

MULTI DEVICE STATUS MONITORING AND CONTROL SYSTEM USING IOT

Submitted in partial fulfillment of the requirements for the award of Bachelor of
Engineering Degree in Electronics and Instrumentation Engineering
by

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SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **SURYA B (38180010)**, **VINEETHWEL PREM (38180009)** who carried out the project entitled "**MULTI DEVICE STATUS MONITORING AND CONTROL SYSTEM USING IOT**" under my supervision from September 2021 to May 2022.

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We, **SURYA B (38180010)** and **VINEETHWEL PREM (38180009)** hereby declare that the Project Report entitled “**MULTI DEVICE STATUS MONITORING AND CONTROL SYSTEM USING IOT**” done by under the guidance of **Ms.A.SABARIVANI,M.TECH.,(Ph.D.)** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Instrumentation Engineering.

1)



2)



DATE: 09.05.2022

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ABSTRACT

Embedded systems are becoming increasingly popular in today's environment and the majority of gadgets in business and at home are now connected to the Internet of Things. Such systems monitor industrial safety factors such as temperature, light intensity, and gas levels in greenhouses, thanks to developments in internet technology and wireless sensor networks. A system is presented to monitor different parameters in industrial and home automation based on the inspiration of the aforesaid system. This suggested system primarily monitors and regulates safety characteristics such as light intensity via the LDR, room fire accident via the fire Sensor, and gas leaks via the MQ2 Sensor. This suggested system also monitors the state of appliances and automatically sends an alert through network to the appropriate authorities by updating the status on the Embedded Web Server. We may also use web server linkages to control the devices, such as turning them on or off. If the circumstances become anomalous, they will discover a wide range of applications where actual presence is not always possible. The sensor module is implemented using WiFi module This system offers a comprehensive, low-cost, powerful, and user-friendly technique of real-time monitoring and control of industry or the house.

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LIST OF ABBREVIATIONS

GND	Ground
EEPROM	Electrically Erasable Programmable Read Only Memory
RAM	Random Access Memory
PCB	Printed Circuit Board
UART	Universal Asynchronous Receiver Transmitter
LDR	Light Dependent Resistor
IR	Infrared
LED	Light Emitting Diode
AC	Alternating Current
DC	Direct Current
CT	Current Transformer
IDE	Integrated Development Environment
GIS	Geographic Information System
IOT	Internet Of Things
WIFI	Wireless Fidelity
RTOS	Real Time Operating System
PLC	Programmable Logic Controller
SCADA	Supervisory Control And Data Acquisition
GPS	Global Positioning System
FPGA	Field Programmable Gate Array
ASIC	Application-Specific Integrated Circuit
DAC	Digital-to-Analog Converter
ADC	Analog-to-Digital Converter
MQ2	Grove-Gas Sensor

CHAPTER-1

INTRODUCTION

1.1 INTRODUCTION

As time goes on, modern testing plays an increasingly significant role in the business of testing and maintaining various types of gear. The state of gadgets or equipment can be tracked as it changes. Quality improvement, quick solutions, and low power usage are all employed. There are systems for monitoring and controlling current processes such as Zigbee, PLC-SCADA, Internet of Things (IoT), and others. The Internet of Things (IoT) is an important tool to monitor and control current processes in today's society. An embedded framework and communication system that connects the gadget to the internet via a remote sensor system and devices that detect mobile phones and active channels. Kevin Ashton, an English pioneer, coined the term "Internet of Things" in 1999. He pointed out that utilising a sensor, every piece of visible writing in the area can be linked to the internet. Since then, the web has been integrated with a variety of themes, sensors, and gadgets for IoT applications. A real-time IoT configuration was built to evaluate core business capabilities like DC engine speed control and blending with an IoT mixer (PLC). This study completes the current viewing process by connecting the Internet of Things into different systems.

It is typical to collect data from gears and then send it to the distant web using the Wi-Fi module (ESP8266). One of the WiFi modules in business plans is the ESP8266, which consists of a microcontroller and a low-cost radio wire. PLC-based shading blending, liquid volume control and test, DC engine speed control, and power monitoring are the four applications that make up the mechanical watch frame. The paper is divided into five sections. The linked procedure of reviewing the framework is depicted in Area II. Area IV contains the plan and evaluation of the proposed new framework, while Area III outlines the proposed new framework. Area V clarifies and concludes the paper's discussion of the framework's advantages.

1.2 EMBEDDED SYSTEM

An embedded device is a controller that is designed and maintained by a real-time operating system (RTOS) and has a desired characteristic within a larger mechanical or electrical system, often with real-time processing restrictions.

It's frequently integrated as part of a larger instrument that includes hardware and mechanical components. Embedded systems control a variety of today's ordinary devices. To address the typical embedded system challenge, 98% of all microprocessors are synthetic.

Low electricity consumption, compact size, tough operating stages, and coffee in line with-unit cost are examples of qualities of common embedded computer systems compared to trendy-motive counterparts. This has an impact on the value of constrained processing assets, making them significantly more difficult to programme and deal with.

However, by combining current sensors and embedded network life to construct smarter ways on hardware, one can more efficiently manage the resources available in the unit and phases of the network and provide extra capabilities. in addition to what's already on the market To control power, for example, clever techniques are frequently used.

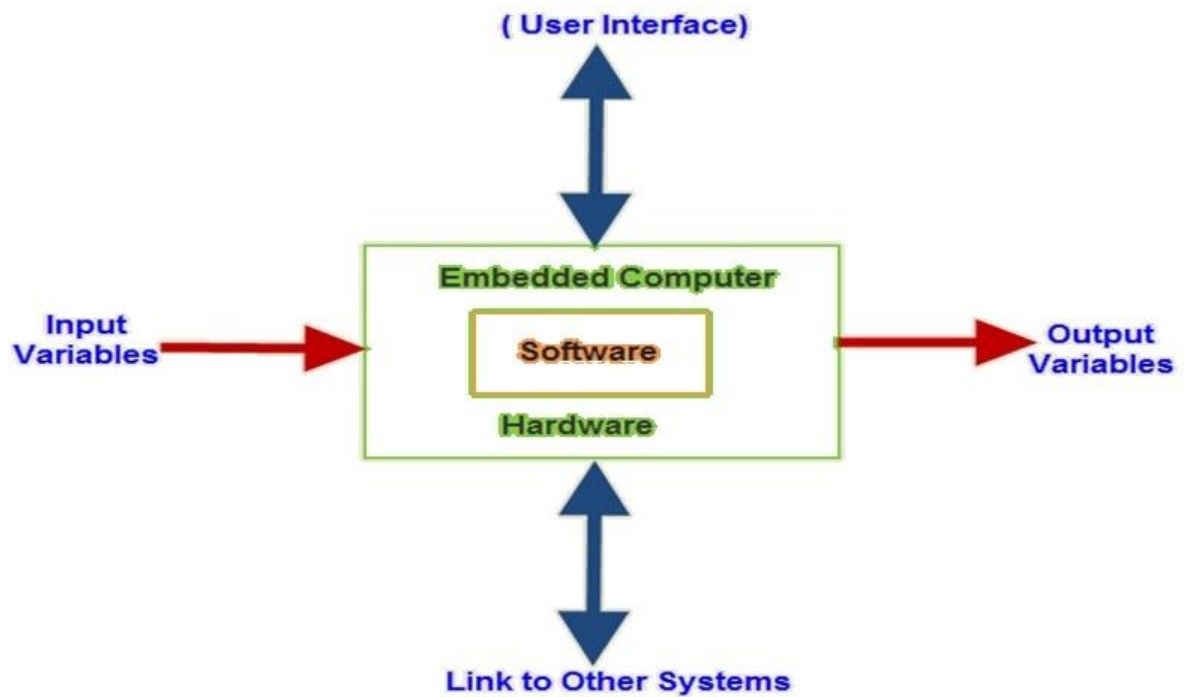


Fig:1.1 : Embedded System

Electronic robot with embedded computer sub-assembly. Consumers, industries, transportation, medical applications, advertising, and the military all have access to embedded systems.

For successful users, communication systems use a variety of embedded systems ranging from mobile networks to mobile phones. For route information, the portable computer network employs dedicated routers and network bridges.

MP3 players, cell phones, game consoles, digital cameras, GPS receivers, and printers are examples of consumer electronics. Microwave ovens, washing machines, and dishwashers are examples for the use embedded systems to provide flexibility, efficiency, and functions.

1.2.1 Classifications of Embedded System

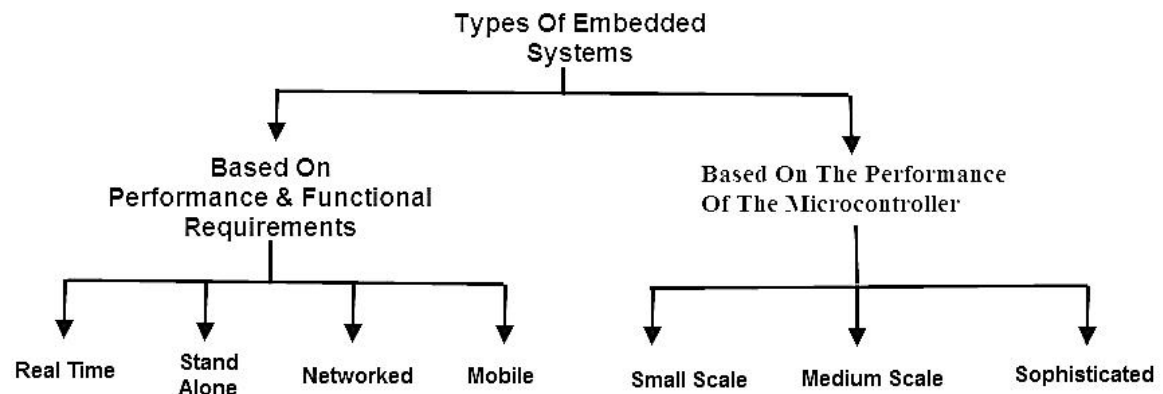


Fig:1.2 : Classifications of Embedded System

Advanced HVAC systems use network thermostats to properly and efficiently control temperature that varies throughout the day and season. Home automation employs a wired and wireless network to manage lights, weather, security, audio or visual, monitoring, and other functions, many of which relay on embedded hearing and control devices, such as robots, factory controls, and particularly complex ones. hybrid automobiles, MRI, and avionics are examples of such systems. Embedded systems cover a wide range of applications, from small devices like digital clocks and MP3 players to large-scale installations.

1.2.2 Block Diagram For Embedded System

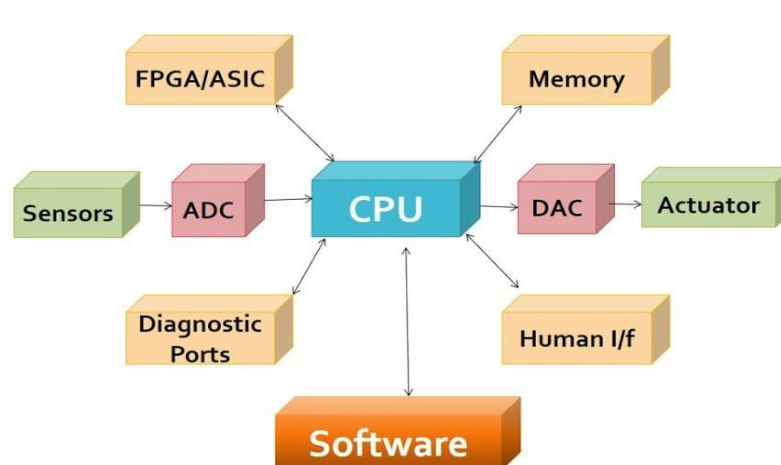


Fig:1.3 : Block Diagram of an Embedded System

Embedded processors are commonly found in embedded systems. Embedded systems are used in most machines with a digital interface, such as microwaves, VCRs, and automobiles. Software is included in certain embedded systems. Some are extremely unique, resulting in the usage of the entire mind as a single system. These systems are integrated in a specific device for a few specific functions, but the computer is not available for general use.

1.2.3 Embedded firmware

Embedded firmware, often known as embedded software, is software that is written to the device memory for ROM purposes but cannot be easily updated. Firmware can be stored on ROM, formatted ROM, detachable PROM, or flash memory, among other permanent memory devices. Embedded firmware is used to operate a variety of device and system functions, including as instructing the device on how to interface with other devices, perform certain tasks, and give input and output..

The distinction between embedded firmware and embedded software is hazy, but embedded software usually refers to the only code that runs on a piece of hardware, whereas firmware refers to the chip that contains the device's basic installation system (BIOS) or Unified Extensible Firmware Interface), which connects the software to the operating system.

1.2.4 Embedded Systems Applications

Control, physical safety, engine safety, artificial intelligence such as line vehicle movement, automotive entertainment, E-com access, cell phones, and other systems are embedded in vehicles.

- Embedded communication systems including network, mobile computer, and wireless communication, etc.
- Programs embedded in smart cards include banks, telephone and security systems.

- Embedded systems for satellites and arrows that include defense, communications, and aerospace
- Systems embedded in computer networks and peripherals include image processing, communication systems, printers, network cards, monitors and displays Systems embedded in digital consumer electronics include set-top boxes, DVDs, high-definition TVs and digital cameras

1.3 INTERNET OF THINGS

- The term "Internet of Things" usually refers to situations in which network connectivity and computer-generated power extend into everyday objects such as sensors and everyday objects that can be considered computers in general, allowing these devices to generate, exchange, and use data with minimal human intervention. There is no single definition of the cosmos, though.
- Empowerment technology has been around for decades. It involves connecting computers, sensors, and networks to monitor and control equipment. The recent convergence of a few technical advancements, on the other hand, puts the Internet of Things closer to becoming a larger reality. Universal Communication, Extensive IP-Based Comprehensive Reception, Computing Economics, Miniaturization, and Data Development are only a few of them.
- Communication Models: Different communication communication models are used in IoT deployment, each with its unique set of features. Device-to-Device, Device-to-Cloud, Device-to-Gateway, and Back-to-Data Sharing are the four common communication models established by the Internet Architecture Board. These models emphasise the variety of ways that IoT devices can connect and deliver value to users.

Both hardware and software components are used in IoT devices. To make touch with the physical environment as well as to conduct sophisticated computer activities, dedicated hardware components are utilised. Microcontrollers are employed in the development of software that converts input and controls the

system. The functions of both the hardware and software components in the system are discussed in this module. The functions of common hardware components are specified, and the microcontroller's link to software and hardware is discussed. An operating system is frequently used in IoT devices to facilitate interaction between software and a tiny controller. We'll go through the role of the operating system on an IoT device and how it varies from a regular operating system.

1.3.1 How IoT Works

The Internet of Things (IoT) ecosystem comprises of intelligent web-enabled gadgets that gather, transmit, and process data from their locations using embedded processors, sensors, and computer systems. By connecting to an IoT gateway or other device at the edge, IoT devices can share the sensory data they acquire, which is then forwarded to the cloud for analysis or localisation. In some circumstances, these devices interact with other devices and generate data that is derived from other sources. People may not be able to interact with devices, such as set them up, give them instructions, or access data, because they accomplish a lot of work without human participation.

These web-enabled devices' connectivity, network, and communication agreements are greatly dependent on the IoT apps they employ.

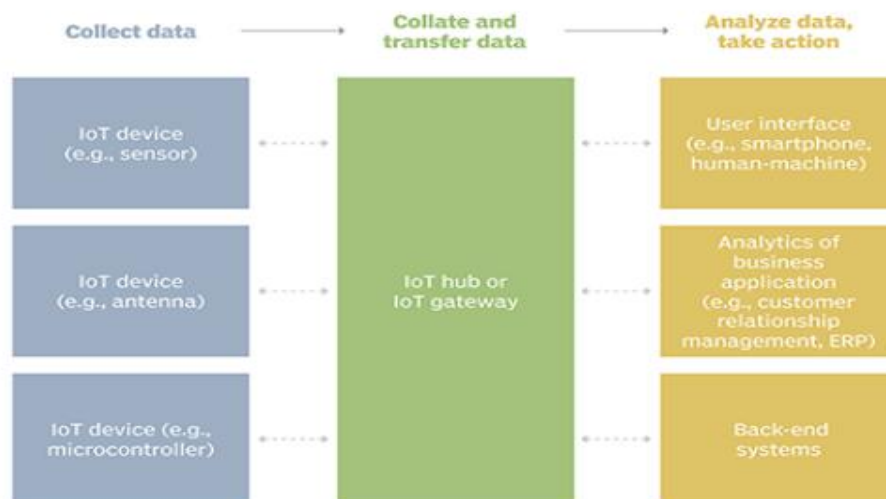


Fig:1.4 : Working of IoT

1.3.2 Benefits of IoT

The internet of things offers a number of benefits to organizations, enabling them to:

- monitor their overall business processes;
- improve the customer experience;
- save time and money;
- enhance employee productivity;
- integrate and adapt business models;
- make better business decisions; and
- generate more revenue.

IoT encourages companies to rethink the ways they approach their businesses, industries and markets and gives them the tools to improve their business strategies.

CHAPTER-2

LITERATURE SURVEY

2.1 LITERATURE SURVEY

2.1.1 Literature Survey 1

TITLE: IOT BASED INDUSTRIAL AUTOMATION by Apurva S Zope, Hajra A Khan, Mayuri S Jambhale, Nimisha M Korde 2017

IOT or internet of things is a technology that makes use of control systems such as computer to control the physical devices over the internet. Here we propose efficient industry automation system that allows user to efficiently control industry appliances/machines over the internet. We use 3 loads as industrial appliances or machines and a motor to demonstrate as an industrial motor.

2.1.2 Literature Survey 2

TITLE: APPLICABILITY OF LIFI TECHNOLOGY FOR INDUSTRIAL AUTOMATION SYSTEM by Deepika A.P, Shaalini.S, Sheela.M 2018

In this paper we have proposed LIFI based industrial field monitoring system which continuously measuring the industrial parameter. If any abnormal condition occurs, it directly sends a message to the administrator via LIFI communication. LIFI provides transmission of data through LED light bulb. It varies in intensity faster than human eye. It is possible to encode data in light at which the LED flicker-based method. To monitor the industrial parameter such as temperature sensor, current sensor, voltage sensor, gas sensor is used. It reduces the human work necessary in the industrial monitoring field by monitoring the overall industrial parameters through single PC with LIFI application.

2.1.3 Literature Survey 3

TITLE: INTERNET OF THINGS ENABLED DEVICE FAULT PREDICTION SYSTEM USING MACHINE LEARNING by Jayapandian.N, Kotte Bhavana, Vinuthna Nekkanti 2020

The Internet of Things (IoT) began as a niche market for enthusiasts and has now grown into a multibillion-dollar industry. This Internet of Things is made up of a variety of technologies, including real-time analysis, machine learning, and artificial intelligence. Home automation, enhanced device error detection, electronic health devices, and remote monitoring apps are just a few of the consumer demands it has produced. In current operating systems, the systematic recognition and determination of many forms of mechanical frustrations is an exciting process. Vibration sensor mistakes are detected using a variety of sensors, including sound sensors, temperature sensors, infrared cameras, light cameras, and many others. In today's world, modern technology is pervasive and pervasive. This device necessitates the use of trustworthy algorithms and forecasts. This article focuses on error prediction in real-world applications that make our lives easier. Previous failures that were returned to the internet using cloud computing technology are listed on the device's webpage. This will aid in the prediction of machine repair failures. Furthermore, the quantity of Nave Bayes is used to locate the missing space in the gadgets. The proposed methodology for this article entails online monitoring of each household item, allowing for the detection of faults with minimal human interaction. Errors in health-related practicality make our lives easier. Previous failures that were returned to the internet using cloud computing technology are listed on the device's webpage. This will aid in the prediction of machine repair issues. Furthermore, the quantity of Nave Bayes is used to locate the missing space in the gadgets. The proposed methodology for this article entails online monitoring of each household item, allowing for the detection of faults with minimal human interaction.

2.1.4 Literature Survey 4

TITLE: INTERNET OF THINGS FOR INDUSTRIAL AUTOMATION -- CHALLENGES AND TECHNICAL SOLUTIONS by Hongyu Pei Breivold, Kristian Sandstrom 2015

In various industrial sectors, such as smart city, smart energy, health care, food and water tracking, logistics and sales, and transportation, the use of the Internet of Things (IoT) to connect items, services, and people to smart jobs has been discussed and deployed. However, there is limited information on how to use IoT in an automated automation domain for dependable and collaborative automation,

such as enabling uncontrolled interaction between various devices and systems, providing real-time predictable and error tolerance control, and intelligent installation. From peripheral devices to the cloud, service functionalities are available. In this article, we will cover the hurdles to certain quality in industrial automation, as well as some of the industrial IoT difficulties that these barriers have created, and the possibilities for addressing these challenges with other technology solutions.

2.1.5 Literature Survey 5

TITLE: GSM & DTMF BASED HOME AND INDUSTRIAL AUTOMATION USING ARDUINO by Anuja D Kanase, Ishan D Kharat, Meghraj K Patil, Sagar A Shelke, Sanjay A Swami 2019

This document explains how to monitor and regulate electrical appliances in the house and office, as well as other technological devices. The lifestyle of device control is improved through automation. Embedded systems are used in this strategy. We suggest a different automation system for this project that uses Dual Tone Multi Frequency (DTMF) and a wireless module to give seamless control over a variety of household and industrial equipment. The DTMF tone created when the user pushes the keypad keys or when linked to a remote remote system is suggested in this study as a control technique. This programme has the advantage of being able to be utilised in any remote or remote place.

2.1.6 Literature Survey 6

TITLE: INDUSTRIAL AUTOMATION USING SENSING BASED APPLICATIONS FOR INTERNET OF THINGS by Geetesh Chaudhari, Sandeep Batule, Sandeep Helkar, Sudarshan Jadhav 2016

The Internet of Things (IoT) is a material network with integrated technical essence that allows it to communicate with the outside world. The Internet of Things object centred on machinery and objects used in business systems is known as the Industrial Internet of Things. It enables you to link anything around you to the internet, including clothing, metres, and natural sensors. These devices will be able to connect to the Internet and share a variety of data. Industrial Automation

was created using cloud computing and Internet-based items. In these publications, sensors are used to track a variety of behaviours such as fire, humidity, and ambient temperature.

2.1.7 Literature Survey 7

TITLE: WIRELESS INDUSTRIAL AUTOMATION SYSTEM by Manu Prasad.M, Navin Kumar.M 2015

The design and implementation of a Raspberry Pi-based wireless industrial automation system using Python are highlighted in this paper. A single sensor module is included in the software. The Raspberry Pi sensor module is used to monitor and regulate numerous parameters in industrial plants. A Raspberry Pi with a sensor module is used to run the coordinator module. The sensor module is connected to the Raspberry Pi via a python script. The acquired experimental findings show that the proposed system is useful in terms of low power usage. It is designed for automation and remote control applications and comes at a low cost.

2.1.8 Literature Survey 8

TITLE: INDUSTRIAL GAS AND FIRE DETECTION SYSTEM by Abhilash.M, Ankitha.S, Gnana Sudha.T, Shreehari.B, Vikas Reddy.S 2019

Every profession in the industry requires a safe working environment, and it is critical to provide one. The finding of fire and gas is a significant concern in all aspects of life where safety precautions are critical. To ensure safety, we utilise an Internet of Things (IoT) system that detects fire and gas leaks and sends a warning message via a cloud application to the floor manager and the local fire station. Sensors are utilised to measure gas emissions, temperature, and humidity, which can be detected using the DHT11 and the Flame detector. The MQTT Protocol is used to upload sensor data to the Cloud application (Message Queuing Telemetry Transport). Notifications can be activated in the event of significant changes in sensor values.

2.1.9 Literature Survey 9

TITLE: DESIGN AND IMPLEMENTATION OF SMART HOME by Abdullahi, Abubakar, Philip Kpae, Woji Chigozinum 2018

A smart home is a place with electrical appliances, lighting, heating, computers, air conditioning, TVs, entertainment sound, videos and cameras, and security systems that can communicate with each other and be measured remotely from any apartment in the house, and remotely anywhere in the world via phone or internet. This project is for designing a gas, smoke, fire, and movement scanner with SMS for home, office, and shopping security, using a pyroelectric (PIR) unoccupied space or homeowner or a pyroelectric (PIR) unoccupied space or homeowner or a pyroelectric (PIR) unoccupied space or homeowner or a pyroelectric (PIR) unoccupied space or homeowner or a pyro This project is important since it will offer alerts for gas leaks, smoke detection, fire, and SMS (entry) movement. It contributes to the enhancement of security. This was taken up by all of the homes. It will, however, necessitate some financial resources. Intelligent homework, like the introduction of power at the turn of the century, requires time to mature before reaching its pinnacle. In any event, having a smart house has numerous advantages due to the security and accommodations that I can supply.

2.1.10 Literature Survey 10

TITLE: HOME AUTOMATION AND SECURITY SYSTEM by Prajwal Prags, Raj kumar, Rakesh K.R, Somraj Chowdhury 2019

The Internet of Things (IoT) and other open source technologies are used to describe the details of home automation design, monitoring, and security systems in this article. The Internet of Things (IoT) is a collection of material or "embedded" objects, software, sensors, and network connections that allow these objects to collect and exchange data. The user can engage directly with the system via an online web-based interface, while home appliances like lights can be monitored and controlled remotely via an easy-to-use web page. Sensor data is sent to an open source location named Thingier, which displays the device status and position along with sensor values.

CHAPTER-3

AIM AND SCOPE

3.1 AIM

To monitor the industrial applications by sensors and generate alerts and alarms and control the situation using the concept of IoT. The system make use of fire sensor, gas sensor, along with LDR sensor and IR sensor to detect fire and gas and fire leakage as well as low lighting to avoid any industrial accidents and prevent loses.

3.2 SCOPE

- The system consists of an embedded web server with Arduino UNO. This Arduino UNO 11 acts as main processor. A wireless sensor network containing the Arduino UNO as master controller along with the various sensors such as MQ2 (Gas sensor), LDR (Light Dependent Resistors), Fire Sensor is also used.
- The proposed system contains a Arduino UNO based Appliances monitoring system. It can monitor the parameters such as light intensity, room temperature, fire and LPG gas. It also indicates the leakage of LPG gas and also inform the usage of LPG gas when it exceeds beyond certain level to the user or concerned authority.
- This system can monitor the status of appliances and update in the web server automatically. WIFI module ESP8266 is used to store the data in the cloud which is flexible and easy to connect and it is connected through the hotspot.
- The IOT monitoring data should be more efficient ,to save time. The data can be viewed in any browser including smart phones by logging in using the credentials.

3.3 BLOCK DIAGRAM

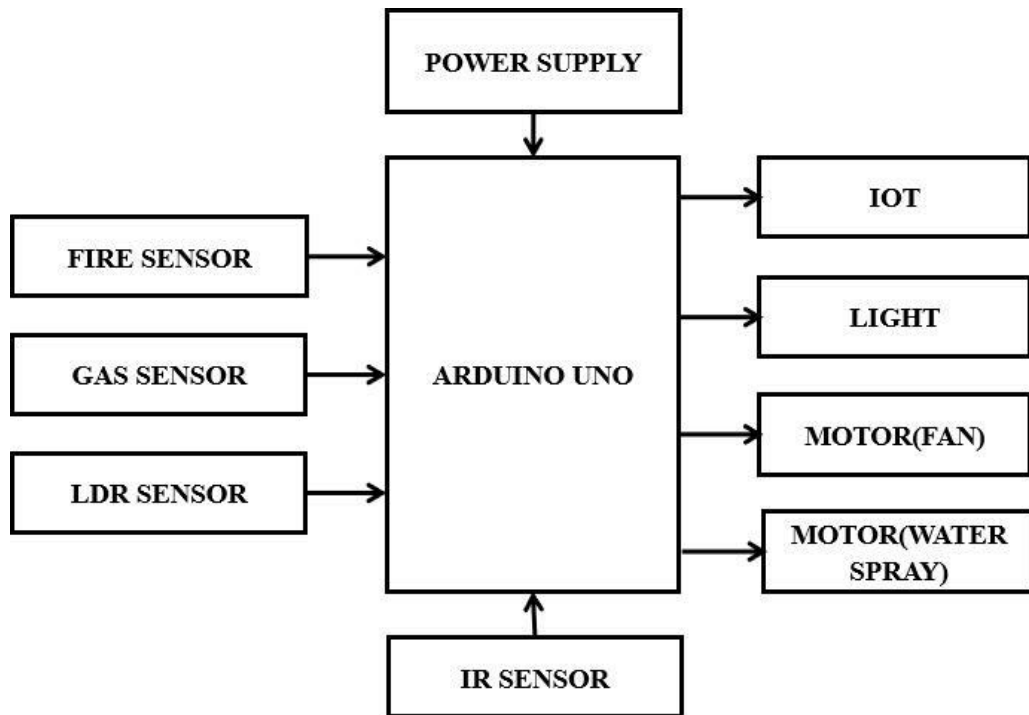


Fig:3.1 : Block Diagram

3.4 PICTURE OF PROJECT

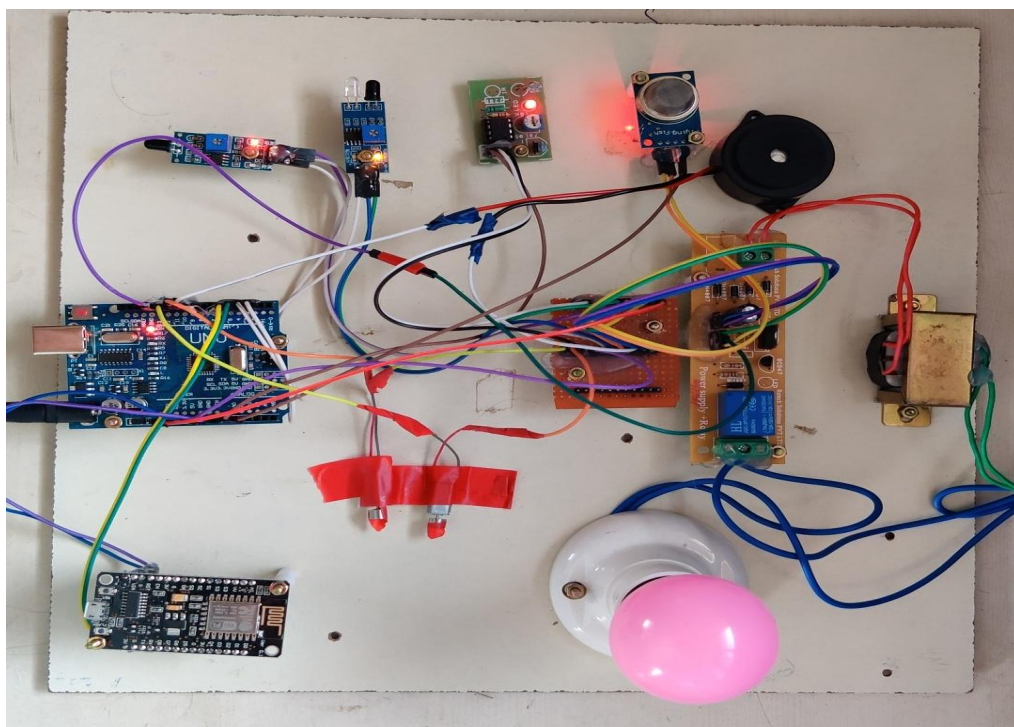


Fig:3.2 : Picture of the Project

CHAPTER 4

MATERIALS AND METHODS

4.1 METHODOLOGY

- ARDUINO UNO microcontroller is Programmed using Embedded 'C' language using arduino software.
- IOT wireless technology is used.

4.2 ARDUINO UNO

The Arduino Uno is also a microcontroller board supported the ATmega328 .It includes fourteen digital input/output pins of that six may be used as PWM outputs, six analog inputs, a sixteen MHz ceramic resonator, a USB affiliation, an influence jack, an ICSP header, and a button. It contains the overall factor mandatory to carry up the microcontroller; To force current, just connect it to a laptop with a USB cord or power it with an AC-to-DC converter or battery. The Uno is unique among previous boards in that it does not have the FTDI USB-to-serial driver chip. Instead, it uses a USB-to-serial converter written on the Atmega16U2 (Atmega8U2 up to version R2). The Uno board's revision two has an electrical component that connects the 8U2 HWB line to ground, making it easier to enter DFU mode.

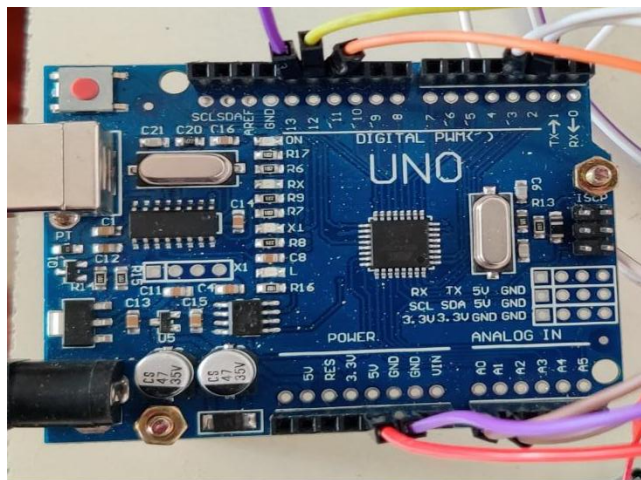


Fig: 4.1 : Arduino UNO

4.2.1 Power

- VIN - The Arduino board's input voltage when it's connected to an external power supply (as vital five volts from the USB association or alternative regulated power source).
- 5Volts - this pin receives a controlled 5Volts from the board's regulator. The board may also be powered by the DC power connection (7 - 12 volts), the USB connector (5 volts), or the board's VIN pin (7-12V). Using the 5Volts or 3.3Volts pins to supply power bypasses the regulator and may harm the board.
- 3Volts-3 The on-board regulator generates a 3.3-volt supply. The maximum current draw is 50 milliamperes.
- Ground pins (GND)

4.2.2 Memory

The ATmega328 has 32 KB of memory (with 0.5 KB used for the boot loader). There's also 2 KB of SRAM and 1 KB of EEPROM on board (which will be read and written with the EEPROM library). Every one of the fourteen digital pins on the Uno is used as an input or output, utilising the pin Mode (), digital Write (), and digital scan () functions. They run on 5 volts. Each pin contains a 20-50 kilo Ohm enclosed pull-up resistor (disconnected by default) and can give or receive a maximum of 40 m A.

4.2.3 Pin Configuration

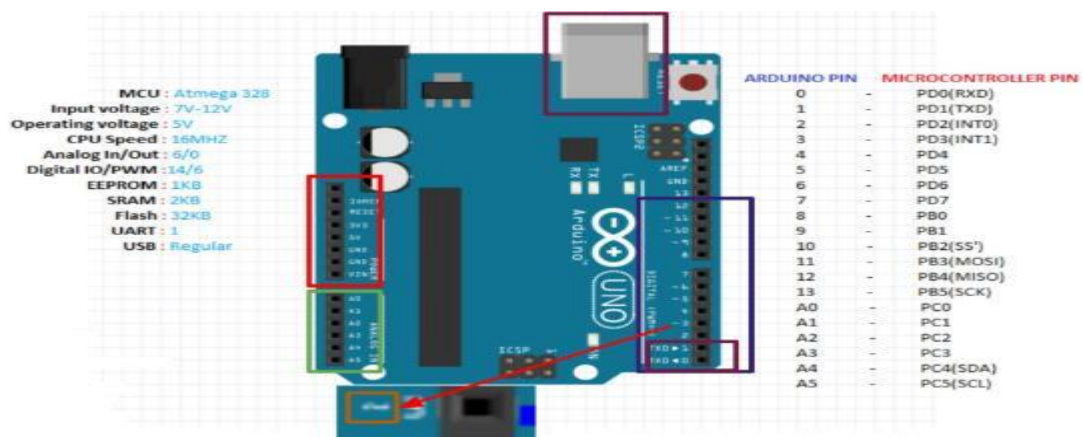


Fig: 4.2 : Arduno Uno Pin Configuration

4.2.4 Specialized Functions

- Serial: 0 (RX) and 1 (TX). Is Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the respective pins of the ATmega8U2 USB-to-TTL Serial chip.
- External Interrupts 2 and 3: These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value. The attach Interrupt () function for details.
- PWM: 3, 5, 6, 9, 10, and 11. Offer 8-bit PWM output with the analog Write () Operates.
- SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication using the SPI library.
- LED: 13. There is a built-in LED connected to digital pin 13. When the pin is HIGH.
- value, the LED is on, when the pin is LOW, it's off. The Uno has 6 analog inputs, labeled A0 through A5, every of that offers 10 bits of resolution (i.e., 1024 Totally different values). By default, 5 Volts is measured from ground, though it is possible to alter the upper end of their range using the AREF pin and the analog Reference () function.
- Additionally, some pins have specialized functionality:
- TWI: A4 or SDA pin and A5 or SCL pin. There square measure one or two of alternative pins on the board:
- AREF. Reference voltage for the analog inputs. Used with analog Reference ().
- Reset. Bring this line LOW to reset the microcontroller. Usually accustomed add a push button to shields that block the one on the board. cf the mapping between Arduino pins and ATmega328 ports. The mapping for the Atmega8, 168, and 328 is identical.

The Arduino Uno provides a number of communication options for connecting to a computer, another Arduino, or other microcontrollers. On digital pins zero (RX) and one (TX), the ATmega328 supports UART TTL (5V) serial connection (TX). The ATmega16U2 on the board channels serial communication through USB and appears to code 16 on the PC as a virtual com 19 port. The '16U2 code makes advantage of high-quality USB COM drivers and does not require an external

driver. On Windows, however, a .inf file is required. A serial monitor is included in the Arduino code, which allows simple matter data to be transferred to and from the Arduino board. Once information is delivered via the USB-to-serial chip and USB association to the computer, the RX and TX LEDs on the board can flash (but not for serial communication on pins zero and 1). a set of instructions Serial communication may be done on any of the Uno's digital pins using the serial library. I2C (TWI) and SPI communication are both supported by the ATmega328. To modify the usage of the I2C bus, the Arduino code contains a Wire library; read the documentation for further information. Use the SPI library for SPI communication.

4.2.5 USB Overcurrent Protection

The Arduino Uno incorporates a resettable poly fuse that secures your computer's USB ports from shorts and overcurrent. though most computers supply their own internal protection, the fuse provides an additional layer of protection. If quite 500 mA is applied to the USB port, the fuse can mechanically break the association till the short or overload is removed.

4.2.6 Physical Characteristics

The maximum length and dimension of the Uno PCB square measure a pair of 0.7 and 2.1 inches severally, with the USB connector and power jack extending on the far side the previous dimension. Four screw holes enable the board to be connected to a surface or case. Note that the gap between digital pins seven and eight is one hundred sixty mil (0.16"), not a fair multiple of the 100-mil spacing of the opposite pins.

4.3 ESP8266

ESP8266 offers a whole and self-contained Wi-Fi networking answer, permitting it to either host the applying or to dump all Wi-Fi networking functions from another application processor. once ESP8266 hosts the applying, and once it's the sole application processor within the device, it's ready to boot up directly from Associate in Nursing external flash. it's integrated cache to boost the performance of the system in such applications, and to reduce the memory needs. Alternately, serving as a Wi-Fi adapter, wireless net access are often further to any

microcontroller-based style with easy property through UART interface or the CPU AHB bridge interface. ESP8266 on-board process and storage capabilities permit it to be integrated with the sensors and different application specific devices through its GPIOs with bottom development up-front and bottom loading throughout runtime. With its high degree of on-chip integration, which has the antenna switch, power management converters, it needs bottom external electronic equipment, and also the entire answer, as well as front-end module, is intended to occupy bottom PCB space.

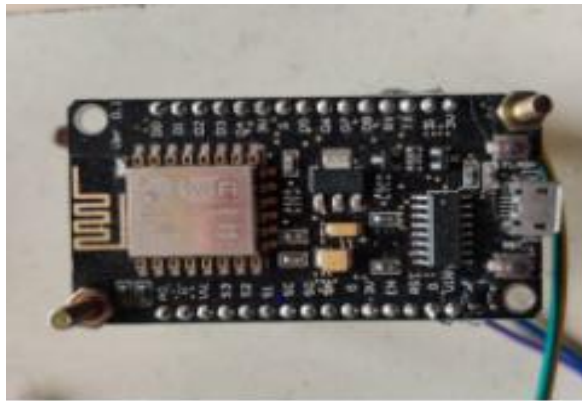


Fig:4.3 : ESP8266 IoT Module

4.3.1 Specification

- 802.11 b/g/n
- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack
- Integrated TR switch, LNA, power amplifier and matching network
- Integrated PLLs, regulators, DCXO and power management units
- +19.5dBm output power in 802.11b mode
- Power down leakage current of <10uA
- Integrated low power 32-bit CPU could be used as application processor
- SDIO 1.1/2.0, SPI, UART
- STBC, 1×1 MIMO, 2×1 MIMO
- A-MPDU & A-MSDU aggregation & 0.4ms guard interval
- Wake up and transmit packets in < 2ms
- Standby power consumption of < 1.0mW (DTIM3)

4.4 FIRE SENSOR

A flame detector is a sensor intended to detect and take action to the presence of a flame or fire, allowing flame detection. Depending on the installation, the response to a detected flame may involve sounding an alarm, disabling a fuel line such as propane or natural gas, and activating a fire suppression system.

When used in applications like industrial furnaces, their job is to provide confirmation that the furnace is operating properly; they do not take any action other than inform the operator or control system in these circumstances. Because of the mechanics it utilises to detect the flame, a flame detector may frequently react faster and more precisely than a smoke or heat detector.

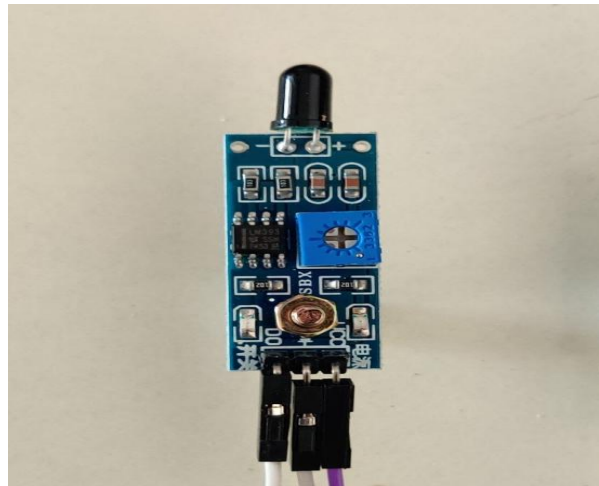


Fig:4.4 : Fire Sensor

4.4.1 Types of Fire Sensor

Flame-sensors are classified into four types

- IR single frequency
- IR multi-spectrum
- UV flame detectors
- UV/ IR flame detectors

4.4.2 Features and Specifications

- Photosensitivity is higher
- Response time is accelerated
- Easy to use
- Sensitivity is adaptable
- Detection angle is 600,
- It is sensitive to the flame range.
- Accuracy can be adaptable
- Operating voltage of this sensor is 3.3V to 5V
- Analog voltage o/ps and digital switch o/ps
- The PCB size is 3cm X 1.6cm
- Power indicator & digital switch o/p indicator
- If the flame strength is light within 0.8m then the flame test can be excited, if the flame intensity is higher, then the detection of distance will be developed.

4.4.3 Applications

- Hydrogen stations.
- Gas-fueled cookers
- Industrial heating and drying systems
- Domestic heating systems
- Industrial gas turbines

4.5 GAS SENSOR

A gas detector is a device that, as part of a safety system, detects the presence of gases in a given space. This type of equipment is used to detect gas leaks or other pollutants and may be connected to a control system to shut down a process without the need for human participation. Operators in the area where the leak is occurring can be alerted by a gas detector, giving them the opportunity to flee. Because many gases may be harmful to biological life, such as humans and animals, this sort of equipment is required.

Combustible, flammable, and poisonous gases, as well as oxygen deficiency, can be detected with gas detectors. This sort of equipment is widely used in industry and may be found in places where manufacturing processes are monitored, such as on oil rigs.

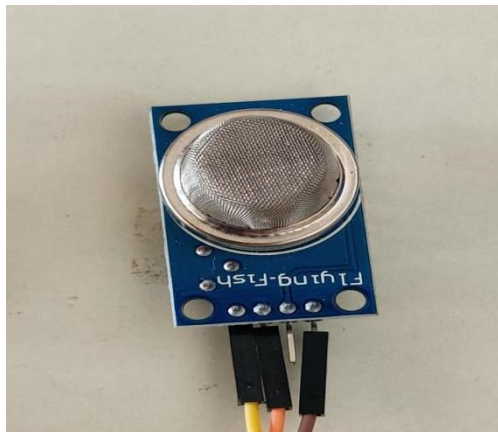


Fig:4.5 : Gas Sensor

4.5.1 Working Principle

This sensor has a detecting element made mostly of aluminium oxide-based ceramic that has been coated with Tin dioxide and is surrounded in a stainless steel mesh. Six connecting legs are linked to the sensing device. The sensor element is heated by two leads, while the other four are employed for output signals. When a sensor material is heated to a high temperature in the air, oxygen is adsorbed on the surface. The donor electrons in tin oxide are then drawn to this oxygen, blocking the current from flowing.

4.5.2 Applications

4.6 LDR SENSOR

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4.6.1 Construction of a LDR

A light-sensitive substance is put atop an insulating substrate, such as ceramic, in the fabrication of an LDR. To achieve the requisite power rating and resistance, the material is arranged in a zigzag pattern. The zigzag area divides the metal-placed portions into two zones.

Where the Ohmic connections are created on the outside of the region or on the sides. The contact resistances must be as low as feasible to ensure that the resistance fluctuates mostly due to the light action. Lead and cadmium compounds are not used since they are harmful to the environment.

4.6.2 Working Principle Of LDR

An LDR's operating principle is photo conductivity, which is nothing more than an optical phenomena. When light is absorbed by a substance, the material's conductivity decreases. When light strikes the LDR, the electrons in the material's valence band are ready to go into the conduction band. However, the photons in the incoming light must have a larger energy than the material's band gap in order for the electrons to jump from one band to the next, i.e. from valance to conduction. As a result, when enough energy is present in the light, more electrons are energised to the conduction band, resulting in a large number of charge carriers. When the result of this process and the flow of current flows more ,the resistance of the device decreases.

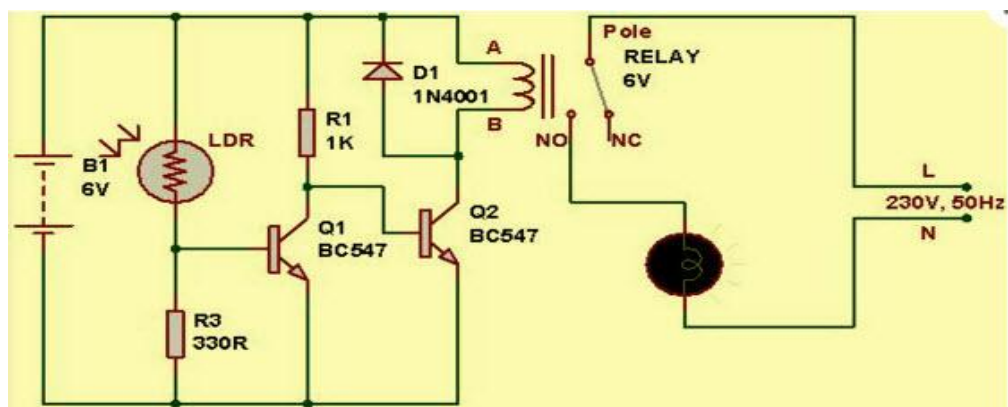


Fig:4.7 : LDR Sensor Circuit Diagram

4.7 IR SENSOR

An IR sensor is an electronic device that emits signals in order to scan some aspects of the surroundings. An infrared sensor can detect motion as well as determine the heat of an item. The term "passive IR sensor" refers to sensors that simply calculate infrared energy rather than emitting it. In general, all things emit some type of heat radiation in the infrared range. These sorts of radiations are invisible to the naked eye but detectable by an infrared sensor. The emitter is a standard IR LED Light Emitting Diode, and the detector is a standard IR photodiode that responds to IR light of the same wavelength as the IR LED. When infrared light strikes the photodiode, the resistances and output voltages vary in response to the intensity of the IR light.

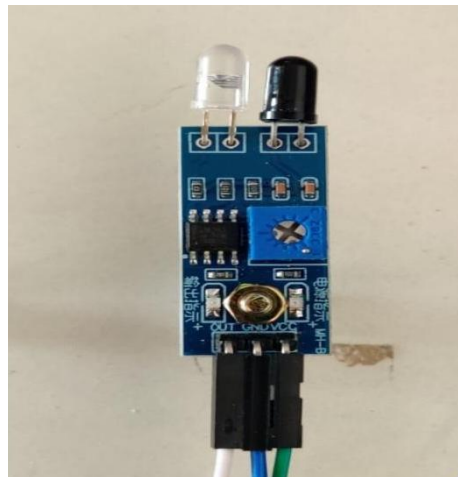


Fig:4.8 : Infrared Sensor

4.7.1 Specifications

- It is available in a leaded package
- The type of detector used is photo-transistor
- The Peak operating distance is 2.5 mm.
- Collector current ranges from 0.2 mm – 15 mm
- The typical o/p current blow test (IC) is 1 mA.
- Blocking filter for daylight
- The wavelength of the emitter is 950 nm
- Infrared sensor including the o/p of transistor

- The operating voltage is 5V
- The forward current of the diode is 60mA
- Output data is analog/digital
- The Collector current of the transistor is 100mA
- Operating temperature ranges from -25°C to +85°C

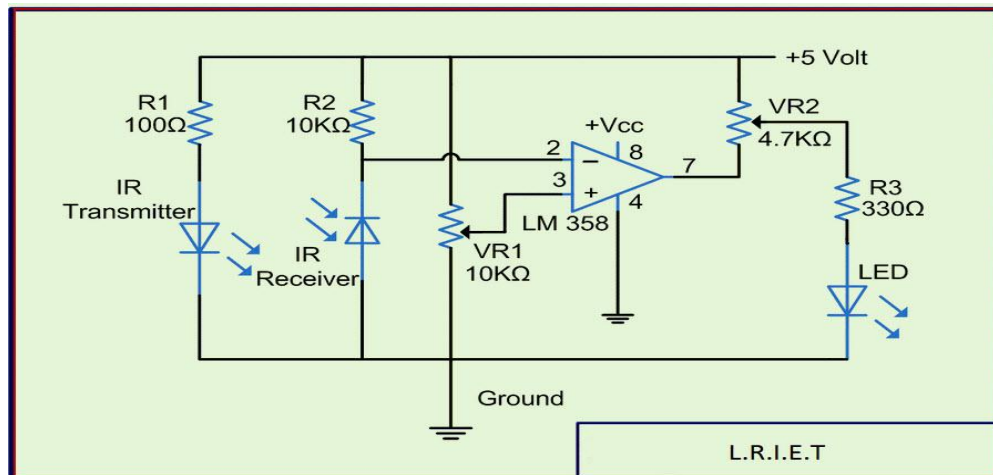


Fig:4.9 : IR Sensor Circuit Diagram

4.8 BUZZER

A buzzer or electronic device is an audio device, which can be mechanical, mechanical device, or electricity (piezo for short). Typical uses of buzzers and beepers embody alarm devices, timers, and confirmation of user input like a depression or keystroke.



Fig:4.10 : Buzzer

4.8.1 Types of Buzzer

4.8.1.1 Electromechanical

Early devices were supported AN mechanical device system a dead ringer for an electrical bell while not the metal gong. Similarly, a relay could also be connected to interrupt its own causative current, inflicting the contacts to buzz, typically these units were anchored to a wall or ceiling to use it as a sounding board. The word "buzzer" comes from the rasping noise that mechanical device buzzers created.

4.8.1.2 Mechanical

A joy buzzer is AN example of a strictly mechanical buzzer and that they need drivers. different samples of them are doorbells.

4.8.1.3 Piezoelectric

A electricity component could also be driven by AN oscillatory electronic circuit or different audio signal supply, driven with a electricity amplifier. Sounds normally won't to indicate that a button has been ironed are a click, a hoop or a beep.

A electricity buzzer/beeper conjointly depends on acoustic cavity resonance or Baron Hermann Ludwig Ferdinand von Helmholtz resonance to supply AN loud beep

4.8.2 Piezo Buzzer Characteristics

- Wide operating voltage: 3~250 V
- Lower current consumption: less than 30 mA higher rated frequency
- Larger footprint
- Higher sound pressure level

4.8.3 Structure Of Piezo Buzzer

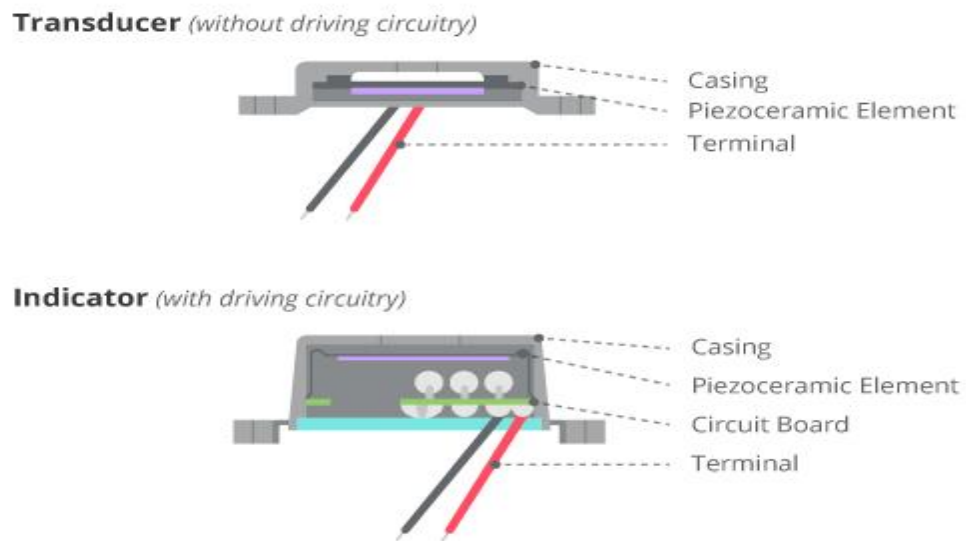


Fig:4.11 : Structure of Piezo Buzzer

There are 2 forms of piezo buzzers - transducers and indicators. Transducers contains a casing, a piezo ceramic part and a terminal. so as to work an electrical device, the user should send a square wave signal to the buzzer. Indicators contains a casing, a piezo ceramic part, a card and a terminal. so as to work AN indicator, the user should send the buzzer a nominative dc voltage.

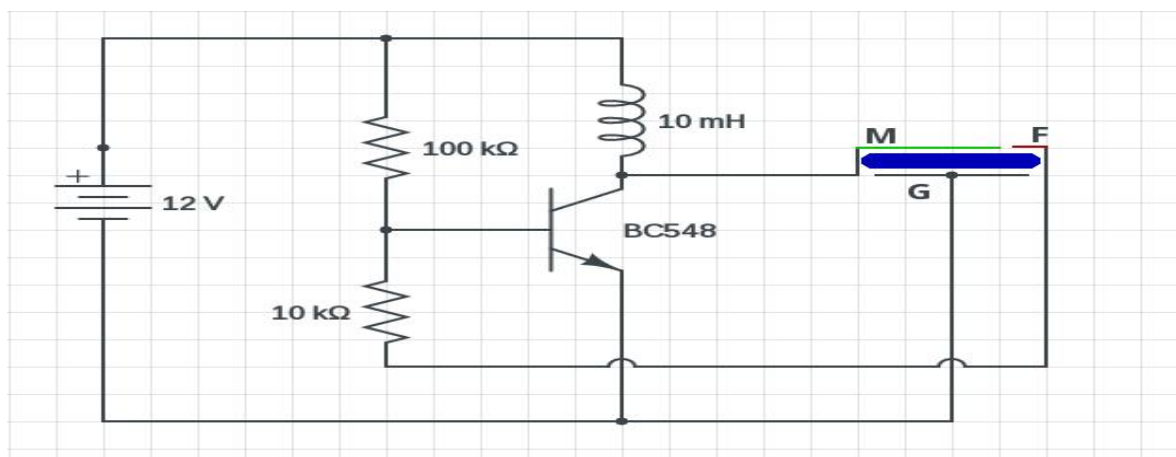


Fig:4.12 : Piezo Buzzer Circuit Diagram

4.8.4 Applications

While technological advancements have caused buzzers to be impractical and undesirable, there are still instances in which buzzers and similar circuits may be used.

Present day applications include:

- Novelty uses
- Judging panels
- Educational purposes
- Annunciator panels
- Electronic metronomes
- Game show lock-out device
- Microwave ovens and other household appliances
- Sporting events such as basketball games
- Electrical alarms
- Joy buzzer (mechanical buzzer used for pranks)

4.9 RELAY

A relay is an electrically operated switch. Several relays employ an electro magnet to automatically operate a switch, while some, such as solid-state relays, use distinct operational principles. Relays are employed when a circuit has to be managed by a separate low-power signal or when several circuits need to be controlled by a single signal. Primary relays were used as amplifiers in long-distance telegraph lines, recurrenring the signal coming in from one circuit and re-transmitting it on another. Relays were widely employed to conduct logical operations in phone exchanges and early computers.

A type of relay that may handle the high power needed to directly management an electrical motor or different masses is named a contactor. Solid-state relays control power circuits without using moving parts, instead relying on a conductor to make changes. In modern electrical power systems, similar duties are accomplished by digital instruments still referred to as "protective relays." Relays with graded

operational characteristics and typically several operational coils are used to safeguard electrical circuits from overload or defects.

Magnetic latching relays require one coil power pulse to move their contacts one way and another, redirected pulse to move them the opposite way. Recurrent pulses from a comparable input have no effect. Magnetic latching relays are useful in applications where the contacts should not be transitioned by interrupted power.

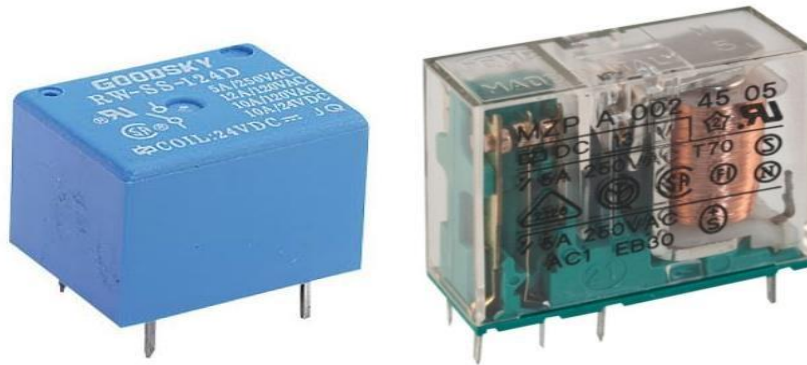


Fig:4.13 : Relay

4.9.1 Basic Design and Operation

A basic magnetic attraction relay is made out of a coil of wire wrapped around a soft iron core (a solenoid), an iron yoke that offers a reluctance channel for magnetic flux on occasion, a moveable iron coil, and one or more sets of contacts (there are a unit 2 contacts within the relay pictured). The coil is hinged to the yoke and is linked to at least one or more sets of moving contacts automatically. Because the coil is controlled in situ by a spring, there is an air gap within the magnetic circuit after the relay is de-energized. One of the two sets of contacts in the relay shown is closed in this circumstance, and the other set is open. Different relays may have more or fewer sets of contacts depending on their function. The relay in the illustration also has a wire that connects the coil to the yoke. This maintains circuit continuity between the coil's moving contacts and, as a result, the circuit track on the computer circuit board (PCB) through the yoke, which is connected to the PCB. When an electrical current passes through the coil, it creates a field of force that activates it, and the following movement of the moveable contact(s) either makes or breaks a reference to a specified contact (depending on the structure).

If the set of contacts was closed once the relay was de-energized, then the movement opens the contacts and breaks the association, and the other way around if the contacts were open. once the present to the coil is shifted, the coil is came back by a force, about 0.5 as robust because the magnetism, to its relaxed position. Usually, this force is provided by a spring, however gravity is additionally used unremarkably in industrial motor starters. Most relays area unit factory-made to work quickly. in a very low-tension application this reduces noise; in a very high voltage or current application it reduces arcing.

A diode is generally put across the coil when it is powered with electrical energy to dissipate the energy from the collapsing field of force during deactivation, which may otherwise cause a voltage spike harmful to semiconductor circuit parts. Such diodes weren't widely utilised until transistors were employed as relay drivers, but they quickly became ubiquitous since early chemical element transistors were simply destroyed by the surge. In the case of some automobile relays, there is a diode. Surge currents around the relay output contacts may also be an issue if the relay is driving a large or reactive load. during this case a snubber circuit (a electrical device and electrical device in series) across the contacts might absorb the surge. appropriately rated capacitors and therefore the associated electrical device area unit oversubscribed as one prepacked element for this common place use.

4.9.2 Types Of Relays

- Single Pole Single Throw Relay.
- Single Pole Double Throw Relay.
- Double Pole Single Throw Relay.
- Double Pole Double Throw Relay.

4.9.3 Advantages Of Relays

- Relays can switch AC and DC, transistors can only switch DC.
- Relays can switch high voltages, transistors cannot.
- Relays are a better choice for switching large currents.
- Relays can switch many contacts at once.

4.10 DC MOTOR

A DC motor is a revolving piece of electrical equipment that converts electrical energy to mechanical energy. The most common kinds take into account the forces generated by magnetic fields. Almost all DC motors include a built-in mechanism, whether mechanical or electronic, that can change the direction of current flow in the motor on a periodic basis.

DC motors were the most commonly used because they could be operated by existing direct-current lighting power distribution networks. The speed of a DC motor is frequently adjusted across a wide range, using either a variable supply voltage or constantly adjusting the intensity of current in its field windings. Small DC motors are found in a variety of equipment, toys, and appliances. The universal motor will look after electrical energy, but it might also be a light-weight brushed motor that is utilised for portable power tools and appliances. Larger DC motors are used in the propulsion of electric vehicles, elevators and hoists, and steel rolling mill drives. The advent of power physics has opened up the possibility of replacing DC motors with AC motors in a variety of applications.

4.10.1 Working of DC Motor

A DC motor is a mechanism that converts electrical energy into energy in a range of rotational directions. Electromagnetism's physical activity is responsible for its mobility. DC motors contain inductors within that provide the field that drives movement, however this field changes when DC current is applied. An iron item wrapped in a wire coil with voltage applied to its terminals might be used as a magnet.. If 2 fastened magnets square measure other in either side of this magnet, the repulsive and enticing forces can manufacture a force. Then, there square measure 2 issues to solve: feeding the present to the rotating magnet while not the wires obtaining twisted, and dynamical the direction of the present at the

acceptable time. each of those issues square measure resolved victimisation 2 devices : a split-ring electric switch, and a try of brushes.

As it is often seen, the electric switch has 2 segments that square measure connected to every terminal of the magnet, besides the 2 arrows square measure the brushes that apply current to the rotary magnet. In real DC motors it are often found 3 slots rather than 2 and 2 brushes.

This way, because the magnet is moving its polarity is dynamical and also the shaft might keep rotating. though it's easy and sounds that it'll work nice there square 44measure some problems that build these motors energy inefficient and automatically unstable, the principal drawback is because of the temporal order between every polarity inversion.

Since polarity within the magnet is modified automatically, at some velocities polarity is dynamical ahead of time, that lead to reverse impulses and typically in dynamical too late, generating instant “stops” in rotation. regardless of the case, these problems manufacture current peaks and mechanical instability.

4.10.2 Control of DC Motor

DC motors have solely 2 terminals. If you apply a voltage to those terminals the motor can run, if you invert the terminals position the motor can amendment its direction. If the motor is running and you suddenly disconnect each terminals the motor can keep rotating however deceleration down till stopping. Finally, if the motor is running and you suddenly short-circuit each terminals the motor can stop. So there's not a 3rd wire to regulate a DC motor, however knowing the previous behaviors it is designed how to regulate it, and also the resolution is AN H-bridge.

4.10.3 Main Types of DC Motors

Understanding the various kinds of DC motors also will assist you perceive however they're used for various applications, and which sort could apply to your application.

There are four main kinds of DC motors:

4.10.3.1 Permanent Magnet DC Motors

The magnet motor uses a magnet to form field flux. this sort of DC motor provides nice beginning torsion and has smart speed regulation, however torsion is proscribed so that they are generally found on low HP applications.

4.10.3.2 Series DC Motors

The sphere is coiled with a few of rounds of an outsized wire carrying the entire coil current in a series DC motor. Typically, series DC motors create a large amount of initial torsion, but they are unable to regulate speed and may even break if operated without a load. Because of these drawbacks, they aren't a good fit for variable-speed drive applications.

4.10.3.3 Shunt DC Motors

In shunt DC motors the sphere is connected in parallel (shunt) with the coil windings. These motors provide nice speed regulation because of the actual fact that the shunt field will be excited one by one from the coil windings, that cojointly offers simplified reversing controls.

4.10.3.4 Compound DC Motors

Compound DC motors, like shunt DC motors, have a one by one excited shunt field. Compound DC motors have smart beginning torsion however could expertise management issues in variable speed drive applications.

4.11 CURRENT TRANSFORMER

A flow transformer (CT) is utilized for estimation of electric flows. Current transformers, along with voltage transformers (VT) (possible transformers (PT)), are known as instrument transformers. At the point when current in a circuit is excessively high to straightforwardly apply to estimating instruments, a current transformer creates a diminished current precisely corresponding to the current in the circuit, which can be helpfully associated with estimating and recording instruments. A current transformer likewise disengages the estimating instruments from what might be exceptionally high voltage in the checked circuit. Flow transformers are usually utilized in metering and defensive transfers in the electrical force industry. Like some other transformer, a current transformer has an essential winding, an attractive center, and an auxiliary winding. The exchanging current streaming in the essential delivers an attractive field in the center, which at

that point instigates a current in the optional winding circuit. An essential goal of current transformer 13 configuration is to guarantee that the essential and auxiliary circuits are effectively coupled, so the optional current bears an exact relationship to the essential current.

4.11.1 Features

- Current transformers are used extensively for measuring current and monitoring the operation of the power grid..
- There are two main ideals to which current transformers are intended. IEC 60044-1 (BSEN 60044-1) & IEEE C57.13 (ANSI)
- Most CTs have rating factors for 35 degrees Celsius and 55 degrees Celsius.
- The minimum primary current a CT can accurately measure is "light load," or 10% of the nominal current

4.11.2 Theory Of Operation

A CT is useful for measurements made on AC waveforms. It acts a bit like a daily voltage transformer, but typically has just one primary winding (the wire carrying the present to be measured). Unlike a daily voltage transformer, there's no physical connection made to the measured line. The CT induces a secondary current by using magnetic fields created by the AC current passing through the first wire. The amplitude of the current on the output is determined by the number of secondary turns divided by the number of primary turns. A CT's output serves as a current source. Current transformers (CTs) are a simple, low-cost, and accurate way to measure current flow in power wires. They come in three basic configurations:

1. Ring Core CTs can measure currents ranging from 50 to 5000 amps, with windows (power conductor opening sizes) ranging from 1" to 8" in diameter.
2. Split Core CTs can measure currents ranging from 100 to 5000 amps, with windows ranging in size from 1" by 2" to 1" by 2" to 13" by 30". Split core CT's have one end removable in order that the load conductor or bus bar doesn't need to be disconnected to put in the CT.

3. Wound Primary CT's are intended to live flows from 1 amp to 100 amps. Since the heap current goes through essential windings inside the CT, screw terminals are accommodated the heap and optional conductors. Wound essential CT's are accessible in proportions from 2.5:5 to 100:5 (Models 189 and 190 are tests of wound essential CT's)

4.11.3 Design of CT

As through and through transformers, blunders emerge because of an extent of the initially input current becoming accustomed to charge the center and not moved to the auxiliary loop . The extent of the primary current utilized for this reason decides the amount mistake. The substance of good plan of estimating current transformers is to guarantee that the charging current is adequately low to guarantee that the blunder indicated for the exactness class isn't surpassed. This is accomplished by choosing reasonable center materials and the fitting cross-sectional space of center. Regularly in estimating flows of 50A and upwards, it's advantageous and actually stable for the main twisting of a CT to have one turn as it were. In these commonest cases the CT is outfitted with an optional curl just, the first being the link or busbar of the most conductor which is gifted the CT gap inside the instance of ring CTs (I .e. single essential turn) it ought to be noticed that the lower the appraised essential current the more troublesome it is (and the more costly to accomplish a given exactness. Thinking about a center of certain fixed measurements and attractive materials with an optional twisting of say 200 turns (current proportion 200/1 turns proportion 1/200) and say it takes 2 amperes of the 200A essential current to polarize the center, the blunder is in this manner only one roughly. Anyway thinking about a 50/1 CT with 50 auxiliary actuates a comparable center it actually takes 2 amperes to charge to center. The mistake is then 4% around. To get a 1% precision on the 50/1 ring CT a lot bigger center as well as costly center material is required. Used to expand the force yield source

4.12 POWER SUPPLY

Force Supply is the gadget that moves electric force from a source to a heap utilizing electronic circuits. Force supplies are utilized in numerous modern and aviation applications and furthermore in customer items. A portion of the

necessities of force supplies are little size, light weight, minimal effort, and high force transformation effectiveness. What's more, some force supplies require the accompanying: electrical

segregation between the source and burden, low consonant contortion for the info and yield waveforms, and high force factor if the source is ac voltage. Some

unique force supplies require controlled course of force stream. Common use of force supplies is to change over AC input capacity to a managed voltage needed for electronic hardware.

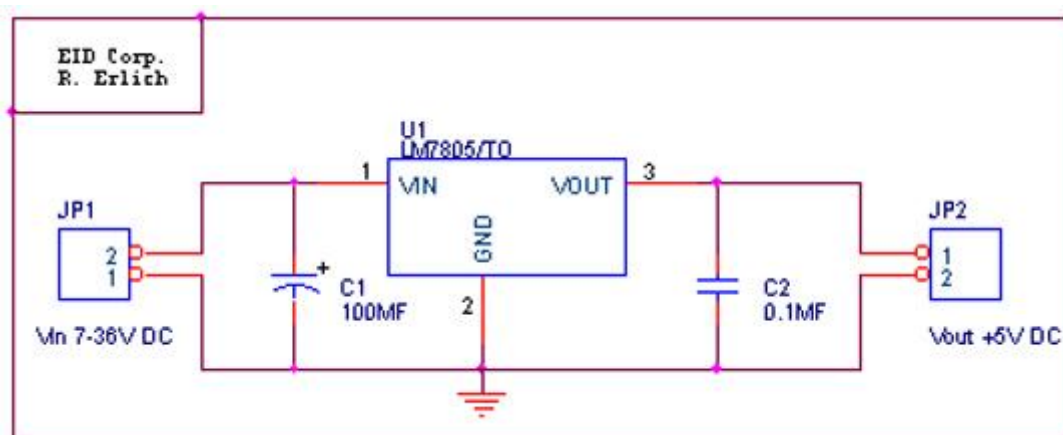


Fig:4.14 : Power Supply Circuit Diagram

4.12.1 Linear Power Supply

A direct force supply is the most established and easiest sort of force supply.

In these force supplies, electrical disengagement must be given by cumbersome line recurrence transformers. The AC source can be redressed with a scaffold rectifier to get an uncontrolled DC, and afterward a DC-to-DC converter can be utilized to get a controlled DC yield. The yield voltage is directed by dropping the additional information voltage across an arrangement semiconductor. They have minuscule yield swell, hypothetically zero commotion, enormous hold-up time and quick reaction. The activity of a transformer is with the end goal that a period fluctuating AC voltage or current is changed to a sequential worth, as set by the transformer turns proportion. The transformer doesn't add power, so it follows that the force on either side should be steady. That is the explanation that the twisting with more turns has higher voltage yet lower current, while the twisting with less

turns has lower voltage however higher current. The progression down transformer changes over the AC contribution with the more elevated level to some lower level. A scaffold rectifier changes over the AC voltage into DC voltage. A four-semiconductor converter (Bridge Rectifier) that can create the most noteworthy yield power than different sorts of rectifiers. The channel circuit opposes the undesirable AC signals. The controller at that point changes a DC voltage over to a lower DC voltage of a similar extremity.

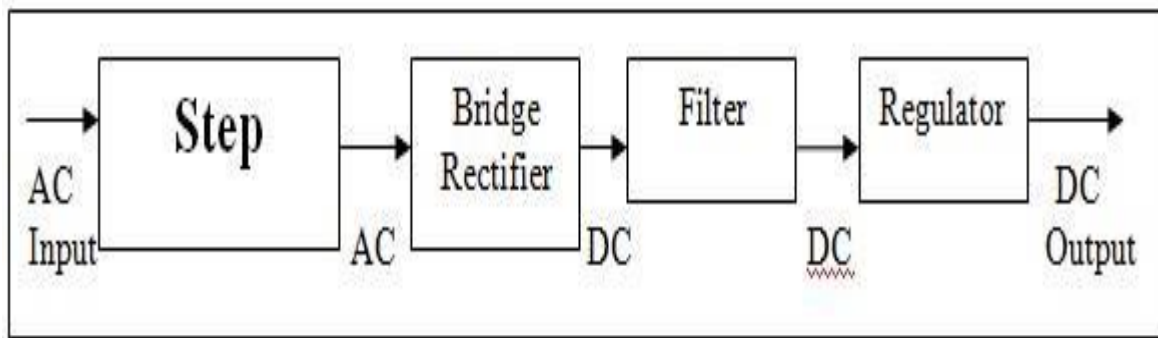


Fig:4.15 : Block Diagram Of Power Supply

4.13 ARDUINO IDE

Arduino is associate ASCII text file platform used for building physics comes. Arduino consists of each a physical programmable printed circuit (often stated as a microcontroller) and a bit of software system, or The IDE (Integrated Development Environment), which is installed on your laptop, is used to write and transmit code to the actual board.

Individuals who are just getting started with physics have found the Arduino platform to be highly appealing. The Arduino, unlike most previous programmable circuit boards, does not require a separate piece of hardware (known as a programmer) to load fresh code into the board; instead, all that is necessary is a USB cable. Furthermore, the Arduino IDE uses a simplified version of C++, making programming easier. Finally, Arduino has a standard problem that divides the activities of the microcontroller into more manageable chunks.

The Arduino hardware and software system may assist artists, designers, enthusiasts, hackers, newbies, and anybody interested in creating interactive objects or environments. Buttons, LEDs, motors, speakers, GPS devices, cameras, the web, and even your smartphone or television will interact with Arduino. This

flexibility combined with the actual fact that the Arduino software system is free, the hardware boards are pretty low-cost, and each the software system and hardware are straightforward to find out has crystal rectifier to an outsized community of users World Health Organization have contributed code and discharged directions for a large style of Arduino-based comes. There are many sorts of Arduino boards (explained on successive page) which will be used for various functions. Some boards look a small amount completely different from the one below, however most Arduinos have the bulk of those parts in common:



Fig:4.16 : Arduino Software

Programs written victimisation Arduino software system (IDE) are referred to as sketches. These sketches are written within the text editor and are saved with the file extension.ino. Cutting/pasting and searching/replacing text are both possible in the editor. The message area gives feedback when saving and mercantilism is in progress, as well as displaying mistakes. The console shows text from the Arduino software system (IDE), as well as detailed error messages and other information. The designed board and interface are displayed in the window's very inexpensive righthand corner. Verify and transfer programmes, generate, save, and save drawings, and open the serial monitor are all possible with the toolbar buttons. The Arduino IDE is quite simple, but it provides a near-complete environment for many Arduino-based projects. The quality options are found in the top menu bar, with "File" (new, load, save, etc.), "Edit" (font, copy, paste, etc.), "Sketch" (for collection and programming), "Tools" (helpful choices for testing projects), and "Help." The IDE's main portion might be a simple text editor, which is where you'll enter the application code. A small piece of the IDE is devoted to an output window where you can check the status of the compilation, how much memory has

been utilised, any faults identified inside the programme, and a variety of other useful notifications.

Projects created victimisation the Arduino are referred to as sketches, and such sketches are sometimes written in an exceedingly cut-down version of C++ (a variety of C++ options aren't included). as a result of programming a microcontroller is somewhat completely different from programming a laptop, there are variety of device-specific libraries (e.g., ever-changing pin modes, output knowledge on pins, reading analog values, and timers). This generally confuses users World Health Organization assume Arduino is programmed in associate “Arduino language.” However, the Arduino is, in fact, programmed in C++. It simply uses distinctive libraries for the device.

The Arduino IDE supports the programming languages C and C++, which need unique code structure conventions. The Wiring project's software system library is included in the Arduino IDE and includes various common input and output processes. User-written code just requires two basic methods to start the sketch and the main programme loop, which are built together with a programme stub `main()` into a potential cyclic computer programme using the antelope toolchain, which is also included with the IDE release. The Arduino IDE uses the avrdude software to transform potential code into a positional notation cryptographic document that is loaded into the Arduino board by a loader programme embedded in the board's computer code.

4.14 EMBEDDED C

Embedded C is the most popular programming language for constructing electrical gadgets in the software system industry. Every processor in an electronic system is linked to a software system called embedded software.

Embedded C programming is essential for the CPU to accomplish specified tasks. In regular life we have a tendency to used several electronic devices like portable, washer, photographic camera, etc. These all device operating relies on microcontroller that is programmed by embedded C.

The Embedded C code written in higher than diagram is employed for blinking the diode connected with Port0 of microcontroller. In embedded system programming

C code is most well-liked over alternative language. because of the subsequent reasons:

- Easy to understand
- High Reliability
- Portability
- Scalability

Most shoppers square measure accustomed to application package that offer practicality on a pc. Embedded package but is commonly less visible, however no simpler. not like application package, embedded package has fastened hardware needs and capabilities, and addition of third-party hardware or package is strictly controlled. Embedded package has to embody all required device drivers at producing time, and therefore the device drivers square measure written for the particular hardware. The package is very keen about the mainframe and specific chips chosen. Most embedded package engineers have a minimum of a passing data of reading schematics, and reading knowledge sheets for elements to see usage of registers and communication system. Conversion between decimal, hex and binary is beneficial further as victimization bit manipulation.

Communications between processors other components are essential. Besides direct memory addressing, common protocols include I²C, SPI, serial ports, and USB. Communications protocols designed for use in embedded systems are available as closed source from companies including Inter Niche Technologies and CMX Systems. Open-source protocols stem from uIP, lwip, and others

A Keyword is a special word with a special meaning to the compiler (a C Compiler for example, is a software that is used to convert program written in C to Machine Code).

For example, if we take the Keil's Cx51 Compiler (a popular C Compiler for 8051 based Microcontrollers) the following are some of the keywords:

- bit
- sbit
- sfr
- small

- large

These are few of the many keywords associated with the Cx51 C Compiler along with the standard C Keywords.

CHAPTER 5

RESULTS AND DISCUSSIONS

5.1 HARDWARE

- When the gas sensor value goes above 2.5 the buzzer turns ON.
- If flame detected==1, the motor will be turned ON for water sprinkler.
- If the LDR value <1 and movement detected by IR sensor, the light will be turned ON.

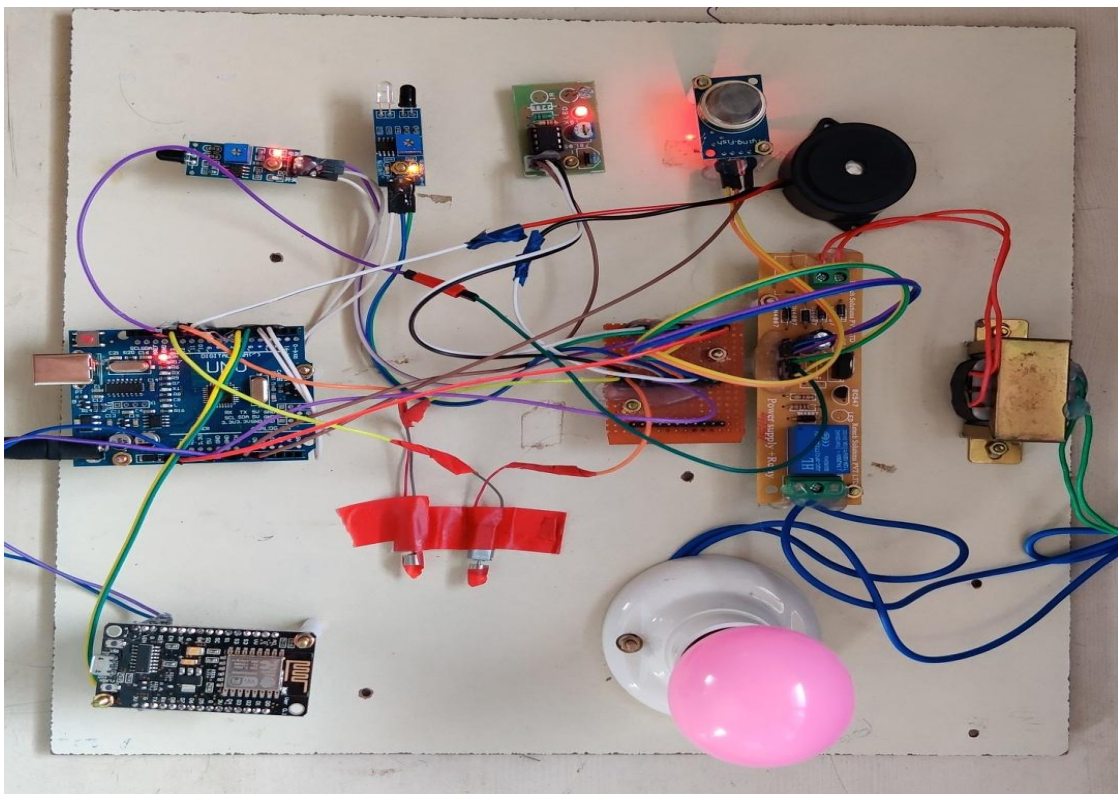


Fig:5.1 : Hardware

5.2 OUTPUT

5.2.1 Gas Detection

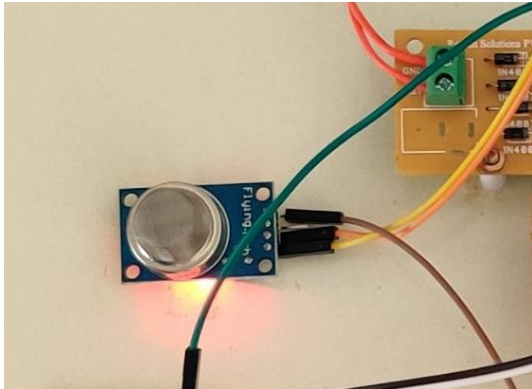


Fig:5.2 : Gas sensor

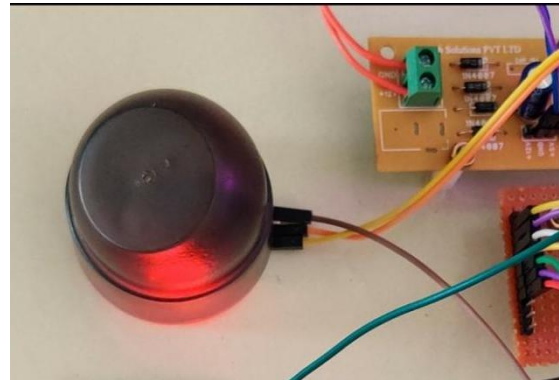


Fig:5.3 : When gas is detected

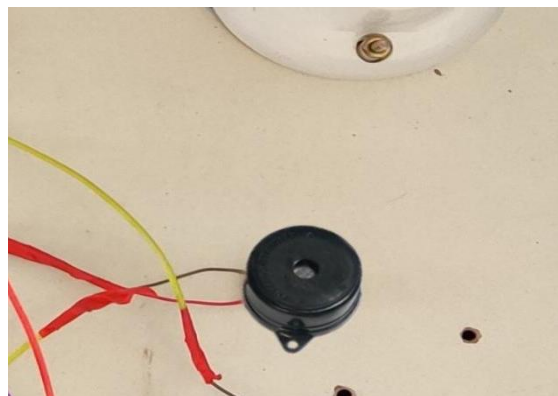


Fig:5.4 : Buzzer beeps

everything is good TOXIC GAS DETECTED everything is good
TOXIC GAS DETECTED everything is good TOXIC GAS DETECTED everything is good everything is good
everything is good everything is good

Fig:5.5 : Webpage alert

For gas detection - Fig 5.2 represents gas sensor which is used to measure the concentration or presence of gas in the atmosphere, when the gas sensor covered with gas filled cap as represented in Fig:5.3 the gas sensors value increases in terms of voltage. Once it reaches the preset value for alerting the gas leak the buzzer will be turned on. Which is shown in Fig: 5.4. and the alert message will be displayed as toxic gas detected in webpage as shown in Fig:5.5 .

5.2.2 Fire Detection

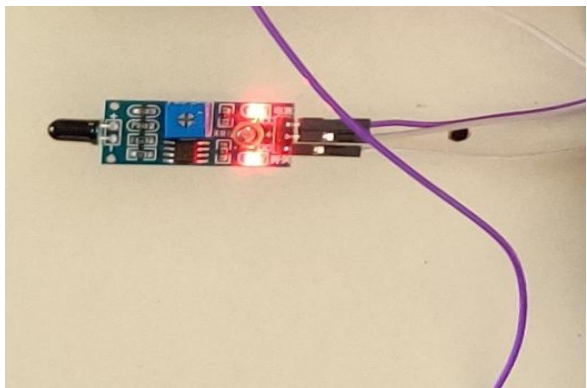


Fig:5.6 : Fire sensor

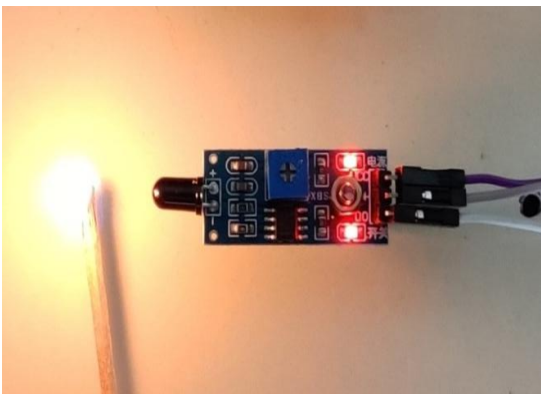


Fig:5.7 : When fire is detected

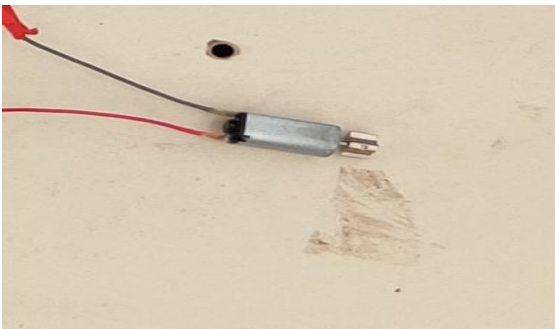


Fig:5.8 : Motor turns on.

Fire Detected Fire Detected
Fire Detected everything is good everything is good everything is good everything is good
everything is good everything is good everything is good everything is good everything is good

Fig:5.9 : Webpage alert

For fire detection - Fig:5.6 represents fire sensor used to sense smoke and heat by an automatic fire detection arrangement, in normal condition the fire sensor gives the value 0 to the microcontroller. So when the fire detected as represented in Fig:5.7 the sensor value becomes 1 and as an output the motor will be turned on for water sprinkler which is represented in Fig:5.8 and the alert message will be displayed as fire detected in webpage as shown in Fig:5.9.

5.2.3 Light Intensity



Fig:5.10 : LDR detects low light and IR detects movement



Fig:5.11 : Light turns on

For light intensity - Fig 5.10 represents LDR sensor and IR sensor which is used to detect low light and human movement, when there is a low light condition the LDR value will become less than one, so if the LDR gives the value less than one to the microcontroller and IR sensor detects human movement using transmitter and receiver diode, the light will be turned on automatically as shown in Fig:5.11.

5.3 RESULT

After integrating all the modules into one set system, the system is successfully able to:

- Detect gas and raise alarm.
- Able to detect fire and control water sprinkler.
- Able to control appliances by measuring light intensity and detecting human movement.
- Transmit the data online to the webpage.

CHAPTER 6

SUMMARY AND CONCLUSIONS

6.1 SUMMARY

By executing business standard conventions on the IOT module and the information transformation components for diverse mechanical applications, the suggested framework informs us about an IOT-based modern observation framework. Some of the framework's preparation assists with a broad variety of information and correspondence conventions, while using the Wi-Fi module. This framework may be used to monitor a variety of diverse types of running applications in businesses, depending on the situation. This project aims to enhance the safety of humans and machines in industries or home the main use of the project was early detection of gas leak, fire around the industries and detects low lighting to avoid industrial accident.

6.2 CONCLUSION

This project aims to enhance the safety of humans and machines in industries or home the main use of the project was early detection of gas leak, fire around the industries and detects low lighting to avoid industrial accident. the system is successfully able to detect gas and raise alarm, able to detect fire and control water sprinkler, able to control appliances by measuring light intensity and detecting human movement and transmit the data online to the webpage.

6.3 FUTURE SCOPE

- Text message notifications for any alarms raised or any other action.
- Opening the car garage door by scanning car number plate using machine learning algorithm and image processing.
- Other parameters like temperature and humidity are also measured.

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