recent times there were many industrial accidents which lead to the death of many people and caused major economic loss. Previously the existing model is consists of detection of gas leak and fire accidents by using Arduino. But in the current era the usage of Arduino has decreased as the technology has changed in recent times LPC2148 microcontroller is used mostly.

In this project we are using LPC2148 microcontroller which is more compatible. we are using embedded c language source code with extension of Control measures in the project. preventive measures are also taken in this project such as turns on the water pump as soon as the fire accident occurs, turns on the cooling fan as soon as the high temperature occurs, turns on the buzzer as soon as the leakage of harmful gas occur. We are also using ESP8266 wi-fi module which updates the information to the people in the industry, people living near industry. When the fire sensor detects the fire accident it automatically turns on the water pump and with the help of the ESP8266 all the updates will be intimated in the users mobile.

In the extension in future we can further add GPS and GSM module in order to intimate the location of the incident immediately after it occurs to the users mobile via GSM module

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