AN IOT BASED AUTOMATIC FIRE DETECTION AND ALERTING SYSTEM

A

Project Report Submitted to

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADAKAKINADA

In partial fulfillment of the award of degree of

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In

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SRI SATYANARAYANA ENGINEERING COLLEGE

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CERTIFICATE

This is to certify that the Project report titled "**AN IOT BASED AUTOMATIC FIRE DEPARTMENT ALERTING SYSTEM"** is the bonafide work carried out by

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in partial fulfillment of the requirements for the award of Bachelor of Technology in Electronics and Communication Engineering by J.N.T.U.K, Kakinada during the academic year 2021-2022.

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ABSTRACT

The Internet of Things refers to connecting things and people through internet, it has imposed itself as the New business practices in different sectors. To make quick and efficient response in real time, IoT enhances the way and provides emergency managers with the necessary information and communication to make use of those assets. In this paper it is proposed that a quick response for fire hazards is evaluated and examined by using IoT based model.

Fire is one of the major reasons of accidental deaths in the world. To implement this proposed system a low-cost Wi-Fi module, gas detection sensor, Flame detection sensor, buzzer to alert and temperature sensors are used. The sensors detects and alerts the local emergency with the data collected by the system, and alerts organizations like fire departments, police stations and hospitals by sending the exact location to both user and operator through module which all are well connected with.

Thus, an integrated intelligent system is designed through IoT to manage such hazards where innocent lives and property.

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CHAPTER 1
INTRODUCTION

This project has proposed an internet of things based fire alarm and monitoring system which is best suited for industrial and home applications. Fire is the major cause of accidental death claiming valuable lives and expensive property. The major property of fire is it spreads exponentially with time spreading in no period of time and destroys everything it catches. Hence, detection of fire in time is important so that many lives and property can be saved. It can detect smoke, the rise in temperature, rise in flame etc. and send it to a far-away controlling unit through GSM to generate needful precautions accordingly inform the nearest domestic help. The proposed system is capable of detecting smoke, different gases and fire. This system will be providing hazard coordinates to the nearby local help including fire department, police stations, and hospitals.

This fire and gas sensing system with systematic IoT framework concentrates on public safety and livelihood service sector. The fire detecting system with IoT standardized design methods is shown in Fig. 1. The spark Detection sensor PT333B is used to sense the spark, the Flammable gas sensor MQ-6 is used to detect the gases like LPG/LNG and the GPS module is to obtain device location. These sensors along with Wi-Fi micro-controller are connected via Internet through which it communicates hazard status to the nearest service centers for all kind of help.

1.1 Internet of things

The Internet of things (IoT) is the extension of online availability into equipment gadgets and ordinary items. Implanted with a wide range of equipment, (for example, sensors), these gadgets share data with one another over the remote system, and these gadgets can be methodically overseen and changes can be produced using time to time. The meaning of the Internet of things has advanced because of up gradation of different advances, run time investigation, framework learning (machine learning), sensors and conventional fields of inserted load up engraved frameworks, unwired sensor systems, control frameworks, robotization (counting home and building computerization), and others all add to setting up the IOT.

In the shopper showcase, IoT innovation is most acquainted with items having to the idea of the "keen home", covering home gadgets and machines that help at least one normal ways of life, and can be controlled telephones or remotes related with that framework, for example, cell phones and speakers. IOT helps in making a few simplicities to the client we in this undertaking are utilizing this for a speedy check and a thought regarding the dangers that can occur and can be maintained a strategth that it gives us freedom to add new things to the framework at whatever point required to make it progressively proficient and dependable.

1.2 Aim of the project

Fire is a very dreadful situation and an outbreak of fire causes a lot of damage to life &property. Every year thousands of properties and lives are claimed due to a fire casualty. Preventing an outbreak of fire and taking required precautions beforehand can save a lot of destruction. In developed countries, properties come equipped with precautionary systems. However, in counties underdeveloped or developing, no such facility prevails. The system that we aim to develop will act as a precautionary measure to alert and thus prevent any further casualties. Since this system is highly cost efficient, deploying it will be economical and affordable. With this system, we aim to create a safe environment at homes, workplaces, universities and public places. The main constraint was to keep the system cost efficient so that maximum advantage can be made of it. Since it is economical, installation of the device can be done to assure safety of live and property.

1.3 methodology

In the older fire alerting systems,theyconsist of a sprinkler, buzzer, fire and smoke sensor, LCD display, etc.it will measure parameters like temperature, humidity. The temperature sensor measures temperature and if it is above the set point value, the buzzer will be turned on and then the sprinkler starts to spray water. The LCD display will show the temperature and smoke value in the surrounding area. There are also other projects based on this idea like detecting forest fire, protecting homes from fire,etc.

1.4 significance of work

IOT based automatic fire department alerting system that instantly and automatically alerts the fire department and informs about the situation so that immediate action can be taken. The system uses temperature sensor (LM 35) to efficiently detect fires and alert fire department over IOT. We use an Arduino no in order to check if a sensor is triggered. Then it reconfirms if it really is a fire outbreak using temperature sensors in order to confirm of fire outbreak. The system now uses a WiFi connection to accessIOT server and transmit data about this incident over internet.

1.5 Introduction to Embedded system

An Embedded system is a computer system designed to perform one or a few dedicated functions oftenwith real-time computing constraints. It is embedded as part of a complete device often including hardwareand mechanical parts. By contrast, a generalpurpose computer, such as a personal computer

designed to be flexible and to meet a wide range of end-user needs. Embedded systems control many devices in common use today.

Embedded systems are controlled by one or more main processing cores that are typically either microcontrollers or digital signal processors (DSP). The key characteristic, however, is being dedicated to handle a particular task, which may require very powerful processors. Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

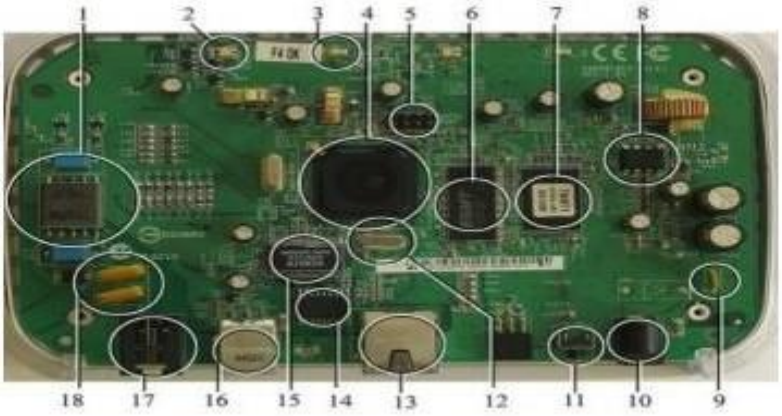


Fig 1.1 : A modern example of embedded system

1.5 Need for Embedded system

The uses of embedded systems are virtually limitless, because every day new products are introduced to the market that utilizes embedded computers in novel ways. In recent years, hardware such as microprocessors, microcontrollers, and FPGA chips have become much cheaper. So when implementing a new form of control, it's wiser to just buy the generic chip and write your own custom software for it. Producing a custom-made chip to handle a particular task or set of tasks costs far more time and money. Many embedded computers even come with extensive libraries, so that "writing your own software" becomes a very trivial task indeed.

1.6 Classification of Embedded system

Real Time Embedded system

Embedded systems which are used to perform a specific task or operation in a specific time period those systems are called as real-time embedded systems. There are two types of real-time embedded systems.

Soft Real Time Embedded Systems

These embedded systems follow a relative dead line time period i.e.., if the task is not done in a particular time that will not cause damage to the equipment. E.g. Consider a TV remote control system, if the remote control takes a few milliseconds delay it will not cause damage either to the TV or to the remote control.

Network Communication Embedded Systems

A wide range network interfacing communication is provided by using embedded systems. Consider a web camera that is connected to the computer with internet can be used to spread communication like sending pictures, images, videos etc.., to another computer with internet connection throughout anywhere in the world. Consider a web camera that is connected at the door lock. Whenever a person comes near the door, it captures the image of a person and sends to the desktop of your computer which is connected to internet.

Fig 1.2 : Network communication Embedded system

1.6 Applications of Embedded Systems

Consumer applications : : At home we use a number of embedded systems which include microwave oven, remote control, VCD players, DVD players, camera etc….

Fig 1.3 : Automatic coffee makes equipment

Office automation : We use systems like fax machine, modem, printer etc…

Fig 1.4 : Automatic fax machine

A fax machine is used to send a document electronically over the phone network to another fax machine.

When you place a document in one fax machine and dial another one, the fax machine you're sending to will print out a copy (facsimile) of the document.

Fax machines do not directly operate over the internet – only on phone networks (many phone networks of today operate through internet based systems, however fax transmissions remain strictly on the "phone" side of those transmissions. As well, services that allow sending and receiving faxes over a web browser, email, or the internet use the internet to connect to the phone network for sending and receiving transmissions.).

CHAPTER 2

LITERATURE SURVEY AND PROBLEM IDENTIFICATION

2.1 LITERATURE SURVEY AND PROBLEM IDENTIFICATION

In the older fire alerting systems,theyconsist of a sprinkler, buzzer, fire and smoke sensor, LCD display, etc.it will measure parameters like temperature, humidity. The temperature sensor measures temperature and if it is above the set point value, the buzzer will be turned on and then the sprinkler starts to spray water. The LCD display will show the temperature and smoke value in the surrounding area. There are also other projects based on this idea like detecting forest fire, protecting homes from fire,etc. In this framework, we have sensors LM35 and MQ6 inserted in the Arduino board. The LM35 is a temperature sensor. The LM35 sensor gives exact readings at room temperature. The smoke sensor utilized is MQ6 which recognizes smoke. It is a nonexclusive gas sensor. It is effectively ready to recognize LPG, iso-butane, propane, Hydrogen, smoke methane. One of the significant points of interest of this sensor is its high affectability and quick reaction time. The yield of the sensor depends on the power of gas. A small scale controller goes about as the focal handling unit, which takes the qualities evaluated by these sensors as the contribution for further preparing. Each framework is fused with a bell. The whole framework is associated with a Wi-Fi module so as to have the capacity to exchange information from the sensors onto diverse frameworks. Every framework has an exceptional Identification number. Alongside the ID, clients are additionally required to give fundamental subtleties as for the area of framework establishment, contact subtleties and Login certifications.

The sensors in the framework will gain information and continually continue sending it crosswise over to this site with the assistance of the Wi-Fi module. The dependable specialists will almost certainly keep themselves refreshed with the status at every area. Each time there is a noteworthy change in the esteem caught by the sensors, an alarm will be sent crosswise over to the local group of fire-fighters just as to the number enrolled alongside the framework. Ready will be sent when the limit esteem is crossed. If there should be an occurrence of an outrageous ascent in temperature or gas levels, the sensors get initiated and quickly an alarm as warning on the site gotten to by local group of fire-fighters is sent. The local group of firefighters is then foreseen to send help at the most punctual since area will be enrolled with them. The focal local group of firefighters will at that point send a prompt alarm to the closest flame station to the spot of mishap. Close by an alarm is likewise sent to the closest medical clinic to send crisis help in the event of any setbacks .

2.2 Proposed system

The main purpose behind this project is to reduce the loss in terms of life, cost… when the fire accidents occurs this system specifies the time and location using to address the problems in times of fire. In this project the flame sensor detects the fire and it activates the GPS which finds the current location of fire accident area. So that we can reduce the cost and we can save the human life before getting more damage.

In generic cases we all finds that fire accident known when half or more lost is happened, so we can all reduce this lost by this project. Fire breakouts create serious health and Infrastructure hazard, associated with it is unavoidable injuries or loss of lives in one hand, partial or complete damage to properties. This loss is inestimably enormous; hence this paper proposes the development of IOT based fire department alerting system. This model constantly monitoring the fire signal and will send warning to alert the user and nearest fire station.

This application targets people who don't have someone to be at home, office or any other workplace so when they away from their place they are notified about the fire problems if any. Using this application will help these people as they will be informed quickly about the incident and also the nearest fire department will be notified in an effective way. The application has a notification feature which notifies the user and the nearest fire station plus the domestic help so that a quick action can be taken.It is also very efficient and hence very easy to use. This system has tried to solve almost every problem related to the safety of homes and its assets.

CHAPTER 3

DESCRIPTION OF BLOCK DIAGRAM

3.1 Block Diagram

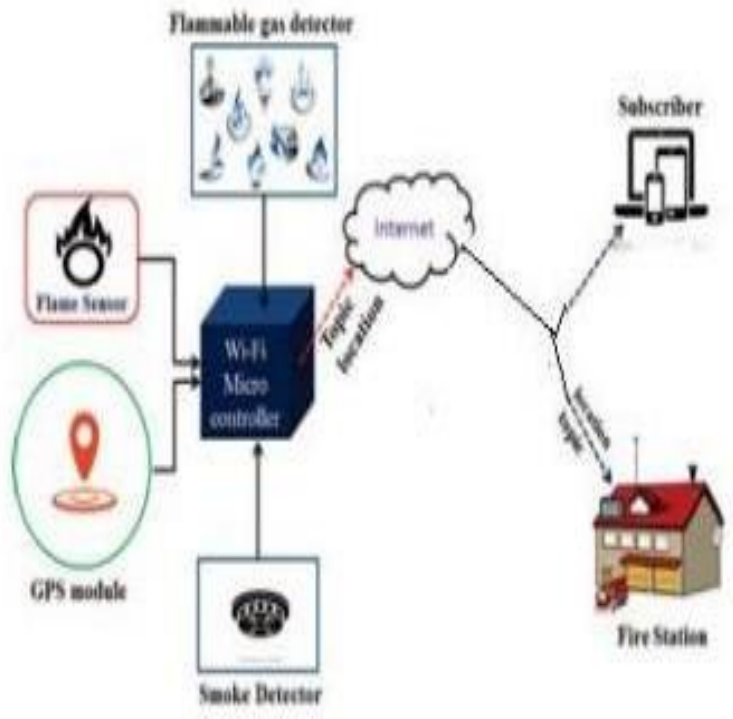


Fig 3.1 : Block Diagram

3.2 Required modules

1. Flame sensor
2. Smoke sensor
3. Gas sensor
4. GPS Module
5. Blynk application
6. WIFI Module
7. LCD
8. Arduino Uno

3.3 Arduino

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward.

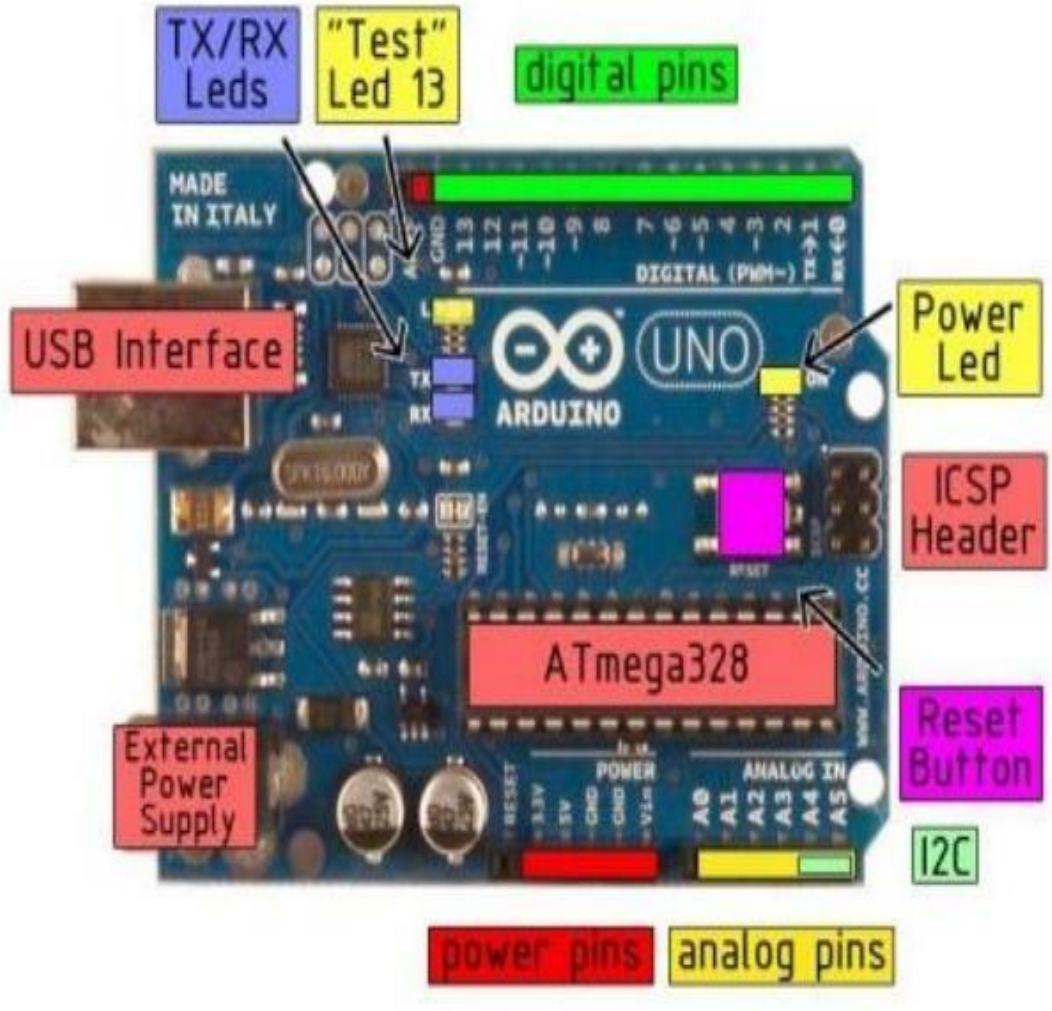


Fig 3.2 : Arduino Board

Table 3.1 : Technical Specifications

Microcontroller	ATmega328
Operating Voltage	5V
Input-Voltage (recommended)	7 – 12V
Input-Voltage (limits)	6 – 20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40mA
DC Current for 3.3V Pin	50 mA
Flash memory	32 KB of which 0.5 KB used by bootloader
SRAM	2KB
EPROM	6KB
Clock speed	16MHz

3.3.1 Power

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector.

The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

The power pins are as follows:

- VIN - The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V - The regulated power supply used to power the microcontroller and other components on the board. This can come either from VIN via an on-board regulator, or be supplied by USB or another regulated 5V supply.
- 3V3 - A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- GND - Ground pins.

3.3.2 Memory

The Atmega328 has 32 KB of flash memory for storing code (of which 0,5 KB is used for the boot loader); It has also 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library).

3.3.3 Input and Output

Each of the 14 digital pins on the Uno can be used as an input or output, using pin Mode(), digital Write(), and digital Read() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms. In addition, some pins have specialized functions:

- Serial: 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-toTTL 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.
- PWM: 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analog Write() function.
- SPI: 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins support SPI communication, which, although provided by the underlying hardware, is not currently included in the Arduino language.
- 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, each of which provide 10 bits of resolution (i.e. 1024 different values). By default they measure from ground to 5 volts, though is it possible to change the upper end of their range using the AREF pin and the analog Reference() function. Additionally, some pins have specialized functionality:

- 12C: 4 (SDA) and 5 (SCL). Support I2C (TWI) communication using the Wire library.

There are coupler pins used in Arduini Uno

- AREF: Reference voltage for the analog inputs. Used with analog Reference().
- Reset: Bring this line LOW to reset the microcontroller. Typically used to add a reset button to shields which block the one on the board.

3.3.4 Communication

The Arduino Uno has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers. The ATmega328 provides UART TTL (5V) serial communication, which is available on digital pins 0 (RX) and 1 (TX). An ATmega8U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The '8U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, an info file is required.

The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. The RX and TX LEDs on the board will flash when data is being transmitted via the USB-to serial chip and USB connection to the computer (but not for serial communication on pins 0 and 1).

A Software Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328 also support I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

3.3.5 Programming

The Arduino Uno can be programmed with the Arduino software. The ATmega328 on the Arduino Uno comes pre burned with a bootloader that allows you to upload new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol.

3.3.6 USB over current protection

The Arduino Uno has a resettable poly fuse that protects your computer's USB ports from shorts and over current. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500mA is applied to the USB port, the fuse will automatically break the connection until the short or overload is removed.

3.3.7 Automatic Reset

Rather than requiring a physical press of the reset button before an upload, the Arduino Uno is designed in a way that allows it to be reset by software running on a connected computer. One of the hardware flow control lines (DTR) of the ATmega8U2 is connected to the reset line of the ATmega328 via a 100 nano farad capacitor. When this line is asserted (taken low), the reset line drops long enough to reset the chip. The Arduino software uses this capability to allow you to upload code by simply pressing the upload button in the Arduino environment. This means that the boot loader can have a shorter timeout, as the lowering of DTR can be well-coordinated with the start of the upload.

3.3.8 Physical characteristics

The maximum length and width of the Uno PCB are 2.7 and 2.1 inches respectively, with the USB connector and power jack extending beyond the former dimension. Three screw holes allow the board to be attached to a surface or case. Note that the distance between digital pins 7 and 8 is 160 mm (0.16"), not an even multiple of the 100 mm spacing of the other pins.

3.3.9 Open source and extensible hardware

The plans of the Arduino boards are published under a Creative Commons license, so experienced circuit designers can make their own version of the module, extending it and improving it. Even relatively inexperienced users can build the breadboard version of the module in order to understand how it works and save money. Arduino Uno R3 Atmega-328IC as shown in Fig.2.2

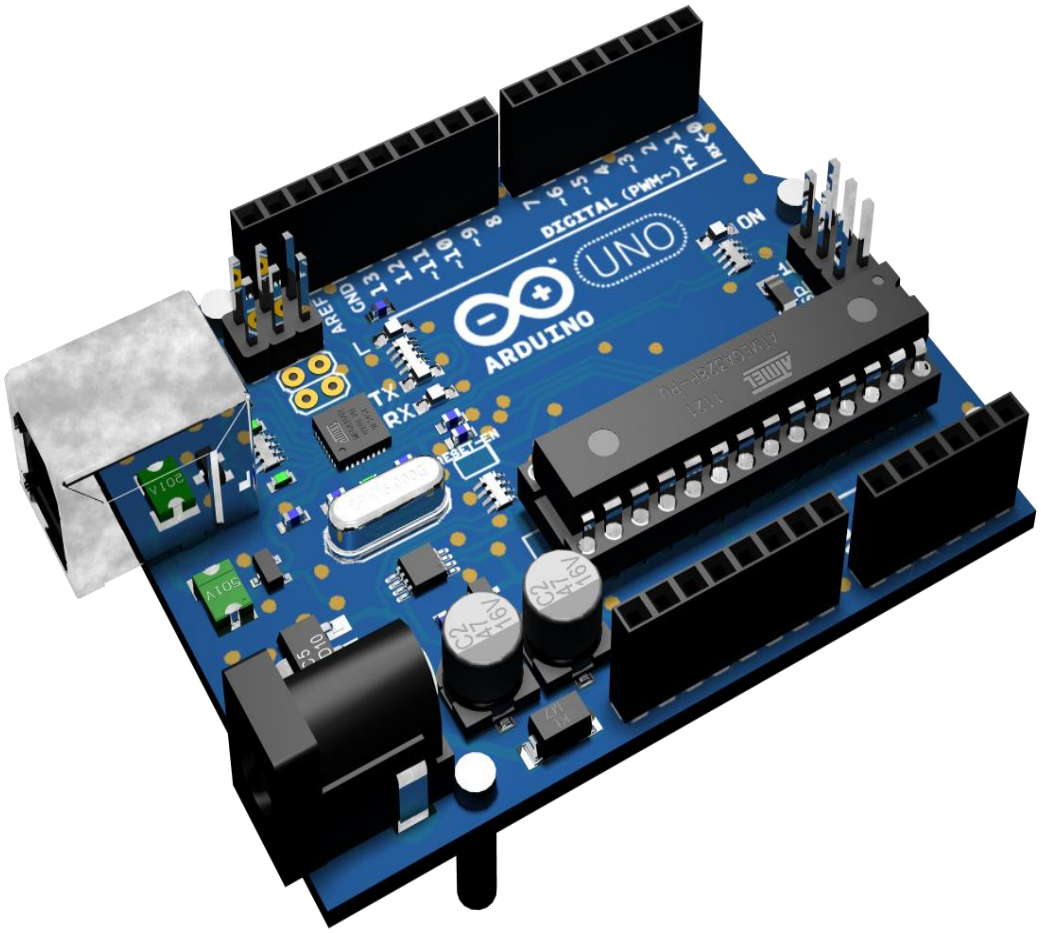


Fig 3.3 : Arduino Uno R3 Atmega – 3281C

General Pin Function

- **LED**: There is a built-in LED driven by digital pin 13. When the pin is high value, the LED is on, when the pin is low, it is off.
- **VIN**: The input voltage to the Arduino/Genuino board when it is using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- **5V**: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator, and can damage the board.
- **3V3**: A 3.3 volt supply generated by the on-board regulator. Maximum current draw is 50 mA.
- **GND**: Ground pins.
- **IOREF**: This pin on the Arduino/Genuino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source, or enable voltage translators on the outputs to work with the 5V or 3.3V.
- **Reset**: Typically used to add a reset button to shields that block the one on the board.

Table 3.2 : Arduino specifications

Microcontroller	Atmega328
Operating Voltage	5V
InputVoltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input pins	6
DC Current per I/O Pin	40mA
DC Current per 3.3V Pin	50mA
Flash Memory	32KB(Atmega328) of which 0.5KB used by boot loader
SRAM	2 KB (Atmega328)
EEPROM	1 KB (Atmega328)
Clock Speed	16 MHZ
Power Consumption	19 mW
PCB Size	18 x 45 mm
Weight	7 grams

Table 3.3 Arduino Uno Pin Details

Pin No.	Pin name	Description	Secondary Function
1	PC6 (RESET)	Pin6 of PORTC	Pin by default is used as RESET pin. PC6 can only be used as I/O pin when RSTDISBL Fuse is programmed.
2	PD0 (RXD)	Pin0 of PORTD	RXD (Data Input Pin for USART) USART Serial Communication Interface [Can be used for programming]
3	PD1 (TXD)	Pin1 of PORTD	TXD (Data Output Pin for USART)USART Serial Communication Interface[Can be used for programming]INT2(External Interrupt 2 Input)
4	PD2 (INT0)	Pin2 of PORTD	External Interrupt source 0
5	PD3 (INT1/OC2B)	Pin3 of PORTD	External Interrupt source1OC2B(PWM - Timer/Counter2 Output Compare Match B Output)
6	PD4 (XCK/T0)	Pin4 of PORTD	T0(Timer0 External Counter Input)XCK (USART External Clock I/O)
7	VCC		Connected to positive voltage
8	GND		Connected to ground
9	PB6 (XTAL1/TOSC1)	Pin6 of PORTB	XTAL1 (Chip Clock Oscillator pin 1 or External clock input)TOSC1 (Timer Oscillator pin 1)
10	PB7 (XTAL2/TOSC2)	Pin7 of PORTB	XTAL2 (Chip Clock Oscillator pin 2)TOSC2 (Timer Oscillator pin 2)
11	PD5 (T1/OC0B)	Pin5 of PORTD	T1(Timer1 External Counter Input)OC0B(PWM - Timer/Counter0 Output Compare Match B Output)
12	PD6 (AIN0/OC0A)	Pin6 of PORTD	AIN0(Analog Comparator Positive I/P)OC0A(PWM - Timer/Counter0 Output Compare Match A Output)
13	PD7 (AIN1)	Pin7 of	AIN1(Analog Comparator Negative I/P)

		PORTD	
14	PB0 (ICP1/CLKO)	Pin0 of PORTB	ICP1(Timer/Counter1 Input Capture Pin)CLKO (Divided System Clock. The divided system clock can be output on the PB0 pin)
15	PB1 (OC1A)	Pin1 of PORTB	OC1A (Timer/Counter1 Output Compare Match A Output)
16	PB2 (SS/OC1B)	Pin2 of PORTB	SS (SPI Slave Select Input). This pin is low when controller acts as slave.[Serial Peripheral Interface (SPI) for programming]OC1B (Timer/Counter1 Output Compare Match B Output)
17	PB3 (MOSI/OC2A)	Pin3 of PORTB	MOSI (Master Output Slave Input). When controller acts as slave, the data is received by this pin. [Serial Peripheral Interface (SPI) for programming]OC2 (Timer/Counter2 Output Compare Match Output)
18	PB4 (MISO)	Pin4 of PORTB	MISO (Master Input Slave Output). When controller acts as slave, the data is sent to master by this controller through this pin.[Serial Peripheral Interface (SPI) for programming]
19	PB5 (SCK)	Pin5 of PORTB	SCK (SPI Bus Serial Clock). This is the clock shared between this controller and other system for accurate data transfer.[Serial Peripheral Interface (SPI) for programming]
20	AVCC		Power for Internal ADC Converter
21	AREF		Analog Reference Pin for ADC
22	GND		GROUND
23	PC0 (ADC0)	Pin0 of PORTC	ADC0 (ADC Input Channel 0)
24	PC1 (ADC1)	Pin1 of PORTC	ADC1 (ADC Input Channel 1)
25	PC2 (ADC2)	Pin2 of PORTC	ADC2 (ADC Input Channel 2)
26	PC3 (ADC3)	Pin3 of PORTC	ADC3 (ADC Input Channel 3)
27	PC4	Pin4 of	ADC4 (ADC Input Channel 4)SDA (Two-

	(ADC4/SDA)	PORTC	wire Serial Bus Data Input/output Line)
28	PC5 (ADC5/SCL)	Pin5 of PORTC	ADC5 (ADC Input Channel 5)SCL (Two-wire Serial Bus Clock Line)

3.4 Power Supply

Modern Arduino Uno boards allow the board to have more than one source of power to be connected simultaneously. An intelligent switching circuitry ensures that the highest available voltage is selected and sent to the onboard voltage regulator and eventually powers up the board.

3.4.1 Four ways to power up the Arduino

- Using USB cable: The USB port of the Arduino Uno can be connected to a desktop/laptop. If the connection is enumerated, i.e. the computer recognizes the device, the current supplied to the board is 500mA at 5V. If the connection is not enumerated, 100mA is supplied at 5V.

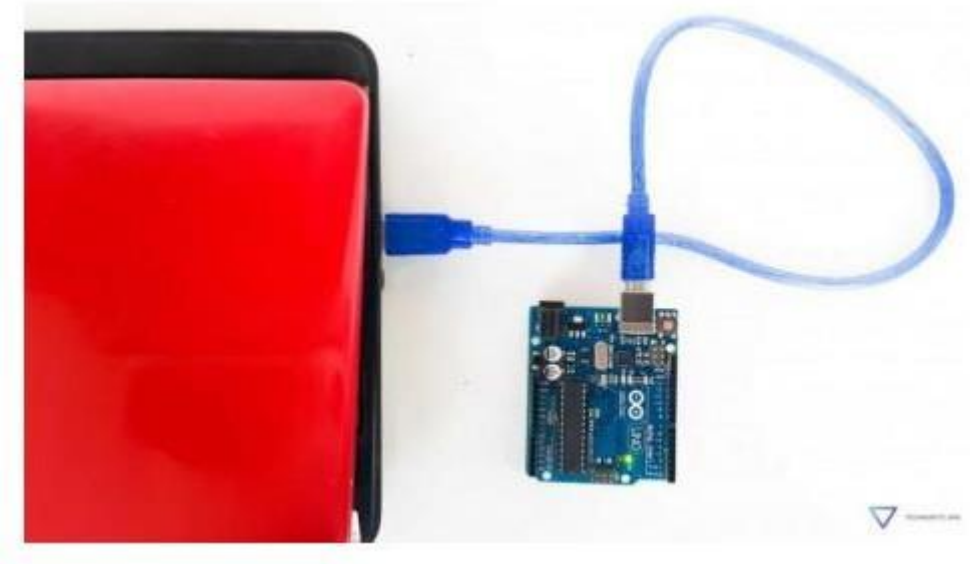


Fig 3.4 : An Arduino Uno powered up using a USB cable

- Using an AC to DC adapter plugged into the barrel connector: The barrel connector can be supplied an input of 7-12V. This is regulated to 5V by the onboard voltage regulator, and the board is powered on.

Fig 3.5 : Arduino Uno powered up using 9V AC-DC adapter

- Using 5V input: It is possible to power up the Arduino using the 5V and GND pins, provided that the input given is steady and regulated 5V. The 5V pin bypasses the voltage regulator and all the safety measures present on the Arduino Uno, so if the input exceeds 5V (5.5 is the maximum upper limit), the board can be damaged. It is generally advised to avoid powering up the Arduino Uno using this method.

Power supply is a supply of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonlyapplied to electrical energy supplies, less often to mechanical ones, and rarely to others.

A power supply may include a power distribution system as well as primary or secondary sources of energywhich is shown in Fig. 3.6.

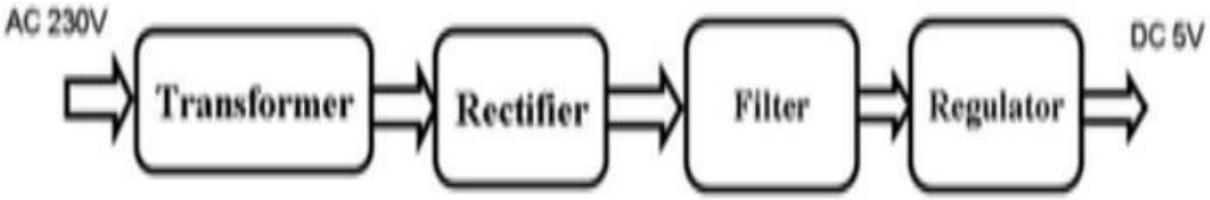


Fig. 3.6 : Regulator power supply

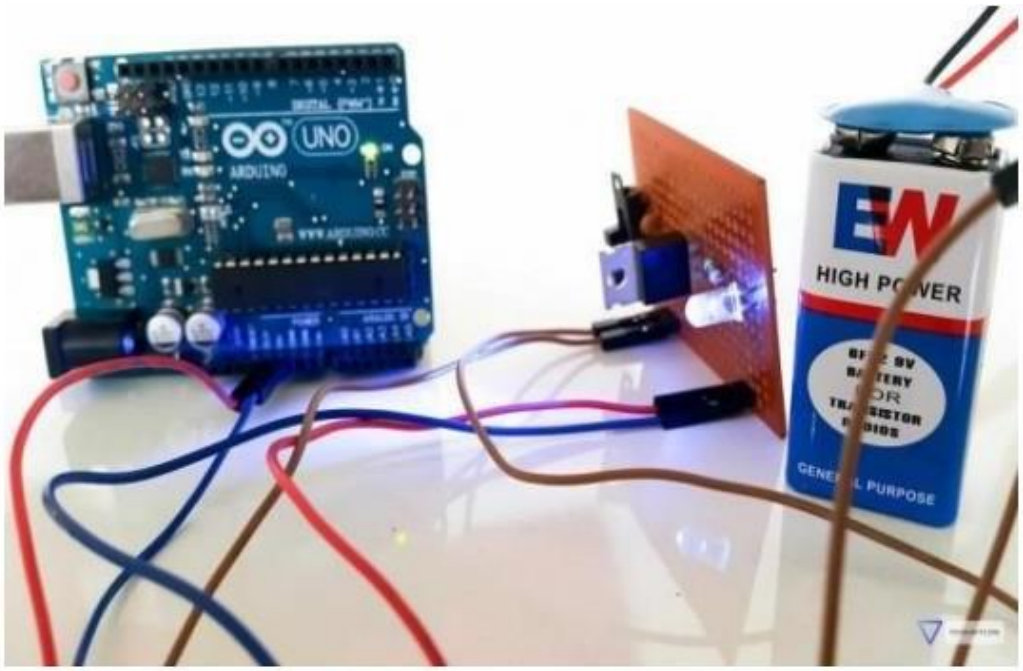


Fig.3.7 : A voltage regulator can be used to supply fixed 5V

Connect a 9V battery with the positive terminal connected to the Vin pin and the negative terminal connected to the GND pin. The Vin port allows an input between 7 and 12 Volts, but we recommend to use a 9V battery. Depending on your application you can input 12V too but make sure the current values stay around 500mA.

Precautions should follow

- If the barrel connector and an AC-DC adapter are being used to power up the Arduino, make sure that the output of the adapter is between 7-12V. Although the rated input can exceed to as much as 20V, it is safe to stay within the recommended range to protect the voltage regulator from excessive heating. Also, see to it that the GND and Vin pins are not shorted.
- But if you are using the 5V and GND pins to power up the Arduino, it is imperative that the 5V input is stable and steady.
- If the Vin/5V and GND pins are being used to power up the Arduino, double check the polarity because if the GND and 5V/Vin pins are mixed up, it can potentially damage the Arduino board.

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

3.5 IR sensor

IR LED is used as a source of infrared rays. It comes in two packages 3mm or 5mm. 3mm is better as it is requires less space. IR sensor is nothing but a diode, which is sensitive for infrared radiation.

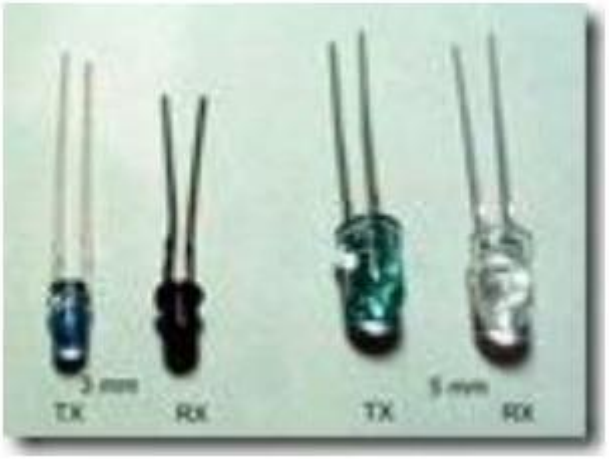
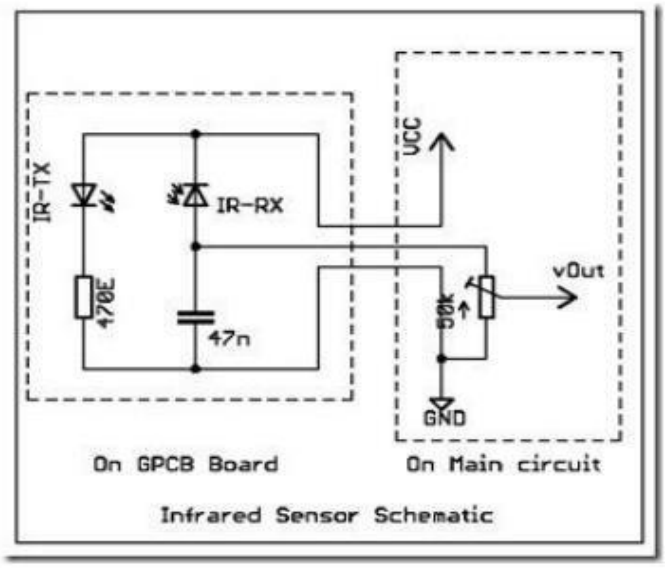


Fig. 3.8 : LED sensors

This infrared transmitter and receiver are called as IR TX-RX pair. It can be obtained from any decent electronics component shop and costs less than 10Rs. Following snap shows 3mm and 5mm IR pairs.

Color of IR transmitter and receiver is different. However you may come across pairs which appear exactly same or even has opposite colors than shown in above picture.

it is not possible to distinguish between TX and RX visually. In case you will have to take help of multimeter to distinguish between them.



The circuit diagram for IR sensor module is very simple and straight forward.

IR TRANSMITTER

Fig. 3.9 : IR Transmitter

IR LED emits infrared radiation. This radiation illuminates the surface in front of LED. Surface reflects the infrared light. Depending on the reflectivity of the surface, amount of light reflected varies. This reflected light is made incident on reverse biased IR sensor. When photons are incident on reverse biased junction of this diode, electron-hole pairs are generated, which results in reverse leakage current.

Amount of electron-hole pairs generated depends on intensity of incident IR radiation. More intense radiation results in more reverse leakage current. This current can be passed through a resistor so as to get proportional voltage. Thus as intensity of incident rays varies, voltage across resistor will vary accordingly.

This voltage can then be given to OPAMP based comparator. Output of the comparator can be read by uc. Alternatively, you can use on-chip ADC in AVR microcontroller to measure this voltage and perform comparison in software.

We have already discussed how a light sensor works. IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.

IR Receiever

Fig.3.10 : IR receiever

A photodiode is a type of photo detector capable of converting light into either current or voltage, depending upon the mode of operation. Photodiodes are similar to regular semiconductor diodes except that they may be either exposed (to detect vacuum UV or X-rays) or packaged with a window or optical fiber connection to allow light to reach the sensitive part of the device.

Many diodes designed for use specifically as a photodiode will also use a PIN junction rather than the typical PN junction A photodiode is a type of photo detector capable of converting light into either currentor voltage, depending upon the mode of operation. Photodiodes are similar to regular semiconductor diodesexcept that they may be either exposed (to detect vacuum UV or X-rays) or packaged with a window or optical fibre connection to allow light to reach the sensitive part of the device. Many diodes designed for use specifically as a photodiode will also use a PIN junction rather than the typical PN junction.

Feature of the photo diode:

1. Excellent linearity with respect to incident light.

2. Low noise.

3. Wide spectral response.

4. Mechanically rugged.

5. Compact and light weight.

6. Long life.

3.6 Smoke sensor

A smoke detector is a device that detects smoke and issues an alarm. Smoke detectors alert people within hearing range; some also interface with a security system or notify emergency services.

History:

Smoke detectors have come a long way since George Darby first invented in 1902. Before scientists knew how to capture ionizing molecules in a small enclosed space, they actually used an open/close electrical system along with a wedge of butter to detect fires and heat. This system's setup included two plates or electrical circuits, not unlike today's Ionization alarms, with a wedge of butter between them. When the heat of the room became overwhelming and dangerous, the butter would melt, causing the two circuits to collapse onto one another, initiating the alarm. Since then, technology has found a way to capture light and molecules in a cheaper, more efficient, and safer way to save millions of lives each year.

3.6.1 Two common types are

1. **Ionization smoke detectors**

An Ionization Smoke Detector has two key parts: the ionization chamber, and a source of radiation. This source of radiation consists of a very minute concentration of Americium- 241, which produce alpha particles. The Ionization Chamber contains two plates: one plate is negatively charged, and the other is positively charged. The alpha particles created by the Americium-241 move at very high speeds and bump into oxygen and nitrogen molecules within the ionization chamber.

The force exerted by this collision causes electrons to fall off from each molecule, creating an ion. The now positively charged ions are attracted to the negatively charged plate while the electrons attracted to the positively charged plate.

This attraction causes a consistent electrical current within the chamber itself. When smoke travels into the chamber, its particles attach to the ionized molecules to neutralize themand pull them away from the plate. This disrupts the electrical current and triggers the alarm.

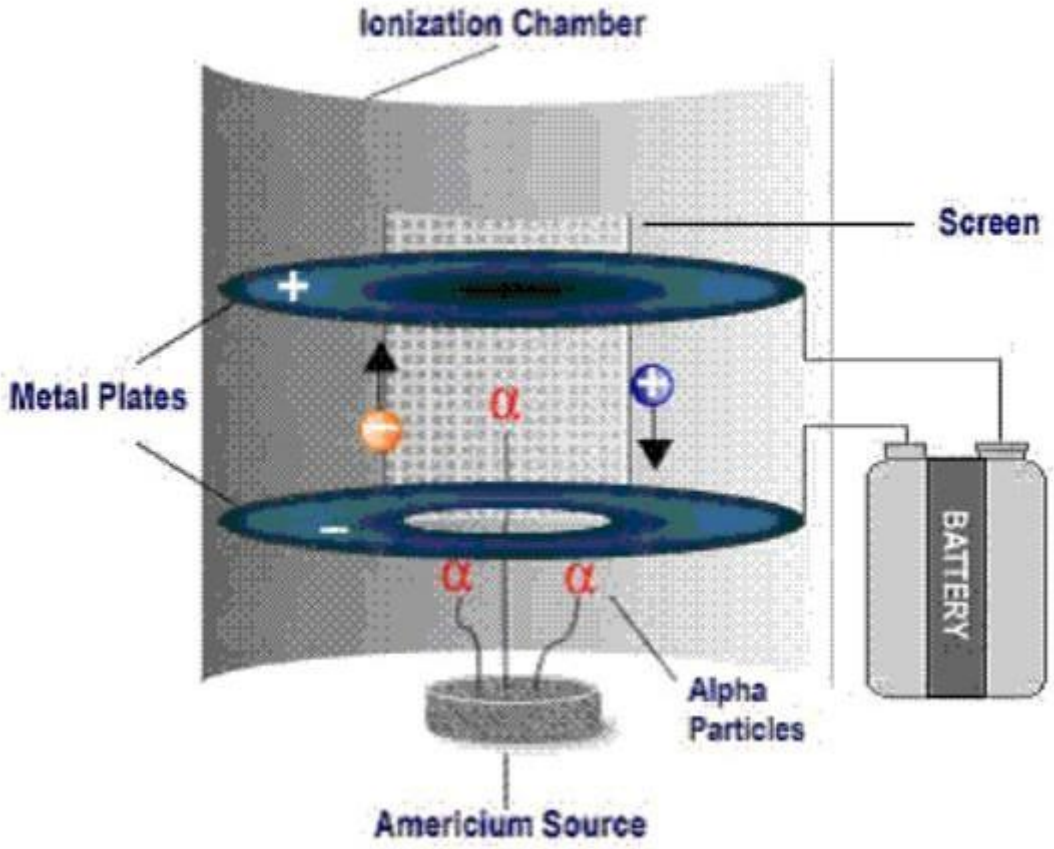


Fig.3.11: Smoke sensor

The main reaction that takes place within a Smoke detector is a chemical reaction between Americium and alpha particles. Many questions about public safety have arisen due to the radiation content within these detectors; however, there is not enough alpha radiation within the chambers to cause any serious damage.

In fact, the content within the chambers of this type of radiation is so weak that the surrounding air particles are able to smother any toxicity secreted. Still one is always cautioned to never directly inhale this substance.

2.The photoelectric smoke detector

It less common and more expensive than the Ionization Smoke Detector. It consists of a chamber inthe shape of a capital letter "T." The horizontal portion of this chamber consists of a light source called a Light Emitting Code. This beam of light travels across this horizontal bar, but never sends light vertically. At the base of the "T," is a photocell, which senses light from darkness. When smoke enters this "T"

chamber, light from the beam is broken up and is scattered away from its straight beam. When a certain level of light reaches the photocell, which is usually in darkness, the alarm is initiated.

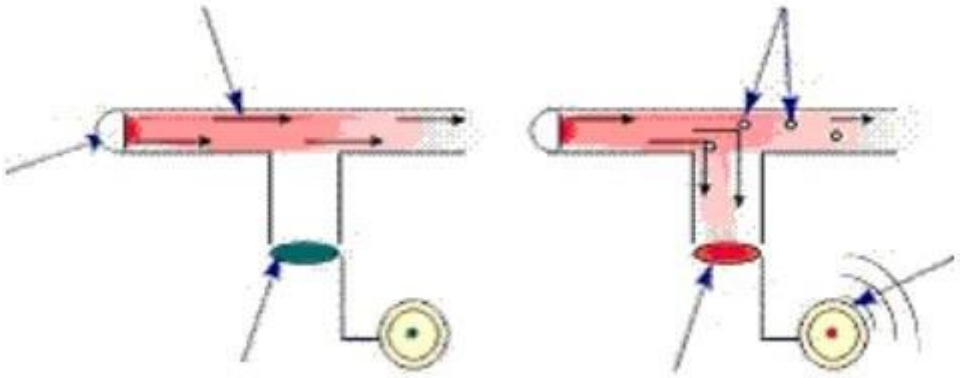


Fig.3.12 : Photoelectric smoke detector

Auto-aligning optical beam smoke detectors

The latest type of intelligent smoke detector is a laser-assisted infrared optical beam smoke detector that self-aligns in less than a minute. They are used to protect large commercial and public spaces such as theatres, shopping malls and sports centres with large skylights, lofty ceilings or condensation issues.

Some models can be installed with up to four detector heads per system.

Incidentally, some smoke detectors are not smoke detectors at all, but security devices incorporating hidden cameras.

Heat alarms

Heat alarms detect an increase in temperature caused by a fire, although they are insensitive to smoke. They are suitable for use in a kitchen, garage, or dusty room but should not be the sole means of fire detection.

Smoke detector installation and maintenance

Mains-powered alarms must be installed by a qualified electrician or installation professional.

Domestic smoke alarms are much easier to install as no wiring is required, but they must be installed and maintained correctly and checked regularly.

Smoke detectors have an average life of about eight to 10 years. Detectors need to be checked periodically, ideally once a week, and the batteries changed when required, at least once a year. A hard-wired smoke detector can last 10 years.

3.7 GPS Module

The Global Positioning System (GPS) is the only fully functional Global Navigation Satellite System(GNSS). The GPS uses a constellation of between 24 and 32 Medium Earth Orbit satellites that transmit precise microwave signals, which enable GPS receivers to determine their location, speed,. GPS was developed by the United States Department of Defense. Its official name is NAVSTAR-GPS. Although NAVSTARGPS is not an acronym, a few backronyms have been created for it. The GPS satellite constellation is managed by the United States Air Force 50th Space Wing. Global Positioning System is an earth-orbiting-satellite based system that provides signals available anywhere on or above the earth, twenty-four hours a day, which can be used to determine precise time and the position of a GPS receiver in three dimensions.

GPS is increasingly used as an input for Geographic Information Systems particularly for precise positioning of geospatial data and the collection of data in the field. Precise positioning is possible using GPS receivers at reference locations providing corrections and relative positioning data for remotereceivers. Time and frequency dissemination, based on the precise clocks on board the SVs and controlledby the monitor stations, is another, use for GPS. Astronomical observatories telecommunications facilitiesand laboratory standards can be set to precise time signals or controlled to accurate frequencies by special purpose GPS receivers.

Similar satellite navigation systems include the Russian GLONASS (incomplete as of 2008), the upcoming European Galileo positioning system, the proposed COMPASS navigation system of China, and IRNSS of India. Following the shooting down of Korean Air Lines Flight 007 in 1983, President Ronald Reagan issued a directive making the system available free for civilian use as a common good.

Since then, GPS has become a widely used aid to navigation worldwide, and a useful tool for map-making, land surveying, commerce, scientific uses, and hobbies such as geocaching. GPS alsoprovides a precise time reference used in many applications including scientific study of earthquakes, and synchronization of telecommunications network.

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3.7.1 Operation

A GPS receiver calculates its position by carefully timing the signals sent by the constellation of GPSsatellites high above the Earth. Each satellite continually transmits messages containing the time the message was sent, a precise orbit for the satellite sending the message (the ephemeris), and the general system health and rough orbits of all GPS satellites (the almanac). These signals travel at the speed of light through outer space, and slightly slower through the atmosphere. The receiver uses the arrival time of each message to measure the distance to each satellite, from which it determines the position of the receiver (conceptually the intersection of spheres - see trilateration) The resulting coordinates are converted to more user-friendly forms such as latitude and longitude, or location on a map, then displayed to the user.

It might seem that three satellites would be enough to solve for a position, since space has three dimensions. However, a three satellite solution requires the time be known to a nanosecond or so, far better than any non-laboratory clock can provide. Using four or more satellites allows the receiver to solve for time as well as geographical position, eliminating the need for a super accurate clock. In other words, the receiver uses four measurements to solve for four variables: x, y, z, and t. While many GPS applications have no particular use for this (very accurate) time, it is used in some GPS applications such as time transfer, and it is the only variable of interest in some applications, such as traffic signal timing.

Although four satellites are required for normal operation, fewer may be needed in some special cases. If one variable is already known (for example, a ship or plane may already know its altitude), a receiver can determine its position using only three satellites. Also, in practice, receivers use additional clues (Doppler shift of satellite signals, last known position, dead reckoning, inertiral navigation, and so on) to give degraded answers when fewer than four satellites are visible.

To provide an introductory description of how a GPS receiver works, errors will be ignored in this section. Using messages received from a minimum of four visible satellites, a GPS receiver is able to determine the satellite positions and time sent.

3.7.2 Position calculation introduction

To provide an introductory description of how a GPS receiver works, errors will be ignored in this section. Using messages received from a minimum of four visible satellites, a GPS receiver is able to determine the satellite positions and time sent. The x, y, and z components of position and the time sent are designated as where the subscript i denotes the satellite number and has the value 1, 2, 3, or 4. Knowing the indicated time the message was received , the GPS receiver can compute the indicated transit time, . ofthe message. Assuming the message traveled at the speed of light, c, the distance travelled, can be computedas .

Knowing the distance from GPS receiver to a satellite and the position of a satellite implies that the GPS receiver is on the surface of a sphere centered at the position of a satellite. Thus we know that the indicated position of the GPS receiver is at or near the intersection of the surfaces of four spheres. In the ideal case of no errors, the GPS receiver will be at an intersection of the surfaces of four spheres. The surfaces of two spheres if they intersect in more than one point intersect in a circle. A figure, two sphere surfaces intersecting in a circle, is shown below.

3.7.3 System segmentation

The current GPS consists of three major segments. These are the space segment (SS), a control segment(CS), and a user segment (US).

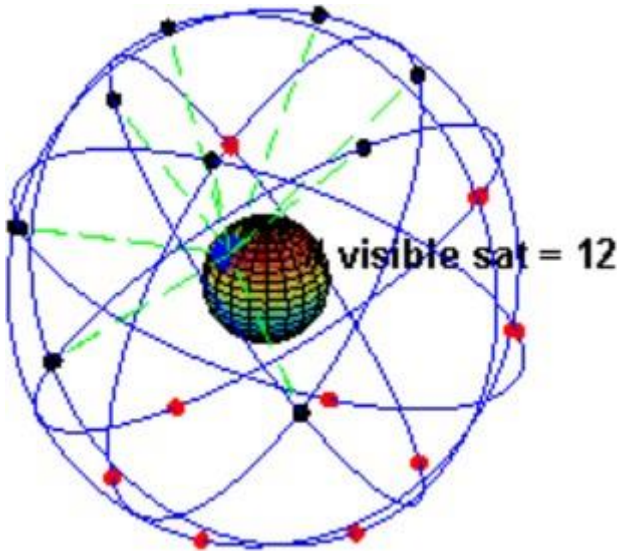


Fig.3.12 : Space segment

A visual example of the GPS constellation in motion with the Earth rotating. Notice how the number of satellites in view from a given point on the Earth's surface, in this example at 45°N, changes with time. The space segment (SS) comprises the orbiting GPS satellites, or Space Vehicles (SV) in GPS parlance.

The GPS design originally called for 24 SVs, eight each in three circular orbital planes, but this was modified to six planes with four satellites each.

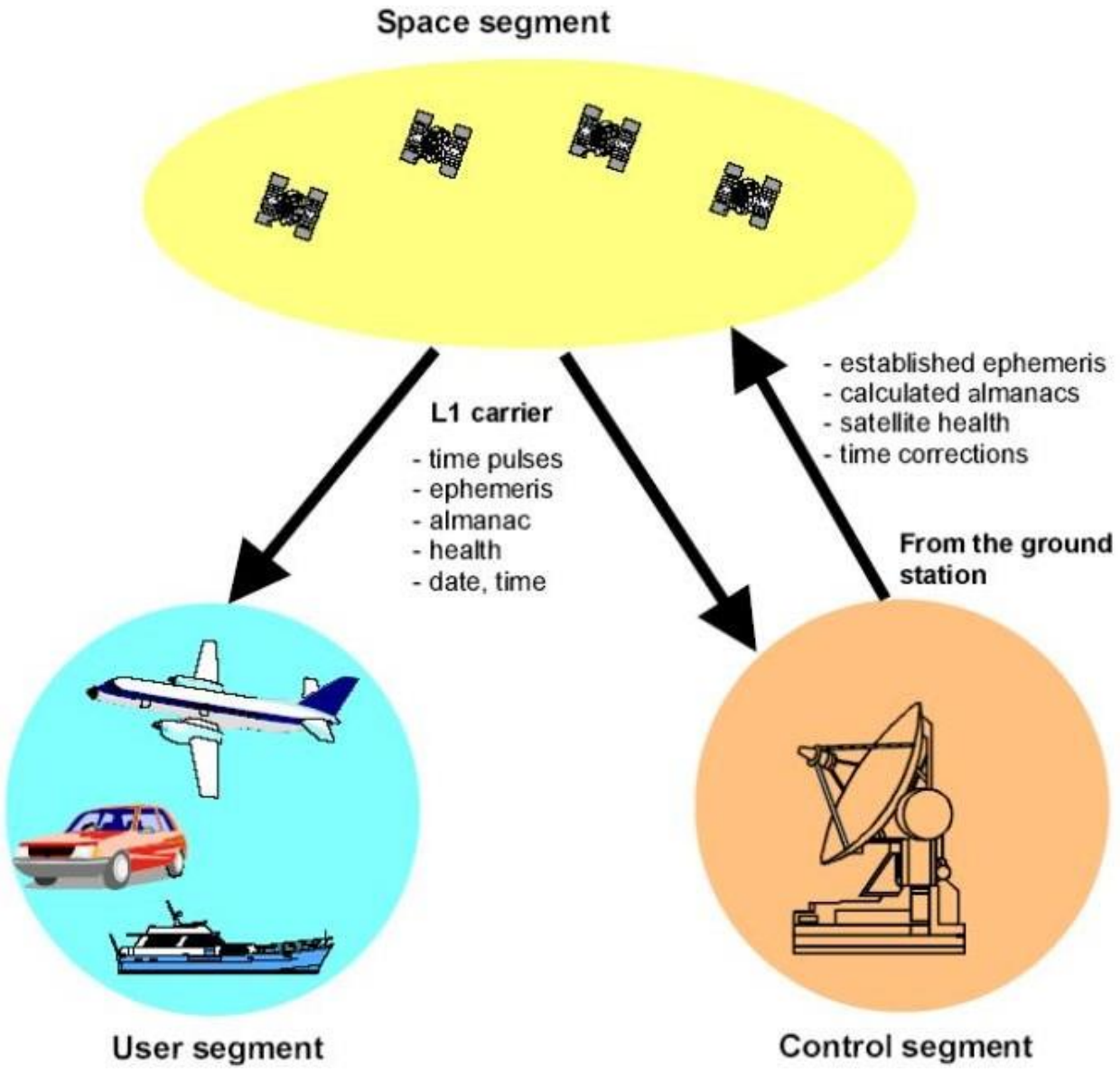


Fig.3.13 : Space segment

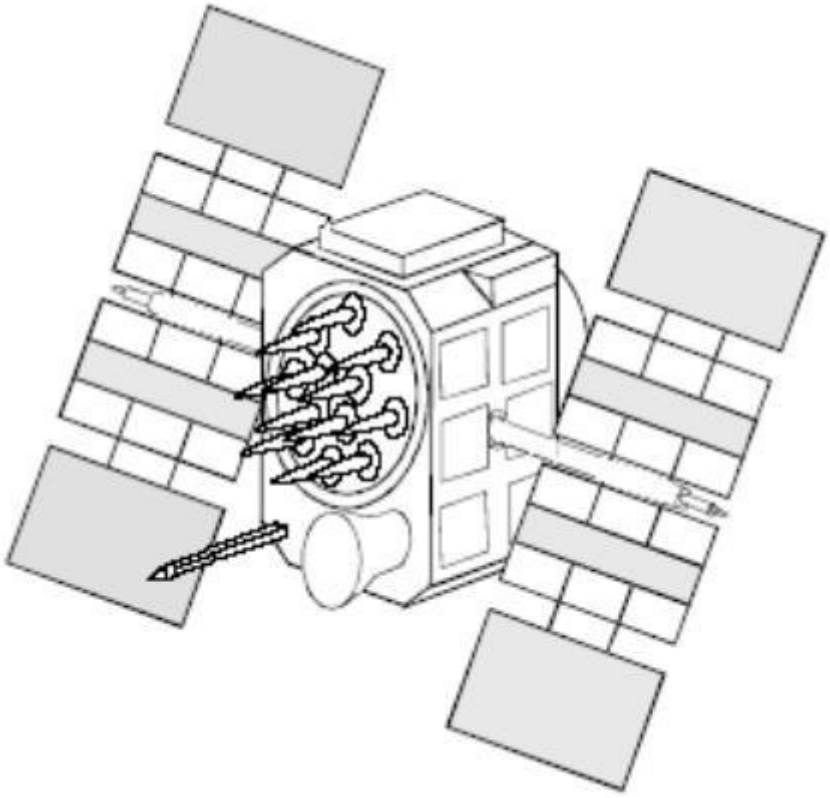


Fig. 3.14 : A GPS satellite

Planes are centered on the Earth, not rotating with respect to the distant stars. The six planes have approximately 55° inclination (tilt relative to Earth's equator) and are separated by 60° right ascension of the ascending node (angle along the equator from a reference point to the orbit's intersection). The orbits are arranged so that at least six satellites are always within line of sight from almost everywhere on Earth's surface. Orbiting at an altitude of approximately 20,200 kilometers (12,600 miles or 10,900 nautical miles; orbital radius of 26,600 km (16,500 mi or 14,400 NM)), each SV makes two complete orbits each sidereal day. The ground track of each satellite therefore repeats each (sidereal) day. This was very helpful during development.

Since even with just four satellites, correct alignment means all four are visible from one spot for a fewhours each day. For military operations, the ground track repeat can be used to ensure good coverage in combat zones. As of March 2008, there are 31 actively broadcasting satellites in the GPS constellation. The additional satellites improve the precision of GPS receiver calculations by providing redundant measurements. With the increased number of satellites, the constellation was changed to a nonuniform arrangement. Such an arrangement was shown to improve reliability and availability of the system, relative to a uniform system, when multiple satellites fail.

3.7.4 Control Segment

The flight paths of the satellites are tracked by US Air Force monitoring stations in Hawaii, Kwajalein, Ascension Island, Diego Garcia, and Colorado Springs, Colorado, along with monitor stations operated by the National Geospatial-Intelligence Agency (NGA). The tracking information is sent to the Air Force Space Command'smaster control station at Schriever Air Force Base in Colorado Springs, which is operated by the 2nd Space Operations Squadron (2 SOPS) of the United States Air Force (USAF). Then 2 SOPS contacts each GPS satellite regularly with a navigational update (using the ground antennas at Ascension Island, Diego Garcia, Kwajalein, and Colorado Springs). These updates synchronize the atomic clocks on board the satellites to within a few nanosecondsof each other, and adjust the ephemeris of each satellite's internal orbital model. The updates are created by a Kalmanfilter which uses inputs from the ground monitoring stations, space weather information, and various other inputs. Satellite maneuvers are not precise by GPS standards.

3.7.5 Applications of GPS Module

The Global Positioning System, while originally a military project is considered a dual-use technology,meaning it has significant applications for both the military and the civilian industry.

Military

The military applications of GPS span many purposes:

- Navigation: GPS allows soldiers to find objectives in the dark or in unfamiliar territory, and to coordinate the movement of troops and supplies. The GPSreceivers commanders and soldiers use are respectively called the Commanders Digital Assistant and the Soldier Digital Assistant.
- Target tracking: Various military weapons systems use GPS to track potential ground and air targets before they are flagged as hostile. These weapon systems pass GPS co-ordinates of targets to precision-guided munitions to allow them to engage the targets accurately. Military aircraft, particularly those used in air-toground roles use GPS to find targets (for example, gun camera video from AH-1 Cobras in Iraq show GPS co-ordinates that can be looked up in Google Earth).
- Missile and projectile guidance: GPS allows accurate targeting of various military weapons including ICBMs, cruise missiles and precision-guided munitions. Artillery projectiles with embedded GPS receivers able to withstand accelerations of 12,000G have been developed for use in 155 mm howitzers.
- Search and Rescue: Downed pilots can be located faster if they have a GPS receiver.
- Reconnaissance and Map Creation: The military use GPS extensively to aid mapping and reconnaissance.
- The GPS satellites also carry a set of nuclear detonation detectors consisting of an optical sensor (Y-sensor), an X-ray sensor, a dosimeter, and an Electro-Magnetic Pulse (EMP) sensor (W-sensor) which form a major portion of the United States Nuclear Detonation Detection System.

GPS Module

Latitude and longitude are usually provided in the geodetic datum on which GPS is based (WGS-84).

- ✓ Receivers can often be set to convert to other user-required datums.
- ✓ Receiver position is computed from the SV positions, the measured pseudo-ranges, and a receiver position estimate.
- ✓ Four satellites allow computation of three position dimensions and time.
- ✓ Three satellites could be used determine three position dimensions with a perfect receiver clock.
- ✓ In practice this is rarely possible and three SVs are used to compute a twodimensional, horizontal fix (in latitude and longitude) given an assumed height.
- ✓ This is often possible at sea or in altimeter equipped aircraft.
- ✓ Five or more satellites can provide position, time and redundancy.
- ✓ Twelve channel receivers allow continuous tracking of all available satellites, including tracking of satellites with weak or occasionally obstructed signals.

The GPS used follows NMEA 0183 version 3.0. The parameters like latitude, longitude, altitude and speed are received from GPS via RS232 these parameters are compare with the predefine wave points and when status of success is displayed on the LCD along with these instant latitude, longitude, altitude and speed parameters are also displayed on the LCD.

To achieve this we are going to use one GPS module and one GSM module, which are connected to a micro controller unit. Whenever the user sends an SMS to the GSM modem, micro controller unit will get the appropriate request by sending standard AT commands, and sends request to GPS module from the micro controller in the form of NMEA standard command sentences, to get the vehicle longitude and latitude. After that by processing the received data in micro controller, the reverse SMS with position will send to the user's number from GSM modem.

The GPS module in this system will communicate with the satellite and receives its current position (vehicle position). If any theft occurs we can lock the doors remotely again by sending SMS.

GPS Receiver

GPS receivers require different signals in order to function figure. These variables are broadcast after position and time have been successfully calculated and determined. To ensure that the different types of appliances are portable there are either international standards for data exchange (NMEA and RTCM), or the Manufacturer provides defined (proprietary) formats and protocols**.**

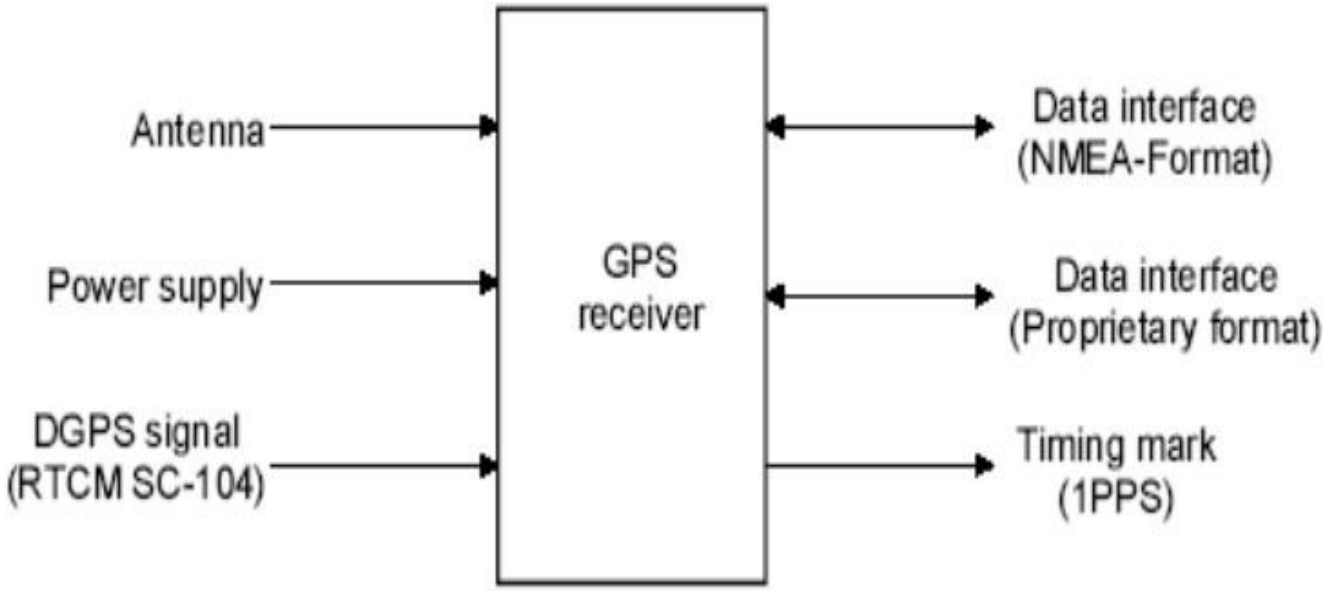


Fig.3.15 : GPS receiver

Block diagram of a GPS receiver with interfaces, Data interfaces, The NMEA0183 data interface, Inorder to relay computed GPS variables such as position, velocity, course etc. to a peripheral (e.g. computer, screen, transceiver), GPS modules have a serial interface (TTL or RS -232level). The most important elements of receiver information are broad cast via this interface in a special data format.

This format is standardised by the national Marine Electronics Association (NMEA) to ensure that data exchange take splace without any problems.Nowadays,data is relay ed according to the NMEA-0183 specification. NMEA has specified data sets for various applications e.g. GNSS (Global Navigation Satellite System), GPS, Loran, Omega, Transit and also for various manufacturers. The following seven datasets are widely used with GPS module store lay GPS information.

1. GGA (GPS Fix Data, fixed data for the Global Positioning System)
2. GLL (Geographic Position–Latitude/Longitude)
3. GSA (GNSSDOP and Active Satellites, degradation of accuracy and the number of active satellites in the Global.
4. GSV (GNSSSatellitesinView, satellites in view in the Global Satellite Navigation System)
5. RMC (Recommended Minimum Specific GNSSD at a)
6. VTG (CourseoverGroundandGroundSpeed, horizontal course and horizontal velocity)
7. ZDA (Time & Date) Structure of the NMEA protocol

3.8 Blynk App

3.8.1 How blynk works

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, vizualize it and do many other cool things.

There are three major components in the platform:

Blynk App - allows to you create amazing interfaces for your projects using various widgets we provide.

Blynk Server - responsible for all the communications between the smartphone and hardware. You can use our Blynk Cloud or run your private Blynk server locally. It's open-source, could easily handle thousands of devices and can even be launched on a Raspberry Pi.

Blynk Libraries - for all the popular hardware platforms - enable communication with the server and process all the incoming and outcoming commands.

Every time you press a Button in the Blynk app, the message travels to space the Blynk Cloud, where it magically finds its way to your hardware. It works the same in the opposite direction and everything happens in a blynk of an eye.

NOTE: Don't share your Auth Token with anyone, unless you want someone to have access to your hardware. It's very convenient to send it over e-mail. Press the e-mail button and the token will be sent to the email address you used for registration. You can also tap on the Token line and it will be copied to the clipboard.

Your project canvas is empty, let's add a button to control our LED. Tap anywhere on the canvas to open the widget box. All the available widgets are located here. Now pick a button.

Drag-n-Drop - Tap and hold the Widget to drag it to the new position.

Widget Settings - Each Widget has it's own settings. Tap on the widget to get to them.

When you are done with the Settings - press the PLAY button. This will switch you from EDIT mode to PLAY mode where you can interact with the hardware. While in PLAY mode, you won't be able to drag or set up new widgets, press STOP and get back to EDIT mode. You will get a message saying "Arduino UNO is offline". We'll deal with that in the next section.

You should by now have the Blynk Library installed on your computer. Example sketches will help you get your hardware online quickly and major Blynk features. Open the example sketch according to the hardware model or shield you are using.

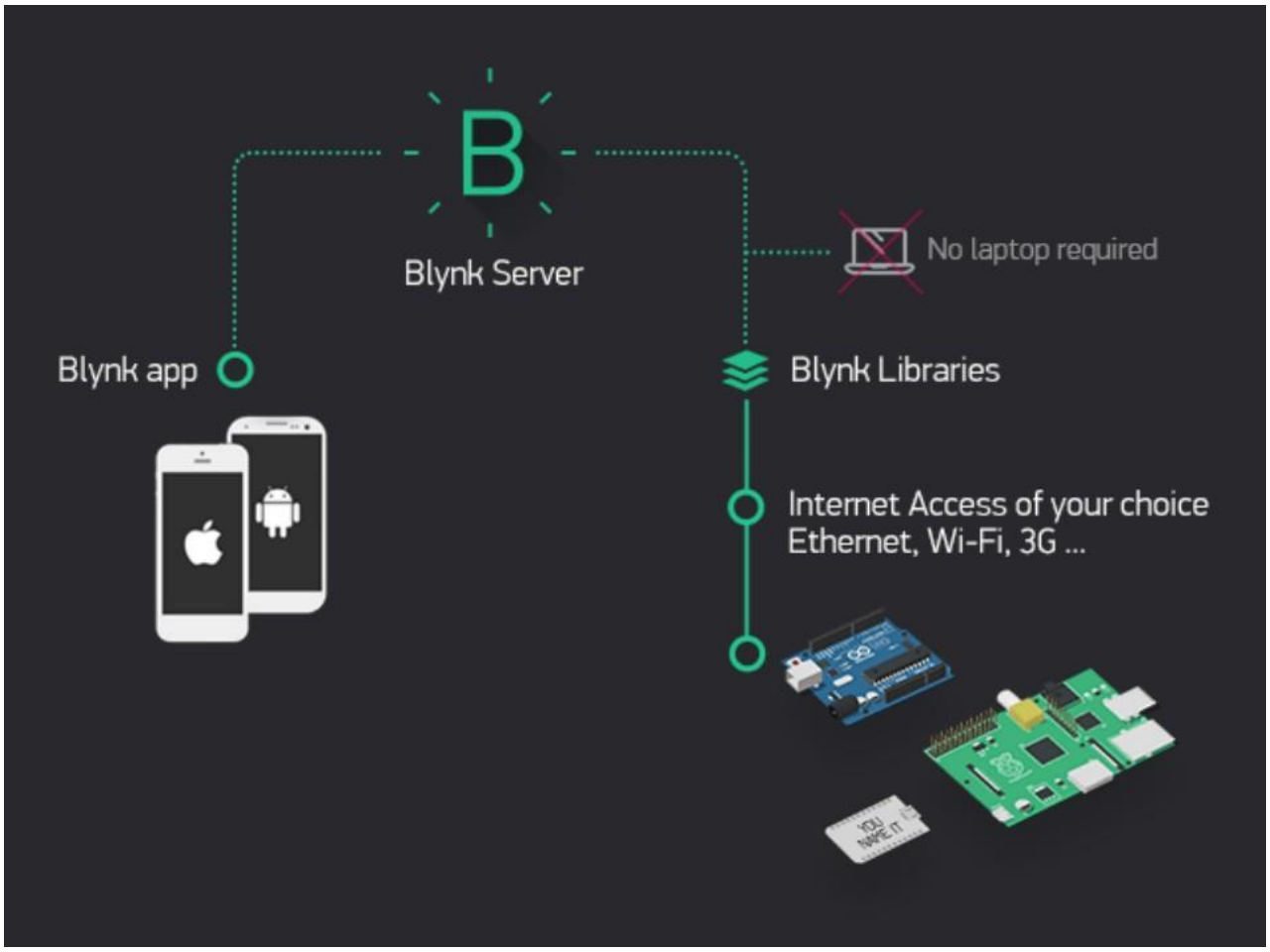


Fig. 3.16 : Blynk app working

Features

- Similar API & UI for all supported hardware & devices
- Connection to the cloud using:
  - WiFi
  - Bluetooth and BLE
  - Ethernet
  - USB (Serial)
  - GSM
  - ...
- Set of easy-to-use Widgets
- Direct pin manipulation with no code writing
- Easy to integrate and add new functionality using virtual pins
- History data monitoring via SuperChart widget
- Device-to-Device communication using Bridge Widget
- Sending emails, tweets, push notifications, etc.
- ... new features are constantly added!

You can find example sketches covering basic Blynk Features. They are included in the library. All the sketches are designed to be easily combined with each other.

3.8.2 What do I need to Blynk ?

At this point you might be thinking: **"Ok, I want it. What do I need to get started?"** – Just a couple of things, really:

1. **Hardware**

An Arduino, Raspberry Pi, or a similar development kit.

Blynk works over the Internet. This means that the hardware you choose should be able to connect to the internet. Some of the boards, like Arduino Uno will need an Ethernet or Wi-Fi Shield to communicate, others are already Internet-enabled: like the ESP8266, Raspberri Pi with WiFi dongle, Particle Photon or SparkFun Blynk Board. But even if you don't have a shield, you can connect it over USB to your laptop or desktop (it's a bit more complicated for newbies, but we got you covered). What's cool, is that the list of hardware that works with Blynk is huge and will keep on growing.

2. **A Smartphone**

The Blynk App is a well designed interface builder. It works on both iOS and Android, so no holywars here, ok?

3.8.3 Getting started

Let's get you started in 5 minutes (reading doesn't count!). We will switch on an LED connected to your Arduino using the Blynk App on your smartphone.

Connect an LED as shown here:

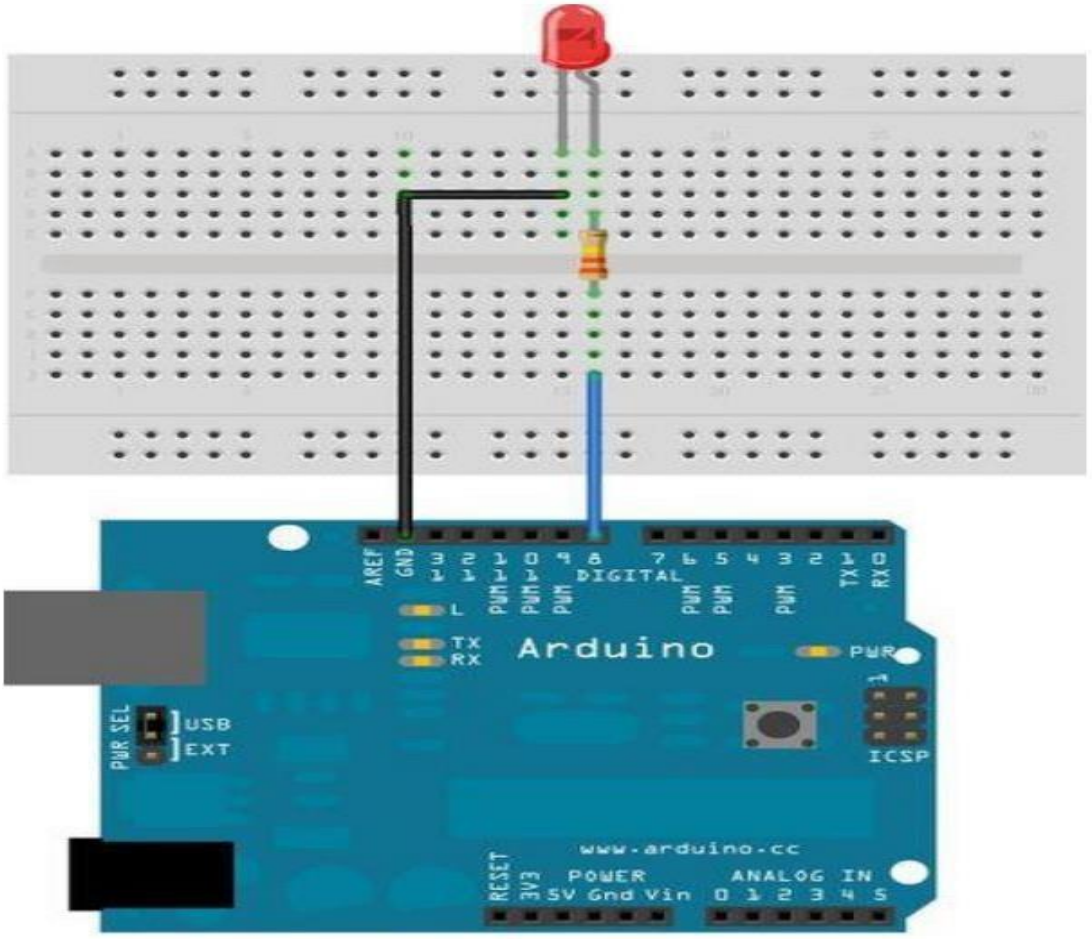


Fig. 3.17 : Blynk connection with Arduino

Getting Started With The Blynk App

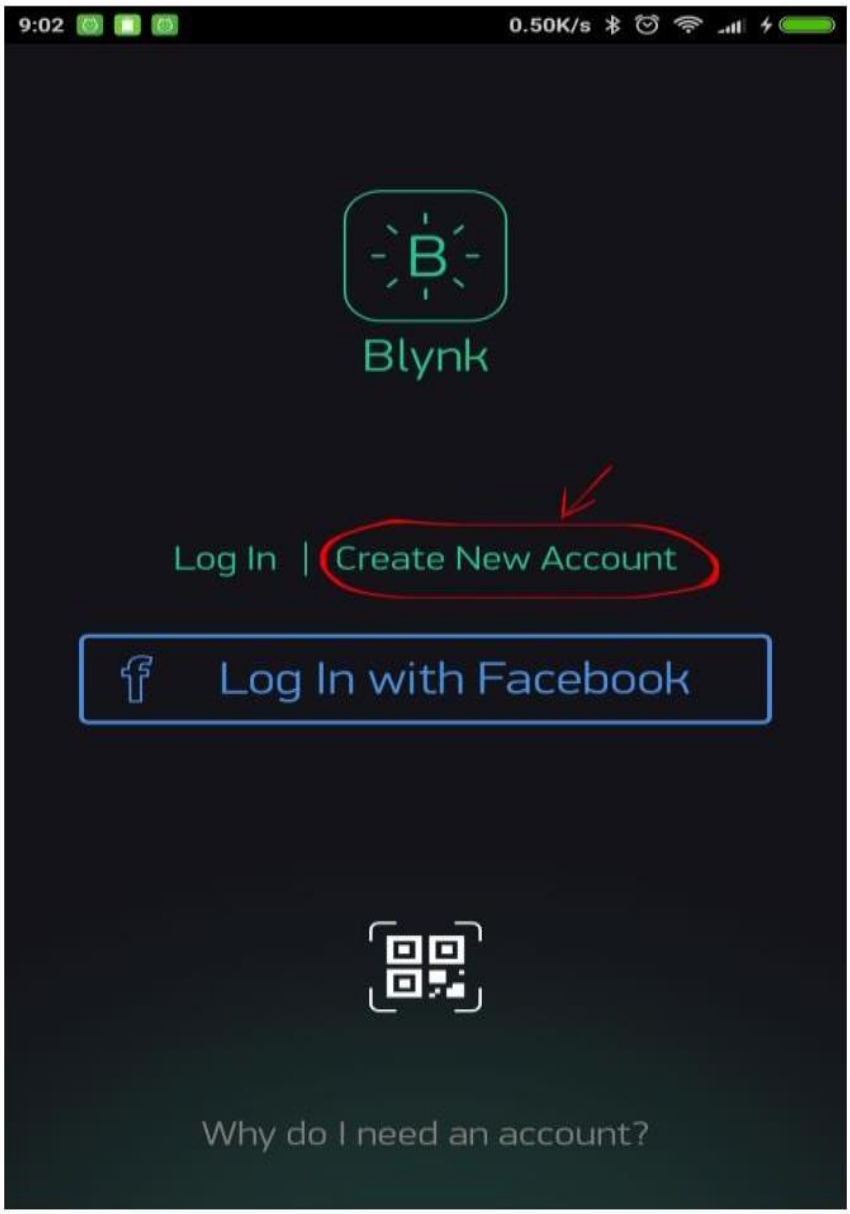
1. Create a Blynk Account

After you download the Blynk App, you'll need to create a New Blynk account. This account is separate from the accounts used for the Blynk Forums, in case you already have one.
We recommend using a **real** email address because it will simplify things later.

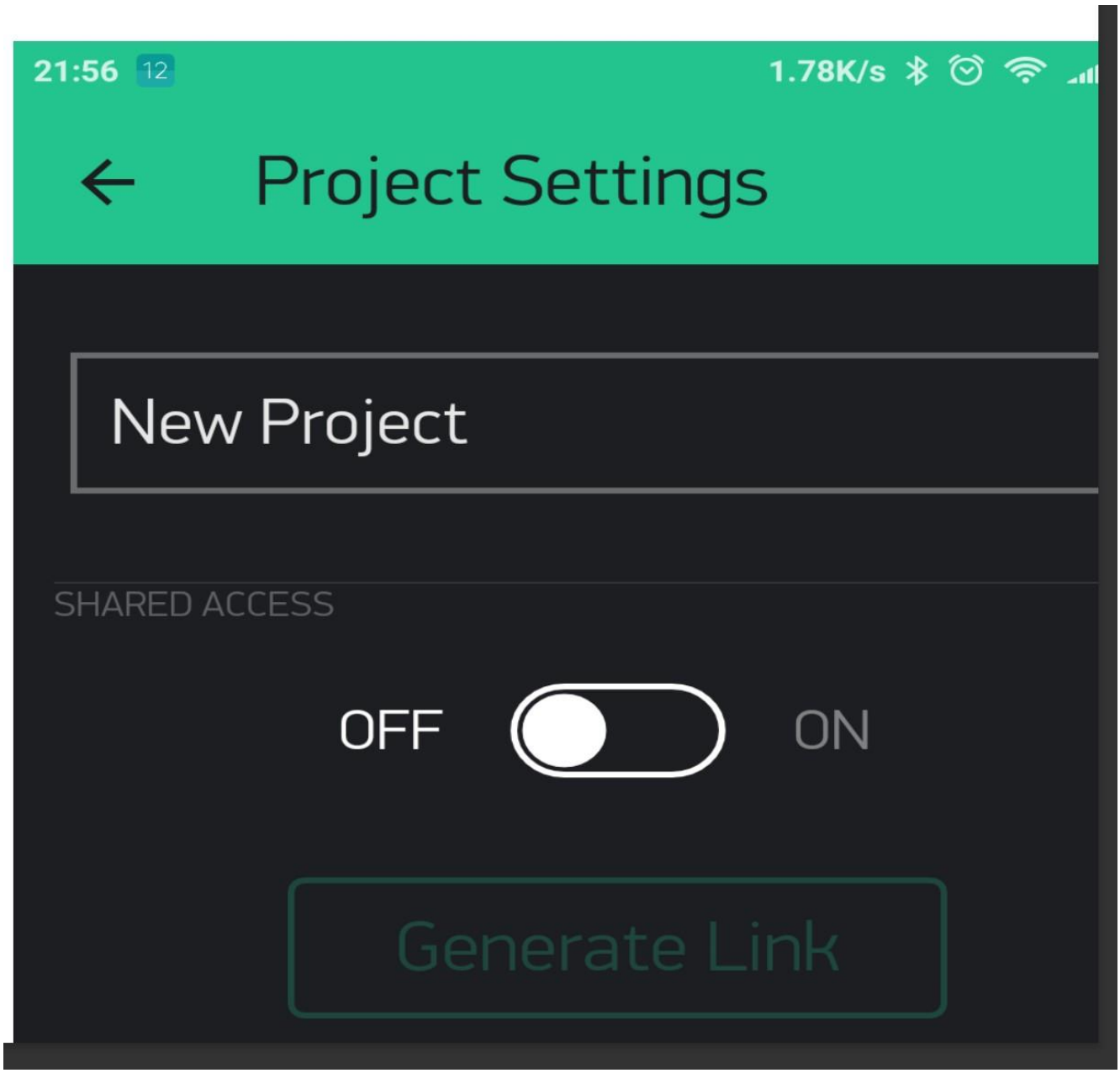
Why do I need to create an account?

An account is needed to save your projects and have access to them from multiple devices from anywhere. It's also a security measure.
You can always set up your own Private Blynk Server and have full control.

2. Create a New Project

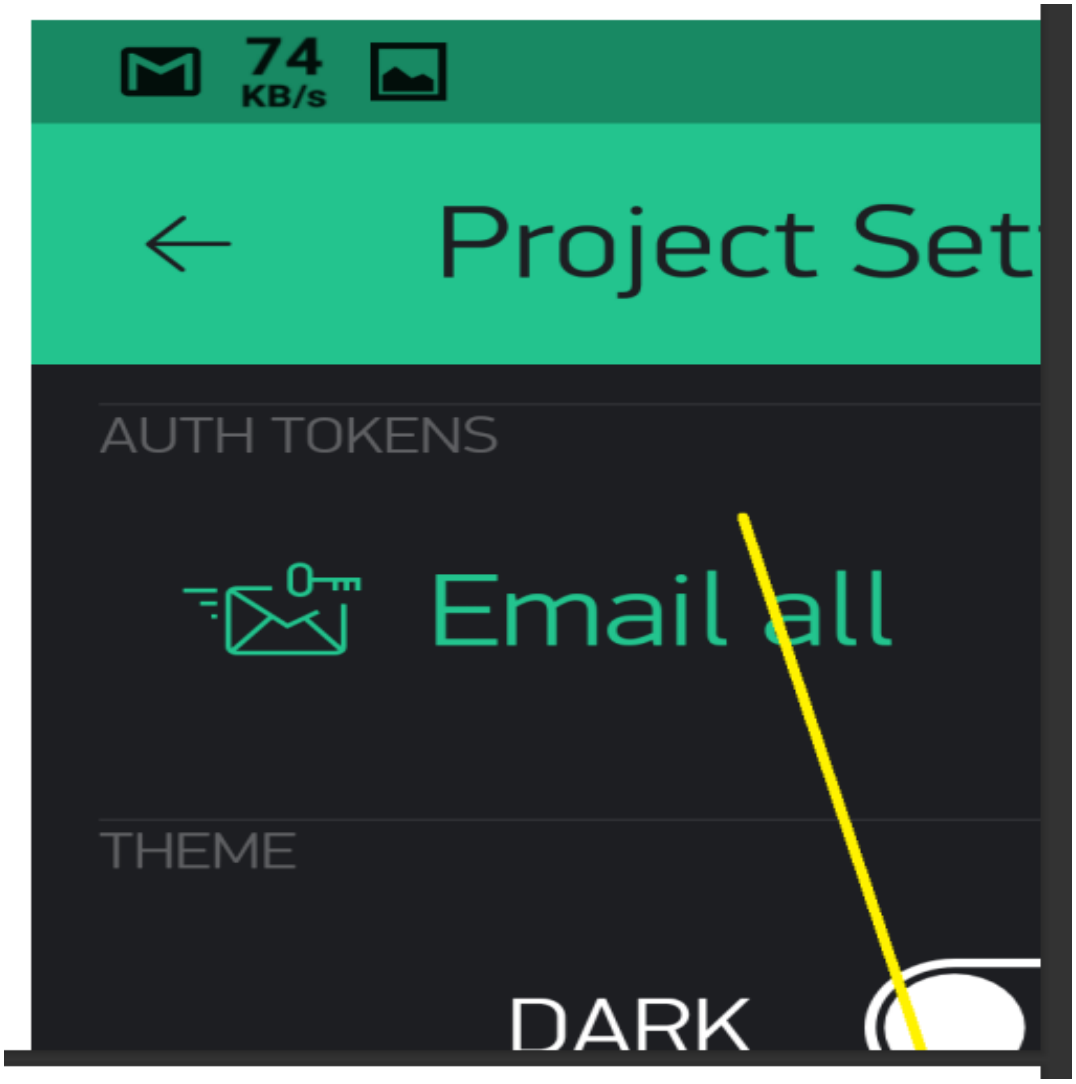


NOTE: After Blynk.config(...) is called, your hardware is not yet connected to the server. It will try to connect while until it hits first instance of Blynk.run() or Blynk.connect()routine. To skip connecting to the server or to disconnect manually, call Blynk.disconnect() after configuration. Use connectWiFi to conveniently set up WiFi connection:

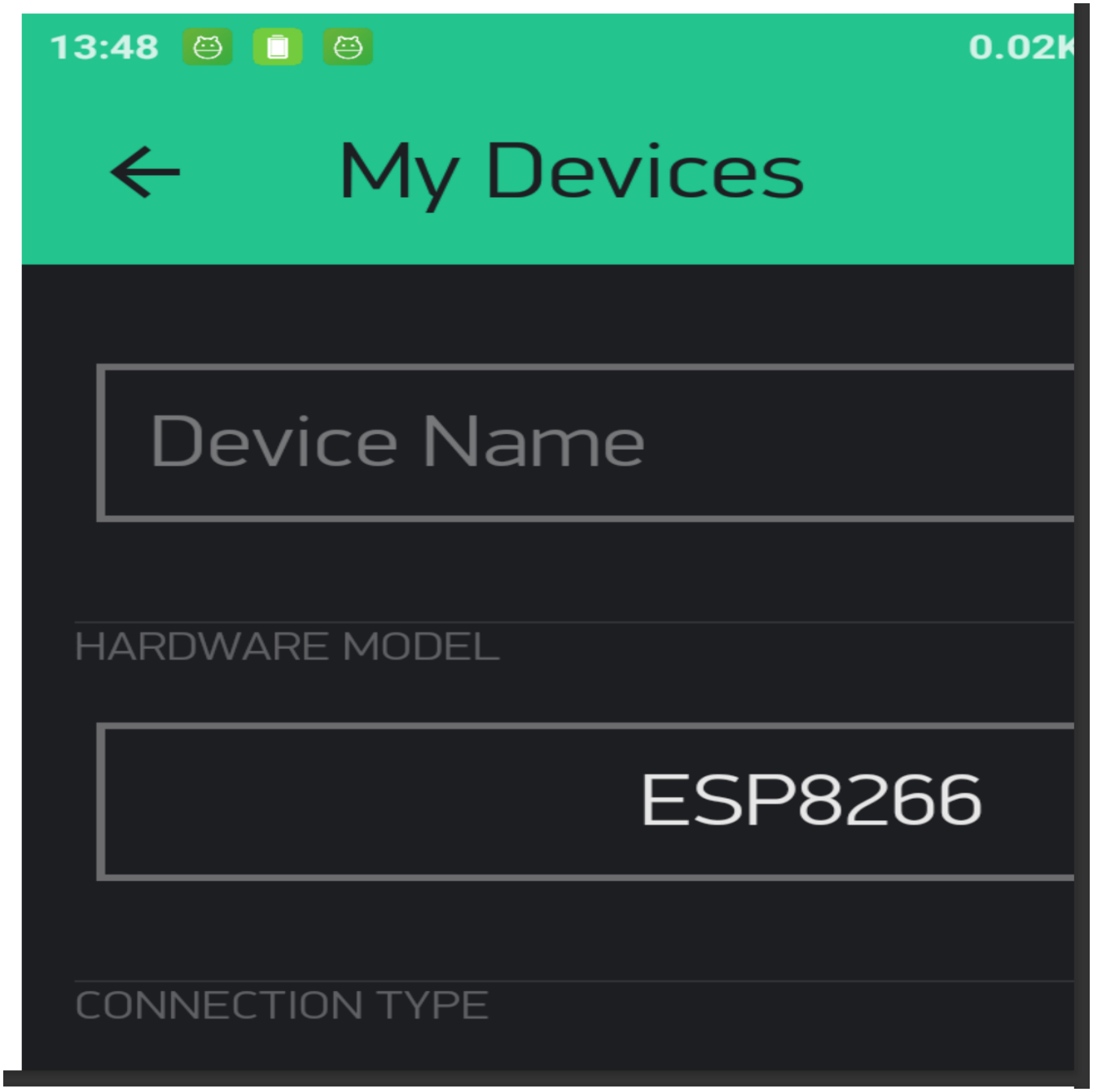


Blynk timer

It's important to send data in intervals and keep the void loop() as clean as possible. BlynkTimer allows you to send data periodically with given intervals not interfering with Blynk library routines Blynk Timer inherits SimpleTimer Library, a well known and widely used library to time multiple events on hardware. BlynkTimer is included in Blynk library by default and there is no need to install SimpleTimer separately or include SimpleTimer.h • A single BlynkTimer object allows to schedule up to 16 timers • Improved compatibility with boards like Arduino 101, Intel Galileo, etc.



Virtual Pins is a way to exchange any data between your hardware and Blynk app. Think about Virtual Pins as channels for sending any data. Make sure you differentiate Virtual Pins from physical GPIO pins on your hardware. Virtual Pins have no physical representation. Virtual Pins are commonly used to interface with other libraries (Servo, LCD and others) and implement custom logic. The device can send data to the App using Blynk.virtualWrite(pin, value) and receive data from the App using



This function should be called frequently to process incoming commands and perform housekeeping of Blynk connection. It is usually called in void loop() {}. This command can be initiated it in other places of your code unless you run out of heap memory (in the cascaded functions with local memory). For example, it is not recommended to call Blynk.run() inside of the BLYNK_READ and BLYNK_WRITE functions on low-RAM devices.

3.9 Node MCU :

NodeMCU is an open source IOT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson, and spiffs.

History :

NodeMCU was created shortly after the ESP8266 came out. On December 30, 2013, Express if Systems began production of the ESP8266. The ESP8266 is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IOT applications. NodeMCU started on 13 Oct 2014, when Hong committed the first file of NodeMCU-firmware to GitHub. Two months later, the project expanded to include an open-hardware platform when developer Huang R committed the gerber file of an ESP8266 board, named devkit v0.9.

Later that month, Tuan PM ported MQTT client library from Contiki to the ESP8266 SoC platform, and committed to NodeMCU project, then NodeMCU was able to support the MQTT IOT protocol, using Lua to access the MQTT broker. Another important update was made on 30 Jan 2015, when Devsaurus ported the u8glib to NodeMCU project, enabling NodeMCU to easily drive LCD, Screen, OLED, even VGA displays. In summer 2015 the creators abandoned the firmware project and a group of independent but dedicated contributors took over. By summer 2016 the NodeMCU included more than 40 different modules.

Due to resource constraints users need to select the modules relevant for their project and build a firmware tailored to their needs.

3.9.1 Specifications :

NodeMCU Dev Board is based on widely explored esp8266 System on Chip from Express if. It combined features of WIFI access point and station + microcontroller and uses simple LUA based programming language. ESP8266NodeMCU offers.

- Arduino-like hardware IO
- Event-driven API for network applications
- GPIOs D0-D10, PWM functionality, IIC and SPI communication, 1-Wire and ADC A0 etc. all in one board
- Wi-Fi networking (can be uses as access point and/or station, host a webserver), connect to internet.

- excellent few $ system on board for Internet of Things (IOT) projects. Recently, there has been interest in programming ESP8266 systems using Arduino IDE. Programming, of ESP8266 using Arduino IDE is not very straight forward, until it is properly configured. Especially because, the Input and output pins have different mappingon NodeMCU than those on actual ESP8266 chip. I had request about showing how to program ESP-12E NodeMCUusing Arduino IDE. I struggled myself earlier in the beginning, so thought of making this Instruct able for beginners.

This is quick guide/tutorial for getting started with Arduino and ESP8266 NodeMCU V2 ESP12Ewifi module.(I think, this method can be used for other NodeMCU boards too. (or only ESP8266 boards, but with necessary hardware modifications and using FTDI modules for programming- not covered in this tutorial because, this is onlyfor NodeMCU development boards).

This Instruct able gives quick intro to

1) Installing Arduino core for ESP8266 Wi-Fi chip in Arduino IDE and Getting started with sketches written using Latest stable Arduino IDE 1.6.7

2) Run/modify basic LED blink sketch to blink onboard LED and/or externally connected LED at pin D0 or GPIO-16 as per the pin configuration mentioned here and here.

NOTE : To use NodeMCU V1 or V2 or V3 development boards using Arduino IDE, we do not need to flash it with firmware using NodeMCU flasher. It is required only if we intend to program NodeMCU using Lua script with esplorer etc.

First and foremost word of - CAUTION!

- ✓ The ESP8266 chip requires 3.3V power supply voltage. It should not be powered with 5 volts like other Arduino boards.
- ✓ NodeMCU ESP-12E development board can be connected to 5Vusing micro USBconnector or Vin pin available on board.
- ✓ The I/O pins of ESP8266 communicate or input/output max 3.3V only. The pins are NOT 5V tolerant inputs.

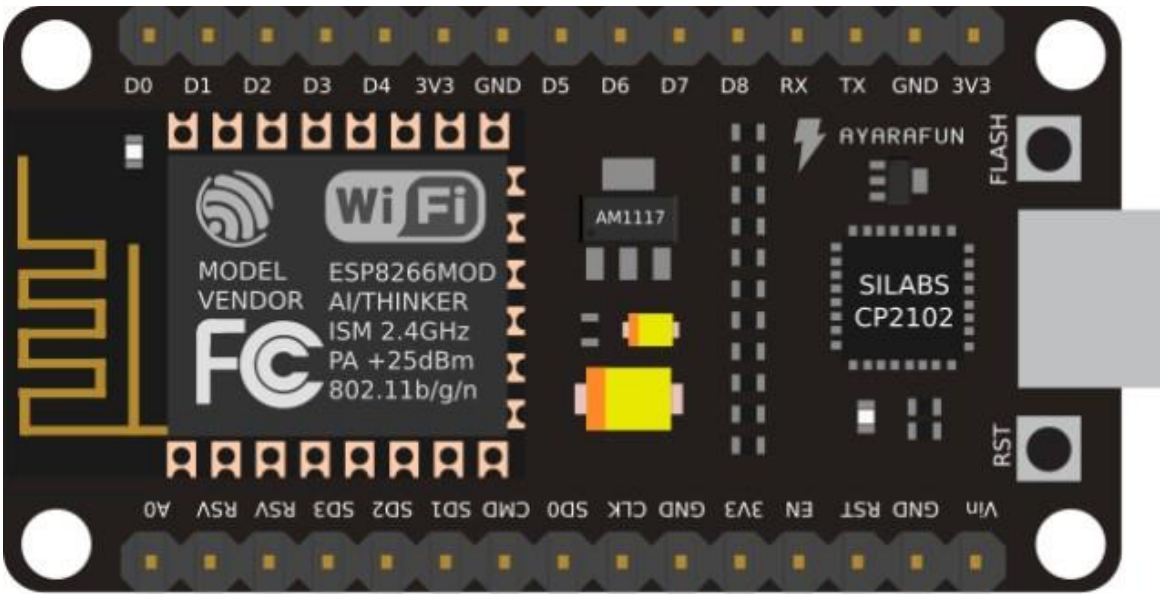


Fig.3.18 : Node MCU

Node MCU Pin out :

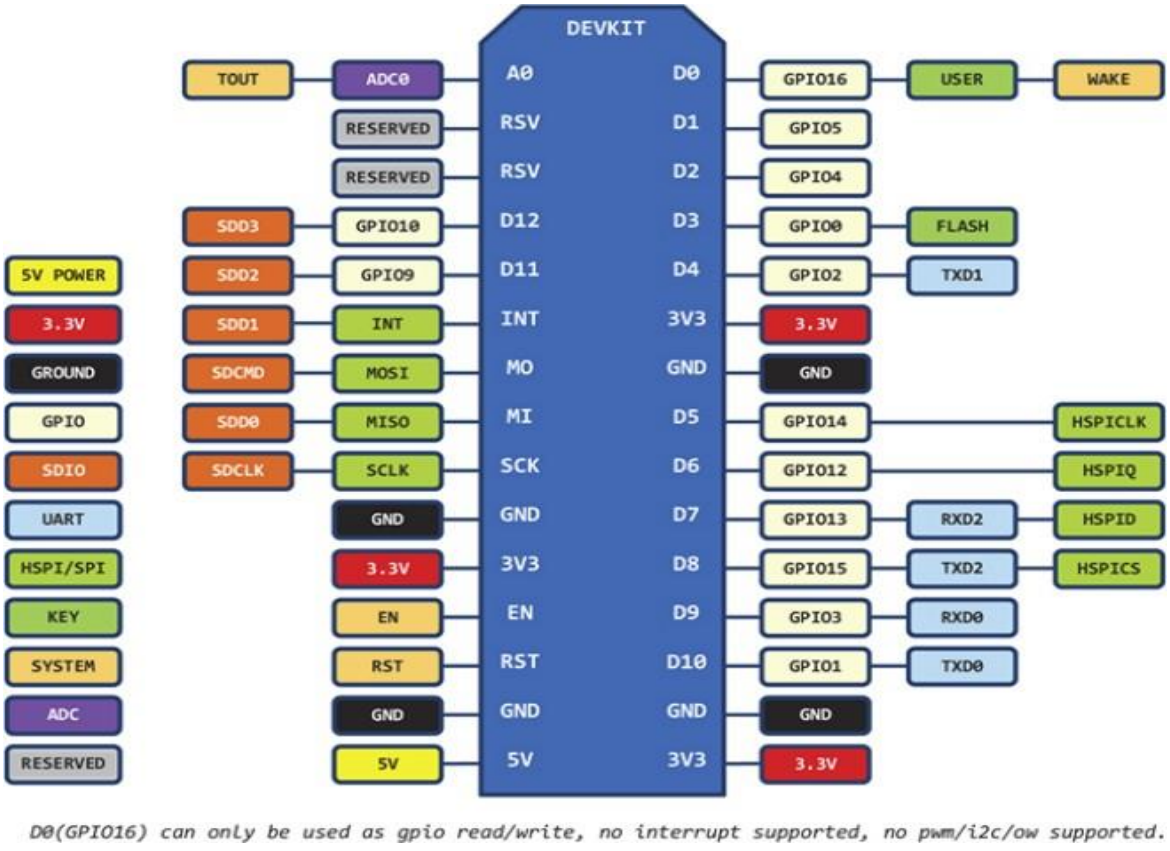


Fig. 3.19 : Node MC Pins

3.10 Gas Sensor

MQ-06 is used to detect inflammable gases in the system. All the gases that emit carbon dioxide in the air after inflating gets detected by the sensor. These sensor has threshold value when crossed they give a notification. For gas where Au and Pt are used as an electrode, Ni-Cr alloy is used for heater coil.

Fig.3.20 : Gas sensor

3.10.1 Features of MQ6 Gas sensor

- Operating Voltage is +5V
- Can be used to detect LPG or Butane gas
- 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

Note: Complete technical details can be found in the **MQ6 Gas Sensor Datasheet** linked at thebottom of this page.

The ability of a Gas sensor to detect gases depends on the **chemiresister** to conduct current. The most commonly used chemiresistor is Tin Dioxide (SnO2) which is an n-type semiconductor that has free electrons (also called as donor). Normally the atmosphere will contain more oxygen than combustible gases. The oxygen particles attract the free electrons present in SnO2 which pushes them to the surface of the SnO2. As there are no free electrons available output current will be zero. The below gif shown the oxygen molecules (blue color) attracting the free electrons (black color) inside the SnO2 and preventing it from having free electrons to conduct current.

When the sensor is placed in the toxic or combustible gases environment, this reducing gas (orange color) reacts with the adsorbed oxygen particles and breaks the chemical bond between oxygen and free electrons thus releasing the free electrons. As the free electrons are back to its initial position they can now conduct current, this conduction will be proportional the amount of free electrons available in SnO2, if the gas is highly toxic more free electrons will be available.

3.11 16x2 LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

Fig.3.21 : 16x2 LCD Display

3.11.1 Features of LCD16x2

The features of this LCD mainly include the following

- The operating voltage of this LCD is 4.7V-5.3V
- It includes two rows where each row can produce 16-characters.
- The utilization of current is 1mA with no backlight
- Every character can be built with a 5×8 pixel box
- The alphanumeric LCDs alphabets & numbers
- Is display can work on two modes like 4-bit & 8-bit
- These are obtainable in Blue & Green Backlight
- It displays a few custom generated characters

Now, we know that each character has (5×8=40) 40 Pixels and for 32 Characters we will have (32×40) 1280 Pixels. Further, the LCD should also be instructed about the Position of the Pixels. Hence it will be a hectic task to handle everything with the help of MCU, hence an Interface IC like HD44780 is used, which is mounted on the backside of the LCD Module itself.

CHAPTER 4

RESULTS & DISCUSSION

In this framework, we have sensors LM35 and MQ6 inserted in the Arduino board. The LM35 is a temperature sensor. The LM35 sensor gives exact readings at room temperature. The smoke sensor utilized is MQ6 which recognizes smoke. It is a nonexclusive gas sensor. It is effectively ready to recognize LPG, iso-butane, propane, Hydrogen, smoke methane. One of the significant points of interest of this sensor is its high affectability and quick reaction.

4.1 Physical Appearance

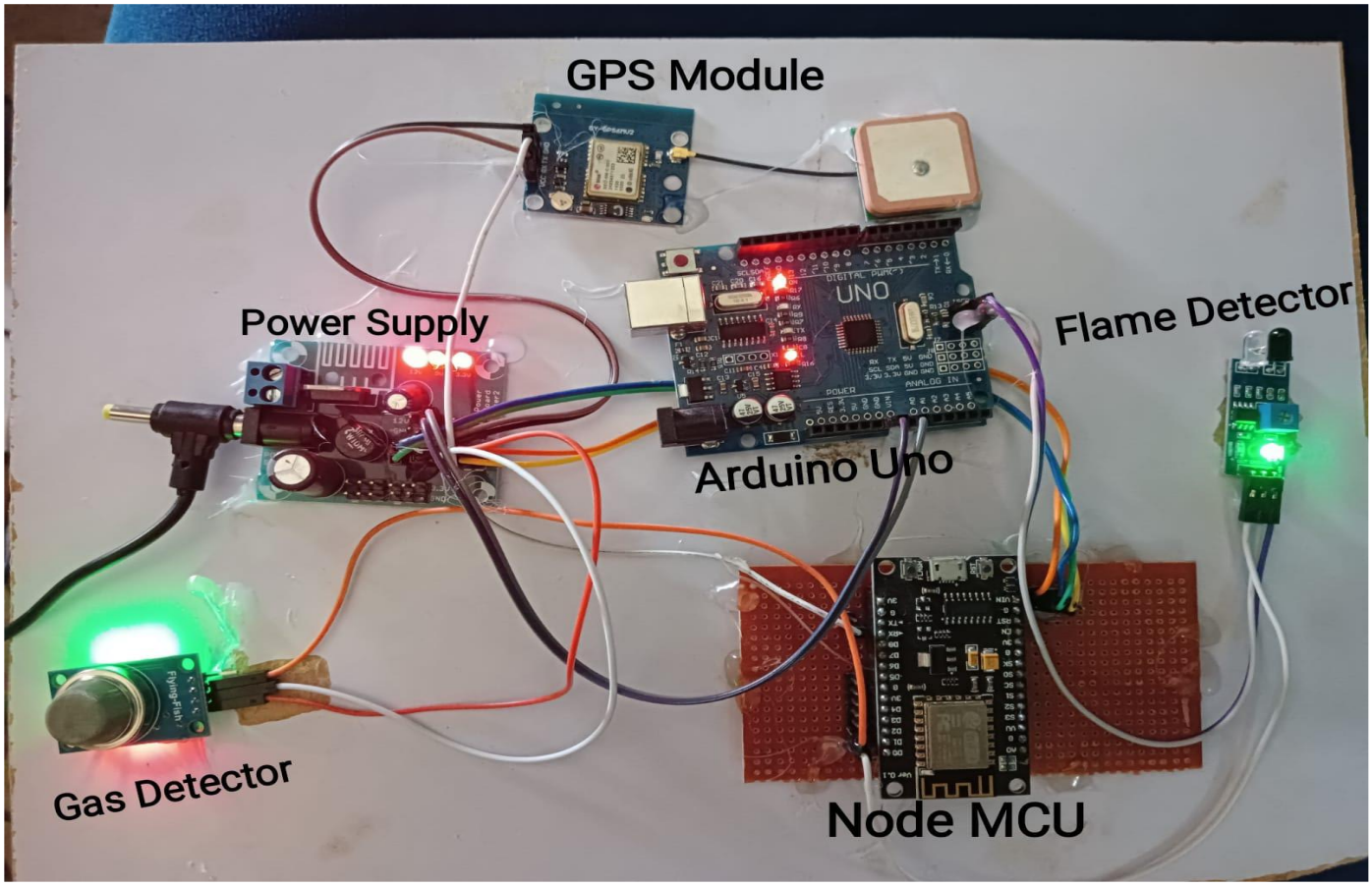


Fig.4.1 : Physical Appearance

Working

The yield of the sensor depends on the power of gas. A small scale controller goes about as the focal handling unit, which takes the qualities evaluated by these sensors as the contribution for further preparing. Each framework is fused with a bell. The whole framework is associated with a Wi-Fi module so as to have the capacity to exchange information from the sensors onto diverse frameworks. Every framework has an exceptional Identification number. Alongside the ID, clients are additionally required to give fundamental subtleties as for the area of framework establishment, contact subtleties and Login certifications.

The sensors in the framework will gain information and continually continue sending it crosswise over to this site with the assistance of the Wi-Fi module. The dependable specialists will almost certainly keep themselves refreshed with the status at every area. Each time there is a noteworthy change in the esteem caught by the sensors, an alarm will be sent crosswise over to the local group of fire-fighters just as to the number enrolled alongside the framework. Ready will be sent when the limit esteem is crossed.

If there should be an occurrence of an outrageous ascent in temperature or gas levels, the sensors get initiatedand quickly an alarm as warning on the site gotten to by local group of fire-fighters is sent. The local groupof firefighters is then foreseen to send help at the most punctual since area will be enrolled with them. Thefocal local group of firefighters will at that point send a prompt alarm to the closest flame station to the spotof mishap. Close by an alarm is likewise sent to the closest medical clinic to send crisis help in the event ofany setbacks.

In this task we utilized distinctive programming methods to construct a code for the Arduino board. Here Arduino board reads the data given by the system and sends the information to site and to client through Wi-Fi module. For the Chart and spark sensor indicator we utilized Php language (Personal home page). Other language utilized were html and CSS to make the page and site additionally appealing. Arduino board: software is used to write programs that can be embedded onto the board. It is available for many operating systems like Windows, Linux, Mac OS X, Portable IDE. It is an open source platform for electronics design, and very easy tool to use for both hardware and software.

Arduino IDE comes with few advantages like fast prototyping and also helps the students who don’t have any prior knowledge in electronics and software programming. It provides flexible, simple and clear programming environment for beginners.

CHAPTER 5

ADVANTAGES & APPLICATIONS

5.1 Advantages

1. Speed of response
2. Detection distance
3. Sensitivity
4. Reliability
5. Range of applications

5.2 APPLICATIONS

1. Industrial and non industrial buildings
2. Apartments
3. Hotels & hospitals
4. Mall and multi stored complexes
5. Offices and control rooms
6. Electric vehicles

CHAPTER 6

CONCLUSION & FUTURE SCOPE

6.1 Conclusion

Fire breakouts create serious health and Infrastructure hazard, associated with it is unavoidable injuries or loss of lives in one hand, partial or complete damage to properties. This loss is inestimably enormous; hence this paper proposes the development of IOT based fire department alerting system. This model constantly monitoring the fire signal and will send warning to alert the user and nearest fire station. This application targets people who don't have someone to be at home, office or any other workplace so when they away from their place they are notified about the fire problems if any.

Using this application willhelp these people as they will be informed quickly about the incident and also the nearest fire department will be notified in an effective way. The application has a notification feature which notifies the user and the nearest fire station plus the domestic help so that a quick action can be taken. It is also very efficient and hence very easy to use. This system has tried to solve almost every problem related to the safety of homes and its assets.

6.2 Future Scope

The framework which we have assembled is only one single unit for testing reason; the equivalent should be possible on a substantial scale. The framework can be actualized by includingdifferent new highlights, for example, camera. Including a Camera will give a reasonable image ofthe site of mishap in this manner enabling policeman to get the outcomes quick and as that issue even suspects. It can likewise be utilized for review purposes in future and to keep comparative mishaps from occurring. What's more, the framework can naturally gauge the power of flame so local group of fire-fighters station can realize how much work power will be required to beat this issue this as well as the measure of quencher required can likewise be created by further research,this will spare the errand of workforce at the stations. Model can likewise be outfitted with water sprinklers which will be valuable for controlling little events of flame, contingent upon spending we can introduce it the entire territory on greatest safeguard.

Future Developments

- This project can be enhanced to sense leakage of GAS (LPG).
- We can further extend this project by adding some more features which can make it moreefficient and security oriented.
- The camcorder can also be used to track all the activities of the unknown person or intruders

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APPENDEX- A

SOFTWARE CODING

```
#include <Servo.h>
#include "DHT.h"
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#define fire D0
int f;
char auth[] = "AFWSOvnAwWHv8VNYJ8XAx1deGnxABAz0";


char ssid[] = "projects";
char pass[] = "projects1234";
BlynkTimer timer;
void sendSensor()
{
  f = digitalRead(fire);
  delay(30); // interval
  if(f == LOW)
  {
  Blynk.notify("FIRE DETECTED..");
  Serial.println("AT");
  delay(1000);
  Serial.println("AT+CMGF=1");
  delay(2000);
  Serial.println("AT+CMGS=\"+916300102942\"\r"); // Replace x with mobile number917892606752
```

```
 delay(2000);
 Serial.print(" https://www.google.com/maps/place/");
 Serial.print("16.463651");
  Serial.print(",");
  Serial.print("80.404453");
  delay(2000);
  delay(2000);
  delay(1000);
  Serial.println("");
  delay(100);
  Serial.println((char)26); // ASCII code of CTRL+Z
  delay(1000);
 delay(2000);
 }
 }
 void setup()
{
 pinMode(fire,INPUT);
 Serial.begin(9600);
 delay(10);
 Blynk.begin(auth, ssid, pass);
 timer.setInterval(1000L, sendSensor);}
void loop()
{
  Blynk.run();
 timer.run();
     }
```