



# **INDUSTRIAL SECURITY AUTOMATION USING IOT**

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**BACHELOR OF TECHNOLOGY**

**in**

**ELECTRICAL & ELECTRONICS ENGINEERING**

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**June 2020**

# **DECLARATION**

We hereby declare that the work presented in this report entitled “INDUSTRIAL SECURITY AUTOMATION USING IOT”, was carried out by us. We have not submitted the matter embodied in this report for the award of any other degree or diploma of any other University or Institute.

We have given due credit to the original authors/sources for all the words, ideas, diagrams, graphics, computer programs, experiments, results, that are not our original contribution. We have used quotation marks to identify verbatim sentences and given credit to the original authors/sources.

We affirm that no portion of our work is plagiarized, and the experiments and results reported in the report are not manipulated. In the event of a complaint of plagiarism and the manipulation of the experiments and results, we shall be fully responsible and answerable.

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# **ABSTRACT**

The main aim of this proposed project is to design and implement a flexible, cost-effective and powerful IoT Based Industrial Automation security system. An IoT based Industrial Automation system is needed for the occupant's convenience and safety. This system helps you to detect burglary, leaking of harmful gas, smoke caused due to fire and after detecting suspicious activity, it sends an alarm message to the owner number as well as security personnel. Our purpose of this project is to use our study & skill to provide a healthy and safe environment in industries with low cost IoT technology.

Earlier Industries used to monitor the things by using RFID system where it was only used for short distance communication. To reduce the manual overhead, the thing which we are introducing is automation of industries using internet of things which can overcome the RFID shorter distance problem. Using IOT in industries we can monitor and control the industrial machineries more easily.

## **CHAPTER-1**

### **INTRODUCTION**

Robotization or modern computerization or numerical control is the utilization of control frameworks, for example, PCs to control mechanical apparatus and procedures, lessening the requirement for human mediation. In the extent of industrialization, robotization is a stage past motorization. Whereas automation furnished human administrators with hardware to help them with the physical necessities of work, computerization enormously diminishes the requirement for human tactile and mental prerequisites also. Procedures and frameworks can likewise be mechanized. Mechanization assumes an inexorably significant job in the worldwide economy and everyday experience. Architects endeavor to consolidate mechanized gadgets with numerical and hierarchical devices to make complex frameworks for a quickly extending scope of utilizations and human exercises.

Revolutionizing technologies upgrades industry as well as increase the risk of damage. So where ever we go security and safety should come first. Industrial Security Automation using IoT serves that task successfully. A security system which can prevent a human being from getting injured or damage of costly assets.

IoT was initially adopted by industries as a way to improve operational efficiency. But in today's environment, it can improve the overall efficiency of industries in terms of productivity, quality, cost, delivery, safety, and morale.

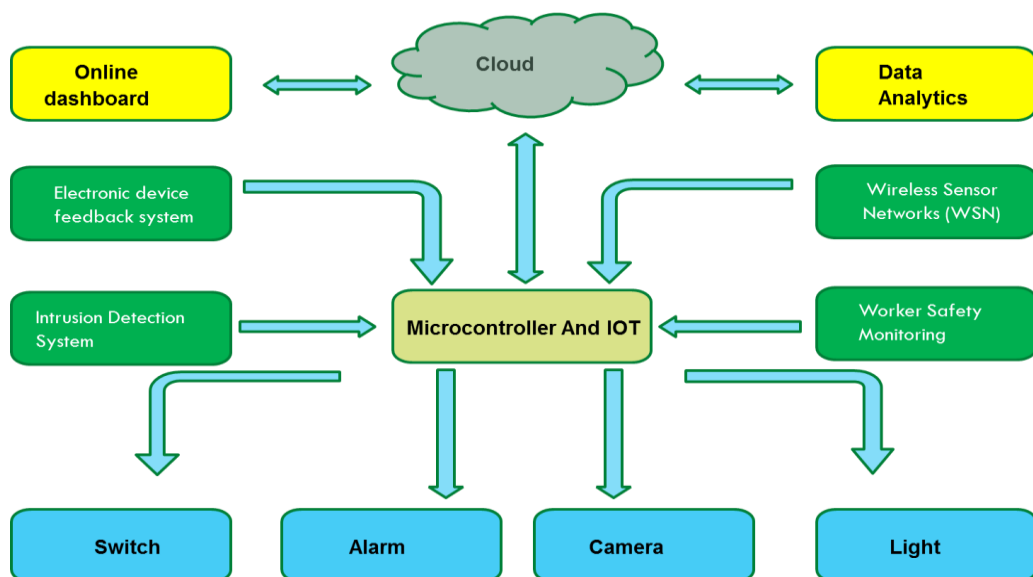
## Industrial Security Automation Using IoT

IoT security is the innovation zone worried about shielding associated gadgets and systems in the web of things (IoT). IoT includes adding web availability to an arrangement of interrelated registering gadgets, mechanical and advanced machines, articles, creatures, or potentially individuals. Every "thing" is given a special identifier and the capacity to consequently move information over a system. Permitting gadgets to interface with the web frees them up to a few genuine weaknesses if they are not appropriately secured.

Thus, security in industries can be easily monitored being cost-effective and efficient. Earlier Industries used to monitor the things by using an RFID system where it was only used for short-distance communication. To reduce the manual overhead, the thing which we are introducing is the automation of industries using the internet of things that can overcome the RFID shorter distance problem.

The omnipresence of threats and the growing awareness of existing vulnerabilities call for new approaches. As of today, industrial IoT security requirements are only shaping up. Surely, ensuring IoT security implies not only leveraging more advanced tools but also imposing stricter security policies on human employees.

### 1.1 Block Diagram of Industrial Security Automation (ISA)



**Figure 1.1- ISA Block Diagram**



This block diagram shown above represents the overall working model of our project: Industry Security Automation Using IoT.

Following blocks are explained below-

### **1.1.1 Microcontroller and IoT**

A microcontroller is the heart of our project. In short, a microcontroller is a compact integrated circuit designed to govern a specific operation in an embedded system. A typical microcontroller includes a processor, memory, and input/output (I/O) peripherals on a single chip. Here, we are working with the AtMega328p microcontroller along with Esp8266 for IoT interface. IoT stands for the Internet of Things. IoT provides us the best user interface as it is more reliable and fast. The microcontroller takes input from several sensors spreader across all over the industry and takes calculations, algorithms to give out an understandable output on the screen for every input sensor accurately with zero percent of mistake. For adding the possibility of remote monitoring and controlling. We doped our system with a fully automated IoT. What this means is that now our system can take input from the sensor, gives output on the screen, and also it can send the same data over the internet to our remote client anywhere in the world. And this requires no manpower to do so. All these data sending receiving again done by our microcontroller AtMega328p with Esp8266.

### **1.1.2 Cloud**

Cloud is a storage unit provided by Blynk Inc. Server. So that clients can communicate with the microcontroller remotely using their smartphones and monitor, control everything with just press of a button on the screen. Blynk is a Platform with IOS and Android applications to control Arduino, Raspberry Pi, and the preferences over the Internet. It's a computerized dashboard where you can construct a realistic interface for your undertaking by just moving gadgets.

### **1.1.3 Online Dashboard**

A dashboard is a sort of graphical UI that frequently gives initially perspectives on key execution markers (KPIs) pertinent to a specific target or business process. So the online dashboard will give clients a GUI simple to peruse, control, and oversee.

### 1.1.4 Data Analytics

Information examination is a procedure of investigating, purging, changing, and demonstrating information to find valuable data, advising ends, and supporting dynamic. Information examination has various features and approaches, including assorted strategies under an assortment of names, and is utilized in various business, science, and sociology areas. In today's industrial world, data analysis plays a role in making decisions more scientific and helping businesses operate more effectively. Here, data analytics is solely performed by the cloud itself.

### 1.1.5 Sensors (Electronic Device Feedback System, IDS, Worker Safety Monitoring, WSN)

A device that discovers and reacts to changes in such things as movement, heat, and light. We have employed the following sensors so that they are best suited in almost every industry upon installations. However, every industry has a unique requirement for sensors. So there is always the possibility of adding, modifying, and omitting sensors. Sensors we currently operating are-Infrared Sensor (SEN-2689), Ultrasonic Sensor (HC-SR04), Current Sensor (ACS712), LPG Detector (MQ-6), Temperature And Humidity Sensor (DHT11), PIR Sensor, Short Circuit Detector. For monitoring, we have sensors that provide input data for the microcontroller. And upon which microcontroller takes requisite calculations and performs suitable operations.

- **Electronic Device Feedback System**-In this previously used sensor which comes with a sense of high risk upon failure will be given extra care using another sensor for zero error possibility and feedback.
- **Intrusion Detection System**- This system provides complete safety to certain highly valuable assets of the industry. This may include a combination of two or more sensors like PIR sensor, Ultrasonic Sensor, RFID system, Security Camera, etc.
- **Workers Safety Monitoring**- Safety of workers is one of the top priorities of any industry. To ensure good health, no harm to workers, Short Circuit Detector, LPG Gas Leakage Detector, Variable Current in electrical equipment monitoring by Current sensor can be done at various stages.
- **Wireless Sensor Network**-To overcome the need for long cable wire lines, we have developed a system in such a manner that each sensor and actuators can work independently and can also communicate with the microcontroller wirelessly with the help of IoT platform. For close-range communication, Bluetooth platforms can also be used.

### 1.1.6 Actuators(Relay as Switches,Alarm,Light,Camera)

An actuator is something that changes over vitality into movement. It additionally can be utilized to apply power. An actuator commonly is a mechanical gadget that takes vitality — typically, the vitality that is made via air, power, or fluid — and changes over it into a movement. Moreover, an actuator is a segment of a machine that is answerable for moving and controlling a component or framework, for instance by opening a valve. In basic terms, it is a "mover". An actuator requires a control signal and a wellspring of vitality. Here, actuators like transfers,alarm are used for the controlling of various activities required to be performed.So that industry security can be done easily and some actions which are required no user permission can be done automatically with prior settings.Actuators used here are namely relay,alarm,LED strip,BLDC fan are used at suitable places.These are fully controlled under the microcontroller's actions i.e.,output signal.

## **CHAPTER-2**

### **LITERATURE REVIEW**

#### **2.1Introduction**

"The most significant advances are those that vanish. They mesh themselves into the texture of regular day to day existence until they are unclear from it" was Mark Weiser's focal explanation in his original paper [Weis 91] in Scientific American in 1991. There is an ocean change in human's everyday life just as in working conditions in associations after the appearance of IT innovations. This is turning into a notable idea across numerous flat and vertical markets including a typical man's regular day to day existence in the general public, as it has a few applications. The advancement of the Internet of Things [IoT] has been determined by the requirements of huge organizations that remain to profit extraordinarily from the foreknowledge and consistency managed by the capacity to finish all articles the item chains in which they are inserted. The capacity to code and track objects has permitted organizations to turn out to be more effective, accelerate forms, diminish mistakes, forestall burglary, and fuse mind-boggling and adaptable authoritative frameworks through IoT. The IoT is mechanical unrest that speaks to the fate of processing and interchanges, and its improvement relies upon dynamic specialized development in a few significant fields, from remote sensors to nanotechnology. They are going to label each question for distinguishing, computerizing, checking, and controlling.

Robotization or programmed control is the utilization of different control frameworks for working hardware, for example, apparatus, forms in processing plants, boilers, and warmth treating stoves, exchanging in phone systems, directing, and adjustment of boats, airplane, and different applications with negligible or diminished human mediation. The greatest advantage of mechanization is that it spares work, spare vitality, materials, and to improve quality, exactness, and accuracy. The remote correspondence innovations are generally applied in fields like Industrial Automation. Infusion shaping machines can secure the molds in either an even or vertical position. Remote correspondence and savvy sensors and actuators present intend to economically improve computerization innovation. To find out about Industrial Automation, an audit procedure including 2 phase approaches has been attempted for 15 examination papers which were distributed in the time of the year 2000 to the year 2013. After a thorough audit process, four key issues were discovered "Controlling strategy for infusion shaping machine for innovations, new patterns in modern Automation, Energy Storage in co-age power plant and Wireless Data Transmission" which is for the most part expected to upgrade of Industrial Automation angles to show signs of improvement arrangement approach. The result of the survey was as different discoveries, found under different key issues. The discoveries included calculations and techniques used to tackle a specific examination issue, alongside their qualities and shortcomings, and the extension for future work in the territory. The plastic infusion forming machine control framework is made out of the driving framework and an electronic regulator. There are three types of the electronic regulator which incorporate the customary transfer regulator, PLC regulator, and microcomputer regulator. A customary transfer regulator has less been applied at present since this has multifaceted nature equipment, low exactness, and trouble for altering and keeping up.

## **2.2 Internet of Things**

The Internet of Things is a novel change in viewpoint in the IT field. The articulation "Web of Things" which is moreover in a matter of seconds

remarkable as IoT is organized from the two words for instance the chief word is "Web" and the ensuing word is "Things". The Internet is an overall course of action of interconnected PC composes that use the standard Internet show suite (TCP/IP) to serve billions of customers around the globe. It is an arrangement of frameworks that contains countless private, open, insightful, business, and government frameworks, of the area to an overall degree, that are associated by a wide group of electronic, far off and optical frameworks organization progresses. Today more than 100 countries are associated with exchanges of data, news, and assessments through the Internet. According to Internet World Statistics, as of December 31, 2011, there were a normal 2, 267, 233, 742 Internet customers around the globe. This infers 32.7% of the world's outright masses is using the Internet. Undoubtedly, even the Internet is going into space through Cisco's Internet Routing in Space (IRIS) program in the coming fourth years. While heading off to the Things that can be anything or person which can be unmistakable by this current reality. Conventional articles join not simply electronic devices we encounter and use each day and imaginatively moved things, for instance, equipment and contraptions, yet "things" that we don't do ordinarily consider as electronic using any means, for instance, food, clothing; and furniture; materials, parts, and rigging, stock and focused things; places of interest, tourist spots, and works of art and all the arbitrariness of exchange, culture, and refinement. That suggests here things can be both living things like an individual, animals—cow, calf, canine, pigeons, rabbit, etc., plants—mango tree, jasmine, banyan, and so forth and non-living things like a seat, refrigerator, tube light, window adornment, plate, etc any home machines or industry contraption. So now, things are authentic things in this physical or material world.

2.1. Definitions There is no uncommon definition open for the Internet of Things that is agreeable by the world system of customers. There is a wide scope of social occasions including academicians, researchers, experts, innovators, engineers, and corporate people that have described the term, even though its basic use has been credited to Kevin Ashton, an authority on cutting edge improvement. What the sum of the definitions shares is the likelihood that the central variation of the Internet was about data made by people, while the accompanying structure is about

data made by things. The best definition for the Internet of Things would be: "An open and expansive arrangement of savvy articles that can auto-sort out, share information, data, and resources, reacting and acting in face of conditions and changes in the earth" Internet of Things is creating and continues being the latest, a most publicized thought in the IT world. Over the latest decade, the term Internet of Things (IoT) has stood apart by envisioning the vision of an overall system of sorted out physical articles, enabling at whatever point, any place arranges for anything and not only for anyone. The Internet of Things can in like manner be considered as an overall framework that allows the correspondence between human-to-human, human-to-things, and things-to-things, which is anything on earth by giving an uncommon character to each address. IoT depicts a reality where practically anything can be related and confers shrewdly than whenever in ongoing memory. Most by far of us consider "being related" similar to electronic devices, for instance, laborers, PCs, tablets, telephones, and PDAs. In what's known as the Internet of Things, sensors and actuators introduced in physical things—from boulevards to pacemakers—are associated through wired and far off frameworks, much of the time using a comparative Internet IP that interfaces the Internet. These frameworks produce goliath volumes of data that stream to PCs for examination. Exactly when things can both sense nature and give, they become instruments for getting multifaceted nature and responding to it rapidly. What's dynamic in this is these physical information structures are by and by beginning to be passed on, and some of them even work by and large without human mediation. The "Internet of Things" suggests the coding and frameworks organization of standard things and things to convey them autonomously machine-clear and recognizable on the Internet. Much existing substance in the Internet of Things has been made through coded RFID marks and IP tends to associated with an EPC (Electronic Product Code) compose.

### **2.3 Technologies**

One of the in vogue articulations in Information Technology is the Internet of Things (IoT). What's to come is the Internet of Things, which will change this current reality objects into keen virtual things. The IoT

experts to unite everything in our world under a run of the mill system, giving us control things around us just as keeping us instructed concerning the state of the things. Thinking about this, the current assessment addresses IoT thoughts through an efficient study of keen investigation papers, corporate white papers, capable discussions with experts, and online databases. Also, this assessment article bases on definitions, beginnings, fundamental essentials, characteristics, and pseudonyms of the Internet of Things. The central objective of this paper is to give an audit of the Internet of Things, designing, and basic advances and their uses in our regular day to day existence. In any case, this unique duplicate will give extraordinary discernment for the new investigators, who need to do explore in this field of Internet of Things (Technological GOD) and energize data storing up inefficiently.

The Internet of Things was from the start energized by people from the RFID social order, who implied the opportunity of discovering information about a named thing by examining a web address or database section that identifies with a particular RFID or Near Field Communication headways. In the assessment paper "Re-search and application on the sharp privately arranged on section advances and Internet of Things", the included key developments of IoT are RFID, sensor development, Nanotechnology, and information embedded development. Among them, RFID is the foundation and frameworks organization that focuses on the improvement of the Internet of Things. The Internet of Things (IoT) enabled customers to convey physical articles into the hover of the advanced world. This was made possible by different marking developments like NFC, RFID, and 2D scanner label which allowed physical articles to be recognized and implied over the web. IoT, which is facilitated with Sensor Technology and Radio Frequency Technology, is the widespread framework reliant on the unpreventable gear resources of the Internet, which is the Internet substance fights together. It is in like manner another surge of the IT business since the utilization of enlisting fields, correspondence frameworks, and overall meandering development had been applied. It incorporates despite refined developments of PC and correspondence sorts out outside, so far including various new supporting advances of the Internet of Things, for instance, gathering Information Technology,



Remote Communication Technology, Remote Information Transmission Technology, Sea Measures Information Intelligence Analyses, and Controlling Technology, etc.

### **2.4 Internet Protocol (IP)**

An Internet Protocol address (IP address) is a numerical imprint allocated to each contraption related to a PC association that uses the Internet Protocol for correspondence. An IP address serves two head limits: host or framework interface conspicuous confirmation and territory tending to. Web Protocol (IP) is the basic framework show used on the Internet, made during the 1970s. IP is the essential correspondences show in the Internet show suite for moving datagrams across arrange limits. The two variations of Internet Protocol (IP) are being utilized: IPv4 and IPv6. Each variation out of the blue describes an IP address. Because of its inescapability, the customary term IP address ordinarily still suggests the addresses described by IPv4. There are five classes of available IP runs in IPv4: Class A, Class B, Class C, Class D, and Class E, while only A, B, and C are regularly used. The certifiable show obliges 4.3 billion IPv4 addresses while the IPv6 will augment the openness to 85,000 trillion areas. IPv6 is the 21st century Internet Protocol. This sponsorship around for 2228 areas.

### **2.5 Electronic Product Code (EPC)**

An Electronic Product Code (EPC) is an all-inclusive identifier that gives a one of a kind personality to a particular physical item. This personality is intended to be remarkable among every single physical item and all classes of physical articles on the planet, forever. Electronic Product Code (EPC) is a 64 piece or 98-piece code electronically recorded on an RFID tag and planned to structure improvement in the EPC standardized tag framework. EPC code can store data about the sort of EPC, a remarkable sequential number of item, its determinations, maker data, and so forth. EPC was created by the Auto-ID focus at MIT in 1999.

EPCglobal Organization which is answerable for normalization of Electronic Product Code (EPC) innovation, made EPCglobal Network for sharing RFID data. It has four segments in particular Object Naming Service (ONS), EPC Discovery Service (EPCDS), EPC Information Services (EPCIS), and EPC Security Services (EPCSS).

### **2.6 Barcode**

A scanner tag or standardized identification is a technique for speaking to information in a visual, machine-coherent structure. At first, standardized tags spoke to information by changing the widths and dividing of equal lines. The creation depended on Morse code that was stretched out too thin and thick bars. Standardized identification is only an alternate method of encoding numbers and letters by utilizing a mix of bars and spaces of changing width. In jail serves its unique expectation to be enlightening yet isn't basic. In The Bar Code Book, Palmer (1995) recognizes that there are elective strategies for information passage procedures. Fast Response (QR) Codes the brand name for a sort of network standardized tag initially intended for the car business in Japan. Standardized identifications are optical machine-lucid names connected to things that record data identified with the thing. As of late, the QR Code framework has gotten famous outside the car business because of its quick lucidness and more prominent stockpiling limit contrasted with the standard. There are 3 sorts of standardized tags of Alpha Numeric, Numeric, and 2 Dimensional. Standardized tags are intended to be machine-comprehensible. For the most part, they are perused by laser scanners, they can likewise be perused utilizing a camera.

### **2.7 Wireless Fidelity (Wi-Fi)**

Remote Fidelity (Wi-Fi) is a systems administration innovation that permits PCs and different gadgets to impart over a remote sign. Vic Hayes has been named as the dad of Wireless Fidelity. The forerunner to Wi-Fi was designed in 1991 by NCR Corporation in Nieuwegein in the Netherlands.

The principal remote items were welcomed available under the name WaveLAN with rates of 1 Mbps to 2 Mbps. Today, there is almost inescapable Wi-Fi that conveys the rapid Wireless Local Area Network (WLAN) availability to a great many workplaces, homes, and open areas, for example, lodgings, bistros, and air terminals. The joining of Wi-Fi into journals, hand-held, and Consumer Electronics (CE) gadgets has quickened the selection of Wi-Fi to where it is about a default in these gadgets. Innovation contains any sort of WLAN item bolster any of the IEEE 802.11 along with the double band, 802.11a, 802.11b, 802.11g, and 802.11n. These days whole urban areas are turning out to be Wi-Fi passageways through remote APs.

### **2.8 Bluetooth**

Bluetooth remote innovation is an economical, short-run radio innovation that takes out the requirement for restrictive cabling between gadgets, for example, journal PCs, handheld PCs, PDAs, cameras, and printers and a successful scope of 10 - 100 meters. What's more, for the most part, convey at under 1 Mbps and Bluetooth utilizes the determination of the IEEE 802.15.1 norm. From the outset in 1994 the Ericson Mobile Communication organization began an undertaking named "Bluetooth". It is utilized for the making of Personal Area Networks (PAN). A lot of Bluetooth gadgets sharing a typical channel for correspondence is called Piconet. This Piconet is fit for 2 - 8 gadgets one after another for information sharing, and that information might be text, picture, video, and sound. The Bluetooth Special Interest Group includes more than 1000 organizations with Intel, Cisco, HP, Aruba, Intel, Ericson, IBM, Motorola, and Toshiba.

### **2.9 ZigBee**

ZigBee is one of the conventions produced for improving the highlights of remote sensor systems. ZigBee innovation is made by the ZigBee Alliance which is established in the year 2001. Attributes of ZigBee are

minimal effort, low information rate, moderately short transmission go, versatility, unwavering quality, adaptable convention plan. It is a low force remote system convention dependent on the IEEE 802.15.4 norm. ZigBee has a scope of around 100 meters and a data transfer capacity of 250 kbps and the geographies that it works are a star, group tree, and work. It is generally utilized in home mechanization, computerized farming, mechanical controls, clinical observing & power frameworks.

### **2.10 Near Field Communication (NFC)**

Close to Field Communication (NFC) is a lot of short-go remote innovation at 13.56 MHz, regularly requiring a separation of 4 cm. NFC innovation makes life simpler and more advantageous for shoppers around the globe by making it less complex to make exchanges, trade advanced substance, and associate electronic gadgets with a touch. Permits' instinctive introduction of remote systems and NFC is correlative to Bluetooth and 802.11 with their significant distance abilities a way off around up to 10 cm. It likewise works in a messy domain, doesn't require a view, simple and straightforward association strategy. It is first evolved by Philips and Sony organizations. Data conversion standard now days roughly 424 kbps. Force utilization during information perusing in NFC is under 15ma.

### **2.11 Actuators**

An actuator is something that changes over vitality into movement, which implies actuators drive movements into mechanical frameworks. It takes pressure-driven liquid, electric flow, or some other wellspring of intensity. Actuators can make a direct movement, rotating movement, or oscillatory movement. Spread short separations, regularly up to 30 feet, and by and large, convey at under 1 Mbps. Actuators normally are utilized in assembling or modern applications. There are three sorts of actuators are (1) Electrical: air conditioning and dc engines, stepper engines, solenoids (2) Hydraulic: utilize pressure driven liquid to incite movement (3)

Pneumatic: utilize packed air to impel movement. All these three kinds of actuators are particularly being used today. Among these, electric actuators are the most usually utilized sort. Water driven and pneumatic frameworks take into consideration expanded power and force from the littler engine.

### **2.12 Wireless Sensor Networks (WSN)**

A WSN is a remote system comprising of spatially conveyed self-governing gadgets utilizing sensors to helpfully screen physical or natural conditions, for example, temperature, sound, vibration, weight, movement, or contaminations, at various areas (Wikipedia). Shaped by hundreds or thousands of bits that speak with one another and pass the information along starting with one then onto the next. A remote sensor organize is a significant component in the IoT worldview. Sensor hubs might not have a worldwide ID as a result of the enormous measure of overhead and countless sensors. WSN dependent on IoT has gotten astounding consideration in numerous regions, for example, military, country security, human services, accuracy horticulture observing, fabricating, living space checking, woodland fire, and flood discovery, etc. Sensors mounted to a patient's body are checking the reactions to the prescription, with the goal that specialists can quantify the impacts of the medications.

### **2.13 Artificial Intelligence (AI)**

Man-made consciousness alludes to electronic situations that are touchy and receptive to the nearness of individuals. In an encompassing insight world, gadgets work in show to help individuals in doing their regular daily existence exercises in a simple, normal way utilizing Information and Intelligence that is covered up in the system associated gadgets. It is portrayed by the accompanying frameworks of attributes: (1) Embedded: Many Networked gadgets are coordinated into the earth (2) Context-Aware: These gadgets can remember you and your situational setting (3) Personalized: They can be custom-made to your requirements (4) Adaptive: They can change in light of you (5) Anticipatory: They can

envision your wants without cognizant intervention. Exploration of computerized reasoning over the most recent two decades has significantly improved the exhibition of both assembling and administration frameworks. As of now, there is a desperate requirement for an article that presents an all-encompassing writing review of around the world, hypothetical systems, and useful encounters in the field of man-made brainpower. This paper reports the best in class man-made consciousness in an incorporated, succinct, and richly refined way to show the encounters in the field. Specifically, this paper gives an expansive audit of ongoing advancements inside the field of computerized reasoning (AI) and its applications. The work is focused on new contestants to the man-made brainpower field. It likewise reminds the accomplished specialists about a portion of the issues they have known.

### **2.14 Conclusion**

IoT has been stepping by step acquiring an ocean of mechanical changes our day by day lives, which thus assists with making our life less difficult and more agreeable, however different innovations and applications. There is an incalculable handiness of IoT applications into all the spaces including clinical, fabricating, modern, transportation, training, administration, mining, environment, and so forth. Even though IoT has plentiful advantages, there are a few imperfections in the IoT administration and execution level. The key perceptions in the writing are that: (1) There is no standard definition in around the world (2) Universal normalizations are required in structural level (3) Technologies are changing from seller merchant, so should be interoperable (4) For better worldwide administration, we have to assemble standard conventions. Let us trust in future better IoT.

## **CHAPTER-3**

### **COMPONENTS**

In this chapter, the components used in this project including sensors, development boards, etc. are described along with their working, pin configuration, applications, and disadvantages.

#### **3.1 List of Components**

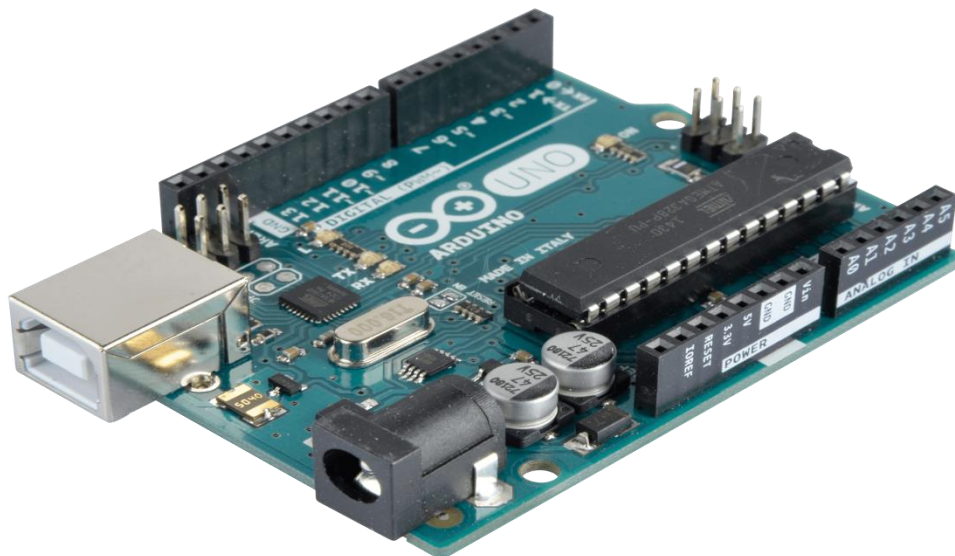
**Table 3.1- List of Components**

<b>NO.</b>	<b>NAME OF COMPONENT</b>	<b>MODEL NO.</b>	<b>QUANTITY</b>
1	Arduino Uno	RKI 1672	2
2	NodeMCU	RKI 1453	1
3	IR Sensor	SEN 2689	1
4	Ultrasonic Sensor	HC-SR04	1
5	Current Sensor	ACS712	1
6	LPG Detector	MQ6	1

7	Temperature & Humidity Sensor	DHTR-11	1
8	3 Channel Relay Module	-	1
9	LED Strip (White)	-	5 m
10	Buzzer	-	2

### **3.2 Arduino Uno R3**

#### **3.2.1 Introduction**



**Figure 3.1- Arduino Uno R3**

Arduino is an open-source equipment and programming organization, task, and a client network that plans and produces single-board microcontrollers and microcontroller packs for building advanced gadgets. Its items are authorized under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), allowing the assembling of Arduino sheets and programming dissemination by anybody.



Arduino sheets are accessible monetarily in preassembled structure or as do-it-without anyone else's help (DIY) units.

Arduino board structures utilize an assortment of chips and regulators. The sheets are outfitted with sets of advanced and simple info/yield (I/O) sticks that might be interfaced with different extension sheets ('shields') or breadboards (For prototyping) and different circuits. The sheets highlight sequential interchanges interfaces, including Universal Serial Bus (USB) on certain models, which are additionally utilized for stacking programs from PCs. The microcontrollers can be modified utilizing C and C++ programming dialects. Notwithstanding utilizing conventional compiler toolchains, the Arduino venture gives an incorporated improvement condition (IDE) given the Processing language venture.

The Arduino venture began in 2005 as a program for understudies at the Interaction Design Institute Ivrea in Ivrea, Italy, meaning to give a minimal effort and simple route for learners and experts to make gadgets that collaborate with their condition utilizing sensors and actuators. Normal instances of such gadgets expected for tenderfoot specialists incorporate basic robots, indoor regulators, and movement finders.

The name Arduino originates from a bar in Ivrea, Italy, where a portion of the originators of the task used to meet. The bar was named after Arduin of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014.

### 3.2.2 Hardware

Arduino is open-source equipment. The equipment reference structures are conveyed under a Creative Commons Attribution-Share-Alike 2.5 permit and are accessible on the Arduino site. Design and creation documents for certain adaptations of the equipment are additionally accessible.

Even though the equipment and programming structures are uninhibitedly accessible under copyleft licenses, the designers have mentioned the name Arduino to be restrictive to the official item and not be

utilized for inferred works without authorization. The official strategy report on the utilization of the Arduino name stresses that the undertaking is available to fusing work by others into the official item. A few Arduino-perfect items industrially delivered have maintained a strategic distance from the task name by utilizing different names finishing off with – duino.

An early Arduino board with an RS-232 sequential interface (upper left) and an Atmel ATmega8 microcontroller chip (dark, lower right); the 14 advanced I/O pins are at the top, the 6 simple information pins at the lower right, and the force connector at the lower left.

Most Arduino sheets comprise of an Atmel 8-piece AVR microcontroller (ATmega8, ATmega168, ATmega328, ATmega1280, ATmega2560) with changing measures of blaze memory, pins, and highlights. The 32-piece Arduino Due, in light of the Atmel SAM3X8E, was presented in 2012. The sheets utilize single or twofold column pins or female headers that encourage associations for programming and fuse into different circuits. These may associate with add-on modules named shields. Different and perhaps stacked shields might be exclusively addressable using an I<sup>2</sup>C sequential transport. Most sheets incorporate a 5 V direct controller and a 16 MHz precious stone oscillator or clay resonator. A few plans, for example, the LilyPad, run at 8 MHz and get rid of the locally available voltage controller because of explicit structure factor limitations.

Arduino microcontrollers are pre-customized with a boot loader that improves the transfer of projects to the on-chip streak memory. The default bootloader of the Arduino UNO is the optiboot bootloader. Sheets are stacked with program code using a sequential association with another PC. Some sequential Arduino sheets contain a level shifter circuit to change over between RS-232 rationale levels and semiconductor rationale (TTL) level signs. Current Arduino sheets are customized using Universal Serial Bus (USB), executed utilizing USB-to-sequential connector chips, for example, the FTDI FT232. A few sheets, for example, later-model Uno sheets, substitute the FTDI chip with a different AVR chip containing USB-to-sequential firmware, which is reprogrammable using its ICSP header. Different variations, for example, the Arduino Mini and the informal Boarduino, utilize a separable USB-to-sequential connector board

or link, Bluetooth, or different strategies. At the point when utilized with conventional microcontroller apparatuses, rather than the Arduino IDE, standard AVR in-framework programming (ISP) writing computer programs is utilized.

The Arduino board uncovered the vast majority of the microcontroller's I/O pins for use by different circuits. The Diecimila, Duemilanove, and current Uno give 14 computerized I/O pins, six of which can create beat width regulated signs, and six simple sources of info, which can likewise be utilized as six advanced I/O pins. These pins are on the head of the board, using female 0.1-inch (2.54 mm) headers. A few module application shields are likewise industrially accessible. The Arduino Nano, and Arduino-good Bare Bones Board and Boarduino sheets may give male header pins on the underside of the board that can plug into solderless breadboards.

Numerous Arduino-good and Arduino-inferred sheets exist. Some are practically proportionate to an Arduino and can be utilized reciprocally. Many upgrade the essential Arduino by including yield drivers, regularly for use in school-level instruction, to disentangle making carriages and little robots. Others are electrically proportional however change the structure factor, at times holding similarity with shields, once in a while not. A few variations utilize various processors, of changing similarity.

### 3.2.3 Software

A program for Arduino equipment might be written in any programming language with compilers that produce double machine code for the objective processor. Atmel gives an advancement domain to their 8-piece AVR and 32-piece ARM Cortex-M based microcontrollers: AVR Studio (more established) and Atmel Studio (fresher).

#### IDE:

The Arduino coordinated improvement condition (IDE) is a cross-stage application (for Windows, macOS, Linux) that is written in the

programming language Java. It began from the IDE for the language Processing and Wiring. It incorporates a code editorial manager with highlights, for example, text reordering, looking and supplanting text, programmed indenting, support coordinating, and sentence structure featuring and gives a single tick system to arrange and transfer projects to an Arduino board. It additionally contains a message zone, a book reassures a toolbar with catches for basic capacities and a chain of importance of activity menus. The source code for the IDE is delivered under the GNU General Public License, adaptation 2.

The Arduino IDE underpins the dialects C and C++ utilizing unique principles of code organizing. The Arduino IDE supplies a product library from the Wiring venture, which gives numerous basic info and yield methods. Client composed code just requires two fundamental capacities, for beginning the sketch and the primary program circle, that is ordered and connected with a program stub principle() into an executable cyclic leader program with the GNU toolchain, likewise included with the IDE appropriation. The Arduino IDE utilizes the program avrdude to change over the executable code into a book record in a hexadecimal encoding that is stacked into the Arduino board by a loader program in the board's firmware.

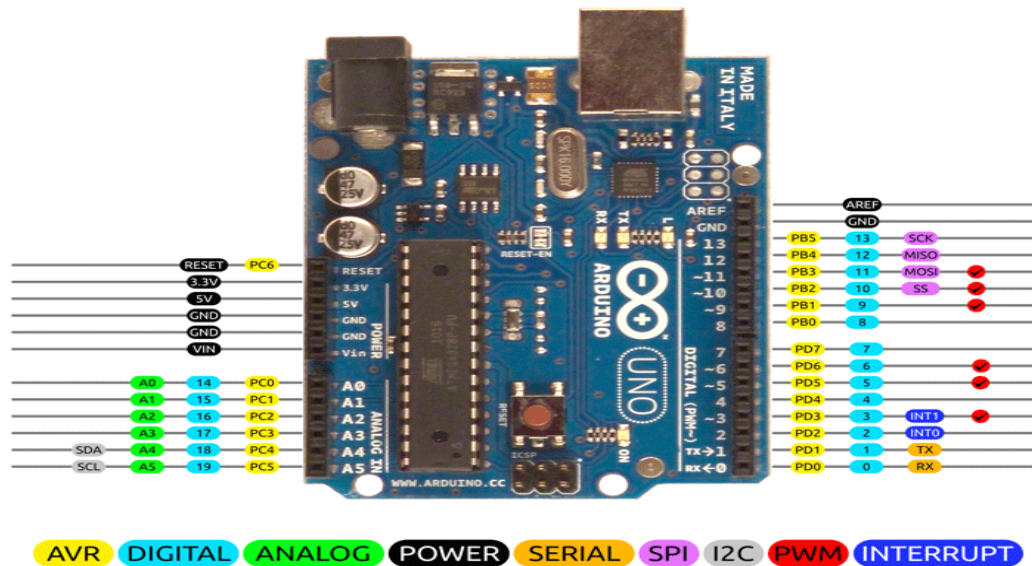
### **Ace IDE:**

On October eighteenth, 2019, Arduino Pro IDE (alpha review) was delivered. The framework despite everything utilizes Arduino CLI (Command Line Interface), yet upgrades incorporate a more expert advancement condition, autocompletion backing, and Git mix. The application frontend depends on the Eclipse Theia Open Source IDE. The fundamental highlights accessible in the alpha delivery are:-

- Modern completely included advancement condition
- Dual Mode, Classic Mode (indistinguishable from the Classic Arduino IDE) and Pro Mode (File System see)
- New Board Manager
- New Library Manager
- Board List

## Industrial Security Automation Using IoT

- Basic Auto-Completion (Arm targets as it were)
- Git Integration
- Serial Monitor
- Dark Mode



**Figure 3.2- Arduino Uno Pin Configuration**

### 3.2.4 Pin Description

**Table 3.2- Arduino Uno Pin Description**

Power	Vin, 3.3V, 5V, GND	Vin: Input voltage 5V: Regulated power supply used to power everything. 3.3V GND: ground pins.
Reset	Reset	Resets the microcontroller.
Analog Pins	A0-A5	Used to provide analog input in the range of 0-5V
Input/Output Pins	Digital Pins 0-13	Can be used as an input or output pins.

Serial	0(Rx), 1(Tx)	Used to receive and transmit TTL serial data.
External Interrupts	2,3	To trigger an interrupt.
PWM	3, 5, 6, 9, 11	Provides 8-bit PWM output.
SPI	10 (SS), 11 (MOSI), 12 (MISO) and 13 (SCK)	Used for SPI communication.
Inbuilt LED	13	To turn on the inbuilt LED.
TWI	A4 (SDA), A5 (SCA)	Used for TWI communication.
AREF	AREF	To provide a reference voltage for input voltage.

### 3.2.5 **Arduino Uno Technical Specifications**

**Table 3.3- Arduino Uno Technical Specifications**

Microcontroller	ATmega328P – 8-bit AVR family microcontroller
Operating Volt	5V
Input Volt	7-12V
Input Volt Limits	6-20V
Analog Input Pins	6 (A0 – A5)
Digital I/O Pins	14 (Out of which 6 provide PWM output)
DC Current on I/O Pins	40mA

DC Current on 3.3V Pin	50mA
Flash Memory	32 KB (0.5 KB is used for Bootloader)
SRAM	2 KB
EEPROM	1 KB
Frequency (Clock Speed)	16 MHz

### 3.2.6 Advantages

- **Inexpensive** - Arduino sheets are generally reasonably contrasted with other microcontroller stages. The most affordable variant of the Arduino module can be amassed by hand, and even the pre-gathered Arduino modules cost under \$50.
- **Cross-stage** - The Arduino programming runs on Windows, Macintosh OSX, and Linux working frameworks. Most microcontroller frameworks are restricted to Windows.
- **Simple, clear programming condition** - The Arduino programming condition is anything but difficult-to-use for tenderfoots, yet adaptable enough for cutting edge clients to exploit too. For instructors, it's helpfully founded on the Processing programming condition, so understudies figuring out how to program in that condition will be acquainted with the look and feel of Arduino.
- **Open source and extensible programming** - The Arduino programming are distributed as open-source devices, accessible for augmentation by experienced software engineers. The language can be extended through C++ libraries, and individuals needing to comprehend the specialized subtleties can make the jump from Arduino to the AVR C programming language on which it's based. So also, you can include AVR-C code legitimately into your Arduino programs on the off chance that you need to.

- **Open source and extensible equipment** - The Arduino depends on Atmel's ATMEGA8 and ATMEGA168 microcontrollers. The designs for the modules are distributed under a Creative Commons permit, so experienced circuit originators can make their variant of the module, broadening it and improving it. Indeed, even generally unpracticed clients can fabricate the breadboard adaptation of the module to see how it functions and set aside cash.

### 3.2.7 Disadvantages

- Arduino utilizes C/C++ with a couple of little expansions of its own (misleadingly called the "Arduino language" where it is C++). The Arduino libraries are advanced towards simple use, however not computational effectiveness.
- Lots of the libraries of Arduino are requirements to address issues like Ethernet, ZigBee, which are not advanced well and needs a great deal of progress.
- Although there has been some utilization of Arduino at the business level still it is a long way from contending to mechanical equipment.

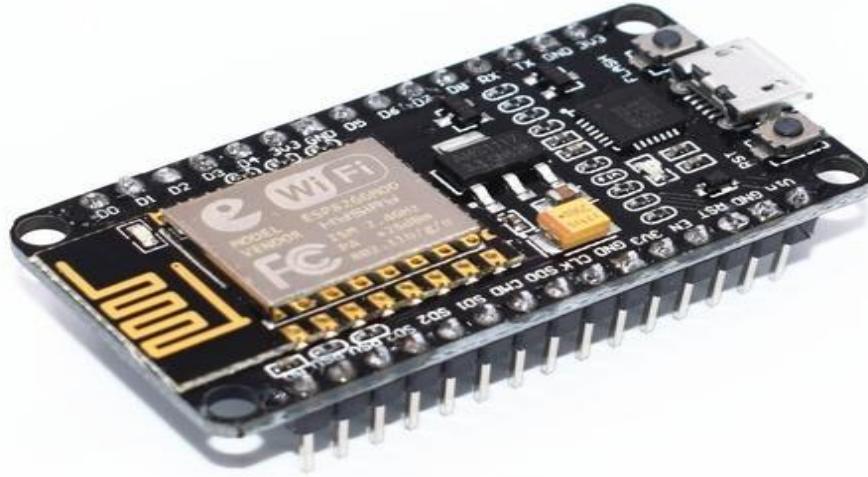
### 3.2.8 Applications

- Arduino Uno is utilized in Do-it-Yourself ventures prototyping.
- In creating ventures dependent on code-based control.
- Development of Automation System.
- Designing of essential circuit structures.



### 3.3 NodeMCU

#### 3.3.1 Introduction



**Figure 3.3- NodeMCU**

NodeMCU is an ease open-source IoT stage. It at first included firmware that sudden spikes in demand for the ESP8266 Wi-Fi SoC from Espressif Systems and equipment which depended on the ESP-12 module. Afterward, support for the ESP32 32-piece MCU was included.

NodeMCU is an open-source firmware for which open-source prototyping board plans are accessible. The name "NodeMCU" joins "hub" and "MCU" (miniaturized scale regulator unit). The expression "NodeMCU" carefully alludes to the firmware instead of the related advancement packs.

Both the firmware and prototyping board structures are open source. The firmware utilizes the Lua scripting language. The firmware depends on the eLua venture and based on the Espressif Non-OS SDK for ESP8266. It utilizes many open-source ventures, for example, Lua JSON and SPIFFS. Because of asset requirements, clients need to choose the modules significant for their undertaking and assemble a firmware customized to their necessities. Backing for the 32-piece ESP32 has likewise been actualized.

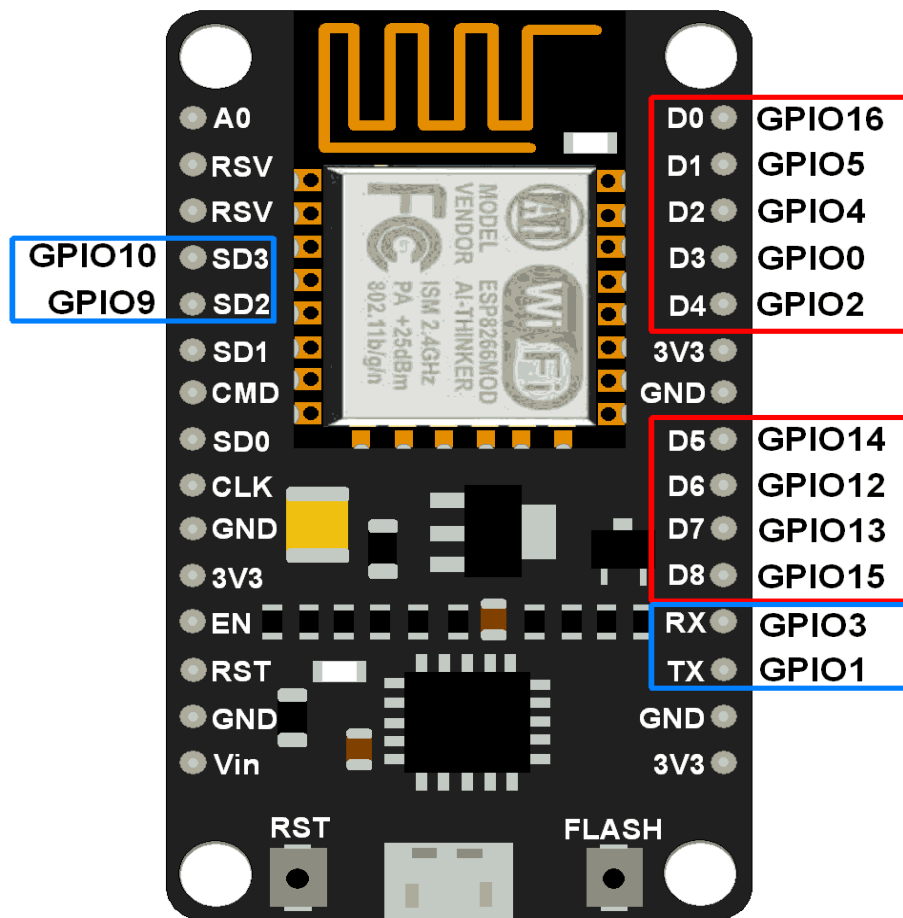
### 3.3.2 Pin Description

NodeMCU gives access to the GPIO (General Purpose Input/Output) and a pin planning table is a piece of the API documentation.

**Table 3.4- NodeMCU Pin Mapping**

I/O Index	ESP8266 pin
0[*]	GPIO-16
1	GPIO-5
2	GPIO-4
3	GPIO-0
4	GPIO-2
5	GPIO-14
6	GPIO-12
7	GPIO-13
8	GPIO-15
9	GPIO-3
10	GPIO-1
11	GPIO-9
12	GPIO-10

[\*] D0 (GPIO16) can only be used for GPIO read/write. It does not support open-drain/interrupt/PWM/I<sup>2</sup>C or 1-Wire.



**Figure 3.4- NodeMCU Pin Configuration**

### 3.3.3 Advantages

- The ESP8266 is a low-cost Wi-Fi enabled microchip with full TCP/IP stack and microcontroller capability.
- NodeMCU includes a CPU core, faster Wi-Fi, more GPIOs, and supports Bluetooth 4.2, and low power Bluetooth.
- Additionally, the ESP32 comes with touch-sensitive pins, and a built-in Hall Effect sensor and temperature sensor.
- Very cheap as compared to Arduino Uno.

### 3.3.4 Disadvantages

- **Incompatible voltage levels:** 3.3V for NodeMCU vs 5V for Arduino Uno. Any 5V Module can reset NodeMCU and possibly fry it.

- **Entirely different internal hardware:** Any Arduino Library or Project if relies even slightly relies on internal hardware, then forget trying that project/library. (Unless you are familiar with the bottom layer of Arduino stack.) Thus many libraries like TimerOne, P10 DMD, etc. fail to work on NodeMCU.

- **The unexpected difference in working:** Due to the above-mentioned factors, there are bound to be differences. And some of those differences can be substantial.

For example, for measuring 2V, `analogRead()` returns  $2/3.3 \times 1024 = 621$  on NodeMCU and  $2/5 \times 1024 = 410$  on Arduino Uno. Arduino framework does not even have measures to counter this like:

```
#define __VCC__ 3300 // for 3.3v boards
```

```
#define __VCC__ 5000 // for 5v boards
```

- **Lack of certain features:** Both NodeMCU and Arduino Uno have only 1 ADC but NodeMCU lacks analog multiplexer, thus has only 1 analog pin. Whereas Arduino UNO has a 1 to 14 input analog multiplexer, as well as 1 to 4 ADC reference analog multiplexer, which is why Arduino Uno has multiple analog pins, which you might be needing. Arduino Uno also has 40mA sink & source whereas NodeMCU only has 12mA source and 18mA sink.
- **Too much power consumption:** ESP8266 consumes a peak of 320mA during start-up, 290+ mA during packet transmission, 35mA average throughout the operation, and 18mA in deep sleep mode. In contrast, ATmega328p consumes 1.6mA average throughout operation and 1.2uA during power down.  
Here as “too much power” entirely depends on your application. But the difference in current is enough of a reason to use Arduino Uno over NodeMCU.
- **Shield connectors:** 493 entirely different kinds of shields compatible with Arduino style connectors. Whereas only 27 different kinds of shields available for NodeMCU (most of which are different motor drivers). Arduino Shield Connectors are so popular that many different evaluation and development boards come with such connectors.

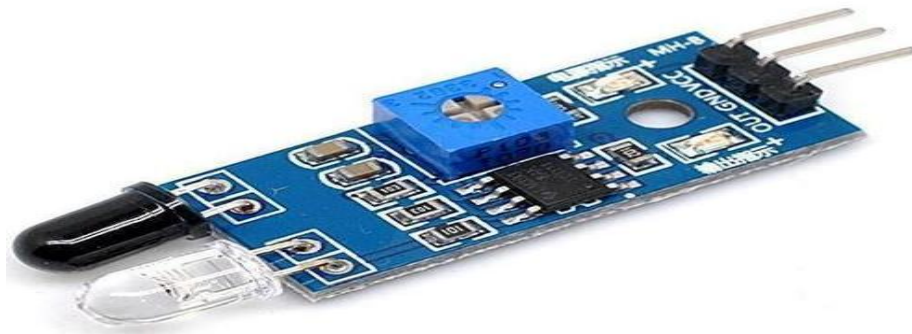
### 3.3.5 Applications

NodeMCU V3 is mainly used in the Wi-Fi Applications which most of the other embedded modules fail to process unless incorporated with some external Wi-Fi protocol. The following are some major applications used for NodeMCU V3.

- Internet Smoked Alarm
- VR Tracker
- Octopod
- Serial Port Monitor
- ESP Lamp
- Incubator Controller
- IoT home automation
- Security Alarms

### 3.4Sensors

#### 3.4.1 Infrared Sensor (SEN-2689)



**Figure 3.5- IR Sensor Module**

#### 3.4.1.1 Introduction

An infrared sensor is an electronic device that exudes to recognize a couple of parts of the natural elements. An IR sensor can check the glow of

an article similarly as recognizes the development. Such sensors measure simply infrared radiation, rather than releasing it that is known as an idle IR sensor. Generally, in the infrared range, all the articles send some sort of warm radiation. These sorts of radiations are imperceptible to our eyes that can be distinguished by an infrared sensor. The maker is only an IR LED (Light Emitting Diode) and the finder is an IR photodiode that is fragile to IR light of a comparative recurrence as that released by the IR LED. Exactly when IR light falls on the photodiode, the assurances and the yield voltages will change concerning the degree of the IR light got.

### 3.4.1.2 Pin Configuration

**Table 3.5- IR Sensor Pin Description**

Pin Name	Description
VCC	Power Supply Input
GND	Power Supply Ground
OUT	Active High Output

### 3.4.1.3 IR Sensor Module Features

- 5VDC Operating voltage
- I/O pins are 5V and 3.3V consistent
- Range: Up to 20cm
- Adjustable Sensing range
- Built-in Ambient Light Sensor
- 20mA flexibly current
- Mounting opening

### 3.4.1.4 Brief about IR Sensor Module

The IR sensor module comprises mostly of the IR Transmitter and Receiver, Opamp, Variable Resistor (Trimmer pot), yield LED in a nutshell.

### **IR LED Transmitter:**

IR LED produces light, in the scope of Infrared recurrence. IR light is undetectable to us as its frequency (700nm – 1mm) is a lot higher than the noticeable light range. IR LEDs have a light-radiating edge of approx. 20-60 degree and scope of approx. not many centimeters to a few feet, it relies on the kind of IR transmitter and the producer. A few transmitters have the range in kilometers. IR LED white or straightforward in shading, so it can give out the measure of greatest light.

### **Photodiode Receiver:**

Photodiode goes about as the IR collector as its direct when light falls on it. The photodiode is a semiconductor that has a P-N intersection, worked in Reverse Bias, implies it begin leading the current the opposite way when Light falls on it, and the measure of the current stream is corresponding to the measure of Light. This property makes it helpful for IR discovery. Photodiode resembles a LED, with a dark shading covering on its external side, Black shading retains the most noteworthy measure of light.

### **LM358 Opamp:**

LM358 is an Operational Amplifier (Op-Amp) is utilized as a voltage comparator in the IR sensor. The comparator will look at the limit voltage set utilizing the preset (pin2) and the photodiode's arrangement resistor voltage (pin3).

Photodiode's arrangement resistor voltage drop > Threshold voltage =  
Opamp yield is High

Photodiode's arrangement resistor voltage drop < Threshold voltage =  
Opamp yield is Low

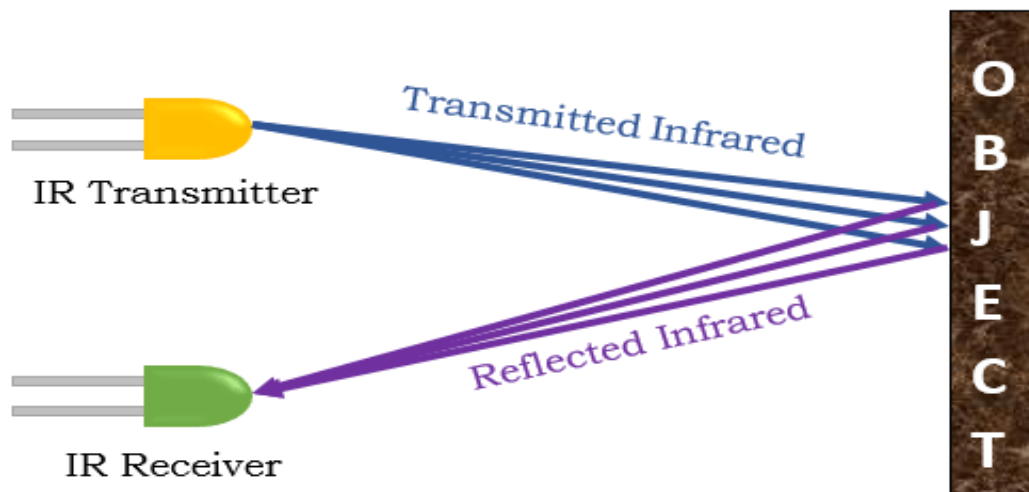
At the point when Opamp's yield is high, the LED at the Opamp yield terminal turns ON (Indicating the location of Object).

### Variable Resistor:

The variable resistor utilized here is preset. It is utilized to adjust the separation extend at which an item ought to be distinguished.

#### 3.4.1.5 Working

- An Infrared Sensor works in the accompanying grouping:
- IR source (transmitter) is utilized to discharge radiation of the necessary frequency.
- This radiation arrives at the item and is reflected.
- The reflected radiation is identified by the IR collector.
- The IR Receiver identified radiation is then additionally prepared



**Figure 3.6- Working of IR Sensor**

dependent on its force. By and large, IR Receiver yield is little and intensifiers are utilized to enhance the distinguished sign. The normal working of the IR sensor identification framework can be comprehended by the figure beneath.

The rate in an IR Detection System might be immediate or circuitous. On account of Direct Incidence, there is no prevention in the middle of the transmitter and recipient. Though in Indirect Incidence, IR Transmitter and Receiver are kept one next to the other and the article is before them.



### 3.4.1.6 Advantages

- Their low force prerequisites make them appropriate for most electronic gadgets, for example, PCs, phones, PDAs.
- They are equipped for identifying movement in the nearness/nonattendance of light nearly with similar unwavering quality.
- They don't require contact with the article for location.
- There is no spillage of information because of shaft directionality IR radiation.
- They are not influenced by erosion or oxidation.
- They have exceptionally solid commotion insusceptibility.

### 3.4.1.7 Disadvantages

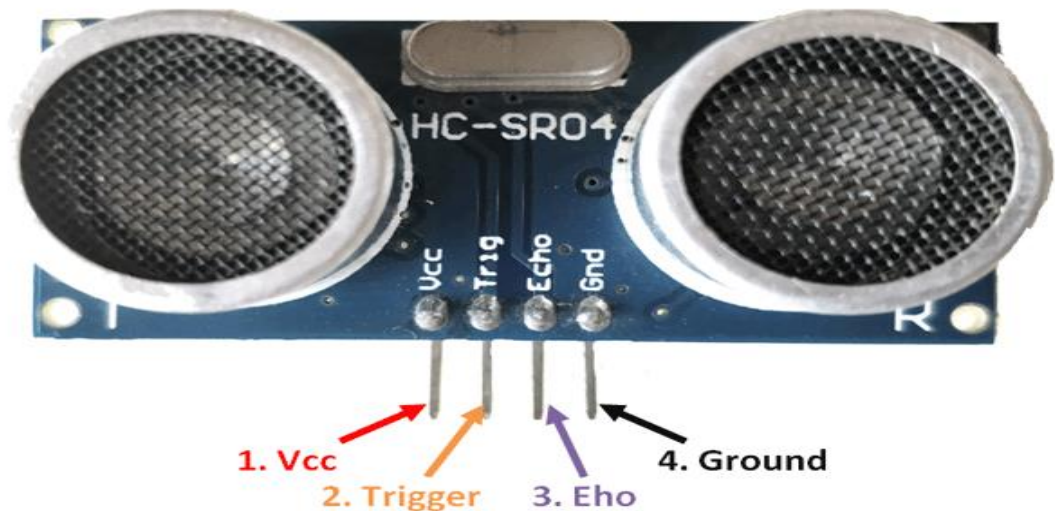
- Required Line of sight.
- Get obstructed by normal articles.
- Limited go.
- Can be influenced by environmental conditions, for example, downpour, haze, dust, contamination.
- The transmission Data rate is moderate.

### 3.4.1.8 Applications

- Obstacle Detection
- Industrial safety devices
- Wheel encoder

### 3.4.2 Ultrasonic sensor (HC-SR04)

#### 3.4.2.1 Introduction



**Figure 3.7- Ultrasonic Sensor (HC-SR04) Pin Configuration**

An ultrasonic sensor is an instrument that quantifies the separation to an article utilizing ultrasonic sound waves.

An ultrasonic sensor utilizes a transducer to send and get ultrasonic heartbeats that transfer back data about an item's closeness. High-recurrence sound waves reflect from limits to deliver unmistakable reverberation designs

#### 3.4.2.2 Pin Configuration

**Table 3.6- HC-SR04 Pin Description**

Pin Name	Description
Vcc	The Vcc pin powers the sensor, typically with +5V
Trigger	Trigger pin is an input pin. This pin has to be kept high for 10us to initialize measurement by sending the US wave.

Echo	The echo pin is an output pin. This pin goes high for a period which will be equal to the time taken for the US wave to return to the sensor.
Ground	This pin is connected to the Ground of the system.

### 3.4.2.3 HC-SR04 Sensor Features

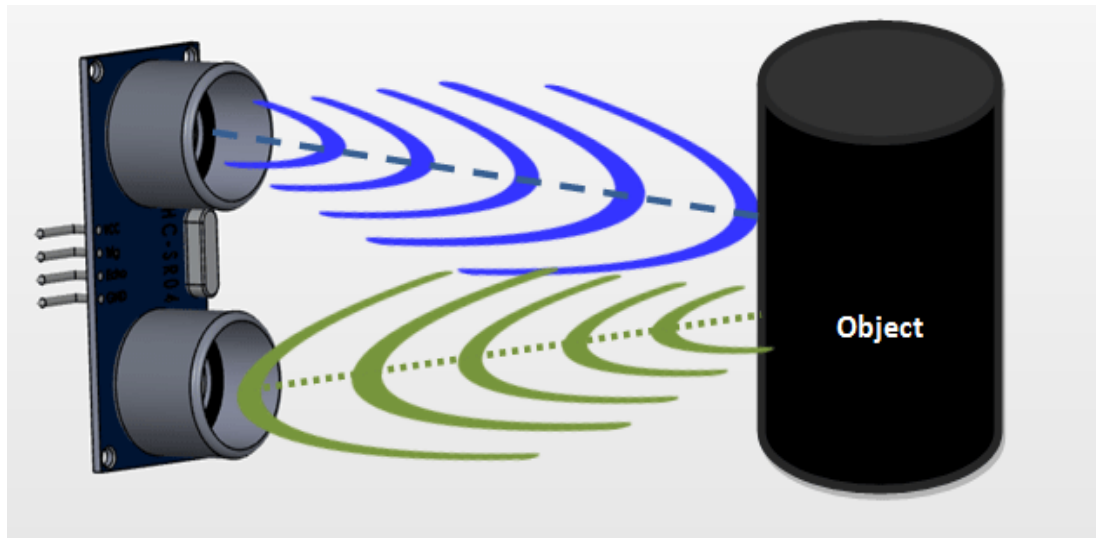
- Operating voltage: +5V
- Practical Measuring Distance: 2cm to 80cm
- Accuracy: 3mm
- Measuring angle covered:  $<15^\circ$
- Operating Current:  $<15\text{mA}$
- Operating Frequency: 40Hz

### 3.4.2.4 Working

As appeared over, the HC-SR04 Ultrasonic (US) sensor is a 4 pin module, whose pin names are Vcc, Trigger, Echo, and Ground separately. This sensor is a mainstream sensor utilized in numerous applications where estimating separation or detecting objects is required. The module has two eyes like undertakings in the front which structure the Ultrasonic transmitter and Receiver. The sensor works with the basic secondary school recipe that

$$\text{Distance} = \text{Speed} \times \text{Time}$$

The Ultrasonic transmitter sends an ultrasonic wave, this wave goes noticeable all around and when it gets questioned by any material it gets reflected toward the sensor this reflected wave is seen by the Ultrasonic recipient module as appeared in the image beneath.



**Figure 3.8- Working of HC-SR04**

Presently, to compute the separation utilizing the above formulae, we should know the Speed and time. Since we are utilizing the Ultrasonic wave we know the all-inclusive speed of US wave at room conditions which is 330m/s. The hardware inbuilt on the module will figure the time taken for the US wave to return and turns on the reverberation pin high for that equivalent specific measure of time, along these lines we can likewise realize the time taken. Presently basically ascertain the separation utilizing a microcontroller or chip.

### **3.4.2.5 Advantages**

- It needs to detect the capacity to detect all the material kinds.
- This sensor isn't influenced because of barometrical residue, downpour, a day off.
- It can work in any unfavorable condition.
- It has a higher detecting separation (in centimeters and inches) contrast with inductive/capacitive closeness sensor types.
- It gives great readings in detecting huge measured articles with hard surfaces.

### **3.4.2.6 Disadvantages**

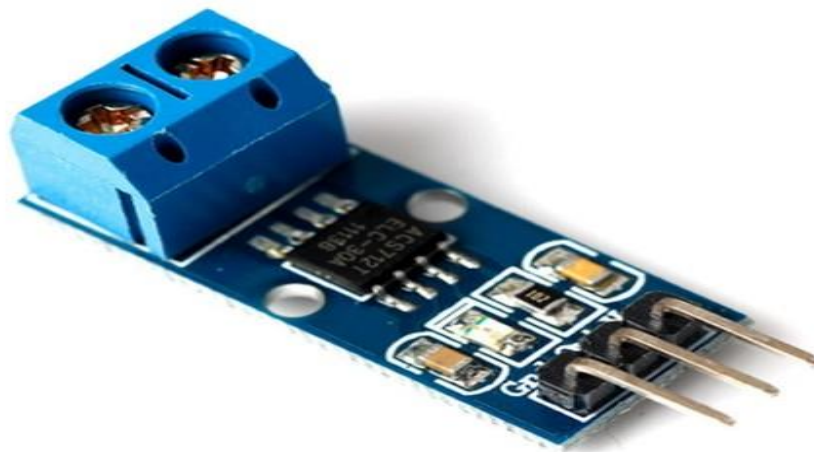
- It is extremely touchy to variations in temperature.
- It has more troubles in perusing reflections from delicate, bent, dainty, and little articles.

### 3.4.2.7 Applications

- This sensor is utilized to quantify speed just as the bearing between two items
- It is utilized in remote charging
- Medical ultrasonography
- This is utilized to identify objects and maintain a strategic distance from snags utilizing robots, for example, biped, pathfinding, impediment evasion, and so on.
- Depth estimation
- Humidifiers
- This sensor is utilized to plot the items close by the sensor by spinning it
- Non-dangerous testing
- By utilizing this sensor profundity of pits, wells can be estimated by sending the waves through water.
- Embedded framework
- Burglar cautions

### 3.4.3 Current Sensor (ACS712)

#### 3.4.3.1 Introduction



**Figure 3.9- Current Sensor (ACS712)**

The creation of power has prompted a progressive change in the life of people. We concocted numerous inventive utilization of power to make our day by day life simpler. Today practically the entirety of our hardware runs on power. The progression of charge is known as Current. Various gadgets need an alternate measure of current dependent on their useful prerequisites.

A few gadgets are touchy to such an extent that they get harmed when a high measure of current is conveyed to them. Along these lines, to spare such a circumstance and screen the measure of current required or being utilized in an application, estimation of current essential. This is the place the Current Sensor becomes an integral factor. One such sensor is the ACS712 Current Sensor.

Current coursing through a conductor causes a voltage drop. The connection between current and voltage is given by Ohm's law. In electronic gadgets, an expansion in the measure of current over its prerequisite prompts overload and can damage the device.

Estimation of current is fundamental for the correct working of gadgets. Estimation of voltage is a Passive assignment and it tends to be managed without influencing the framework. Though estimation of current is an Intrusive errand which can't be recognized straightforwardly as voltage.

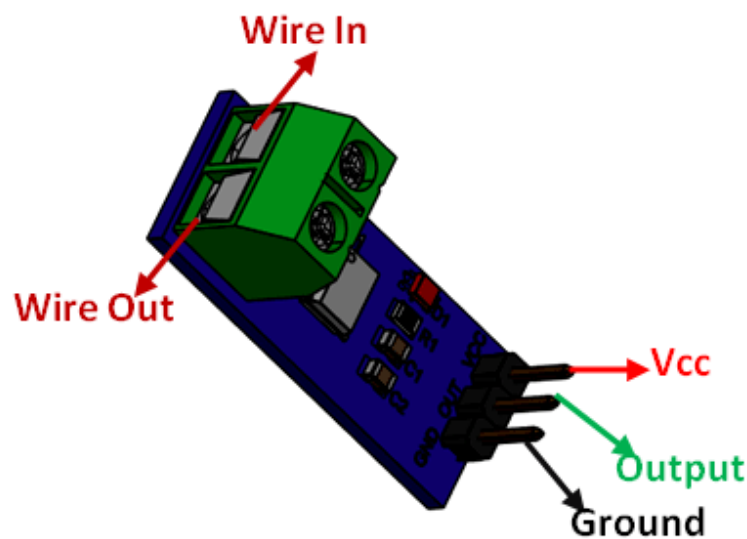
For estimating current in a circuit, a sensor is required. ACS712 Current Sensor is the sensor that can be utilized to gauge and figure the measure of current applied to the conductor without influencing the presentation of the framework.

ACS712 Current Sensor is a completely incorporated, Hall-impact based straight sensor IC. This IC has a 2.1kV RMS voltage seclusion alongside a low obstruction current conductor.

### 3.4.3.2 Pin Configuration

**Table 3.7- ACS712 Pin Description**

Pin Name	Description
Vcc	Input voltage is +5V for typical applications
Output	Outputs Analog voltage proportional to current
Ground	Connected to the ground of the circuit
Wire in & Wire out	The wire through current has to be measured is connected here



**Figure 3.10- ACS712 Pin Configuration**

### 3.4.3.3 Working

The current Sensor identifies the current in a wire or conduit and produces a sign relative to the recognized current either as simple voltage or computerized yield.

Current Sensing is done in two different ways – Direct detecting and Indirect Sensing. In Direct detecting, to recognize current, Ohm's law is utilized to quantify the voltage drop that happened in a wire when current moves through it.

A current-conveying conductor additionally offers to ascend to an attractive field in its encompassing. In Indirect Sensing, the current is estimated by computing this attractive field by applying either Faraday's law or Ampere law. Here either a Transformer or Hall Effect sensor or fiber-optic current sensor is utilized to detect the attractive field.

ACS712 Current Sensor utilizes the Indirect Sensing technique to figure the current. To detect current a liner, a low-balance Hall sensor circuit is utilized in this IC. This sensor is situated at the outside of the IC on a copper conduction way. At the point when current moves through this copper conduction way, it produces an attractive field that is detected by the Hall Effect sensor. A voltage relative to the detected attractive field is produced by the Hall sensor, which is utilized to quantify current.

The nearness of the attractive sign to the Hall sensor chooses the precision of the gadget. Closer the attractive sign higher the precision. ACS712 Current Sensor is accessible as a little, surface mount SOIC8 bundle. In this IC current streams from Pin-1 and Pin-2 to Pin-3 and Pin-4. This structures the conduction way where the current is detected. The usage of this IC is exceptionally simple.

ACS712 can be utilized in applications requiring electrical detachment as the terminals of the conduction way are electrically secluded from the IC leads. Along these lines, this IC doesn't require some other separation procedures. This IC requires a graceful voltage of 5V. Its yield voltage is relative to AC or DC. ACS712 has an about zero attractive hysteresis.

Where Pin-1 to Pin-4 structures the conduction way, Pin-5 is the sign ground pin. Pin-6 is the FILTER pin that is utilized by an outer capacitor to set the data transfer capacity. Pin-7 is the simple yield pin. Pin-8 is the force flexibly pin.



### 3.4.3.4 Advantages

- Factory-trimmed for accuracy
- Extremely stable output offset voltage
- Nearly zero magnetic hysteresis
- Ratiometric output from the supply voltage

### 3.4.3.5 Disadvantages

- Not very reliable
- Only for small scale applications
- Moisture can damage the sensor
- 

### 3.4.3.6 Applications

This IC can distinguish both AC and DC along these lines, it has a wide scope of utilizations. ACS712 is utilized in Peak location circuits, circuits to build gain, amendment application for A to D converters, Overcurrent shortcoming hook, and so forth.... The channel pin gave by this IC is utilized to dispense with the constriction impact in resistor divider circuits.

ACS712 is utilized in numerous mechanical, business, and correspondence applications. This IC is material for Automobile applications. A portion of the normal utilizations of this IC can be found in engine control circuits, for load recognition and the executives, SMPS, overcurrent deficiency security circuits.

This IC can quantify current for high voltage loads working at 230V AC mains. To peruse the qualities it tends to be effectively interfaced with the ADC of a microcontroller.

### 3.4.4 LPG Detector (MQ-6)

#### 3.4.4.1 Introduction

The MQ-6 module is utilized in gas spillage recognizing hardware in family and industry, this module has a high affectability to LPG, iso-butane, propane, and LNG. It can likewise be utilized to recognize the nearness of liquor, cooking vapor, and tobacco smoke. The module gives out the convergence of the gases as a simple voltage comparable to the grouping of the gases. The module likewise has an on-board comparator for contrasting against a flexible preset worth and giving out a computerized high or low. It very well may be effectively interfaced with your Arduino or Raspberry Pi.



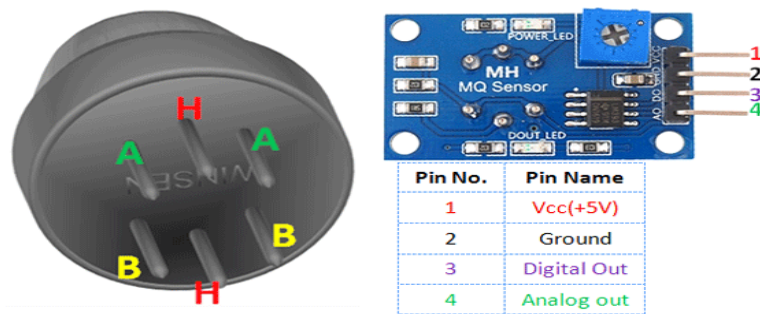
**Figure 3.11- LPG Detector (MQ6)**

This is an easy to-utilize MQ-6 Liquefied Petroleum, iso-butane, propane gas Sensor module, appropriate for detecting LPG (made out of generally propane and butane) fixations noticeable all around.

The MQ-6 can distinguish gas focuses somewhere in the range of 200 to 10000ppm. This sensor has high affectability and quick reaction time. The sensor's yield is a simple resistance. The drive circuit is very simple; all

you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC.

Delicate material of the MQ-6 gas sensor is SnO<sub>2</sub>, which with lower conductivity in clean air. At the point when the objective burnable gas exists, the sensor's conductivity is higher alongside the gas focus rising. If you don't mind utilize basic electro circuit, Convert change of conductivity to relate yield sign of gas concentration. MQ-6 gas sensor has a high affectability to Propane, Butane, and LPG, likewise reaction to Natural gas. The sensor could be utilized to distinguish diverse flammable gas, particularly Methane, it is with minimal effort and reasonable for various applications.



**Figure 3.12- MQ6 Pin Configuration**

### 3.4.4.2 Pin Configuration

**Table 3.8- MQ6 Pin Description**

Pin Name	Description
Vcc	This pin powers the module, typically the operating volt. is +5V
Ground	Used to connect the module to system GND
D0	You can also use this sensor to get digital output from this pin, by setting a threshold value using the potentiometer
A0	This pin outputs 0-5V analog voltage based on the intensity of the gas

### 3.4.4.3 Features of MQ6 Gas sensor

- Operating Volt is +5V
- To detect LPG
- Analog O/P volt: 0V to 5V
- Digital O/P Volt: 0V or 5V
- Preheat duration 20 sec.
- Digital or analog sensor
- The Sensitivity can be varied using the potentiometer

### 3.4.4.4 Working

Utilizing an MQ sensor it distinguishes a gas is exceptionally simple. You can either utilize the advanced pin or the simple pin to achieve this. Power the module with 5V and you should see the force LED on the module to gleam and when no gas is distinguished the yield LED will stay killed meaning the computerized yield pin will be 0V. Recall that these sensors must be kept on for pre-warming time (referenced in highlights above) before you can work with it. Presently, acquaint the sensor with the gas you need to recognize and you should see the yield LED to go high alongside the advanced pin, if not utilize the potentiometer until the yield gets high. Presently every time your sensor gets acquainted with this gas at this specific focus the computerized pin will go high (5V) else will stay low (0V).

You can likewise utilize the simple pin to accomplish something very similar. Peruse the simple qualities (0-5V) utilizing a microcontroller, this worth will be straightforwardly relative to the grouping of the gas to which the sensor distinguishes. You can explore different avenues regarding these qualities and check how the sensor responds to various centralizations of gas and build up your program in like manner.

### 3.4.4.5 Advantages

- It has a strong and straightforward development.
- It is anything but difficult to work without oxygen.

- It has a wide estimation go.

### **3.4.4.6 Disadvantages**

- It requires air or oxygen to work
- It can be harmed by lead, chlorine, and silicon
- It gets responded because of the warming of the wire.
- It is hard to know disappointment modes except if extremely propelled techniques for observing are utilized...

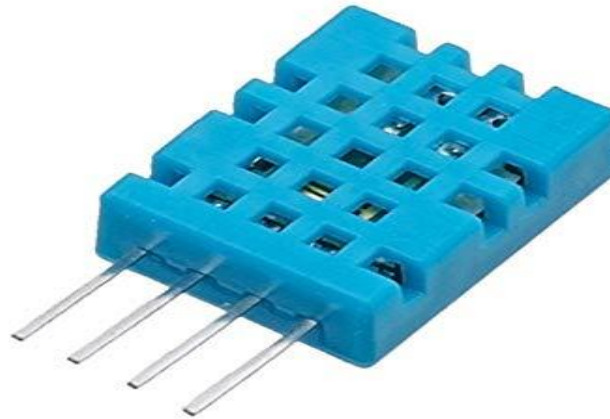
### **3.4.4.7 Applications**

- Detector measure Gases like LPG, and butane
- Air quality monitor
- Gas leak alarm
- Safety standard maintenance
- Maintaining environment standards in hospitals

## **3.4.5 Temperature & Humidity Sensor (DHT11)**

### **3.4.5.1 Introduction**

Humidity is the proportion of water fume present noticeable all around. The degree of stickiness in air influences different physical, compound, and natural procedures. In mechanical applications, moistness can influence the business cost of the items, wellbeing, and security of the representatives. Thus, in semiconductor ventures and control framework businesses estimation of moistness is significant. Moistness estimation decides the measure of dampness present in the gas that can be a blend of water fume, nitrogen, argon or unadulterated gas, and so forth.... Humidity sensors are of two sorts dependent on their estimation units. They are a relative stickiness sensor and Absolute dampness sensor. DHT11 is a computerized temperature and dampness sensor.

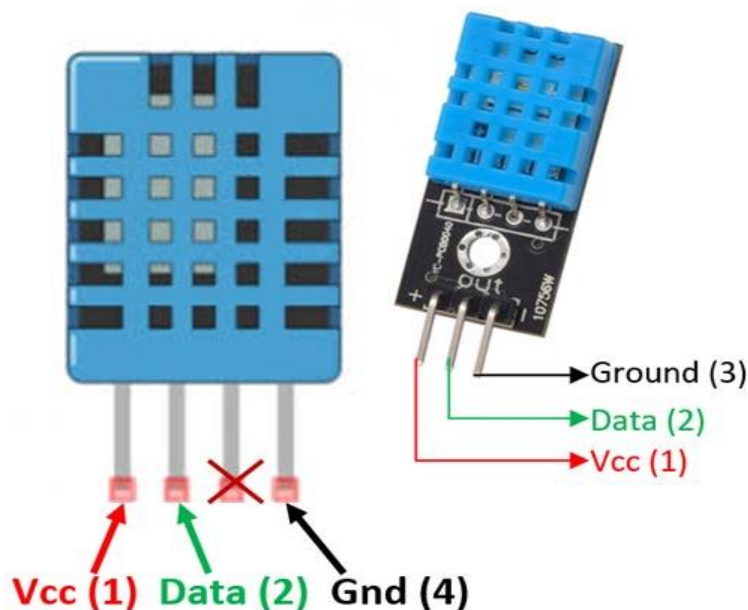


**Figure 3.13- Temperature & Humidity Sensor (DHT-11)**

DHT11 is a minimal effort advanced sensor for detecting temperature and dampness. This sensor can be effectively interfaced with any microcontroller, for example, Arduino, Raspberry Pi, and so on.... to gauge moistness and temperature quickly.

DHT11 mugginess and temperature sensor are accessible as a sensor and as a module. The contrast between this sensor and module is the draw up resistor and a force on the LED. DHT11 is a relative dampness sensor. To gauge the encompassing air this sensor utilizes a thermistor and a capacitive moistness sensor.

### 3.4.5.2 Pin Configuration



**Figure 3.14- DHT-11 Pin Configuration**

**Table 3.9- DHT-11 Pin Description**

Pin Name	Description
Vcc	Power 3.5V to 5.5V
Data	O/P both Temp. and Humidity
NC	No Connection
Ground	Connected to the GND

### **3.4.5.3 Features of DHT11**

- Operating Voltage: 3.5V to 5.5V
- Operating current: 0.3mA (measuring) 60uA (standby)
- Output: Serial data
- Temperature Range: 0°C to 50°C
- Humidity Range: 20% to 90%
- Resolution: Temperature and Humidity both are 16-bit
- Accuracy:  $\pm 1^\circ\text{C}$  and  $\pm 1\%$

### **3.4.5.4 Working**

DHT11 sensor comprises a capacitive dampness detecting component and a thermistor for detecting temperature. The moistness detecting capacitor has two anodes with a dampness holding substrate as a dielectric between them. Change in the capacitance esteem happens with the adjustment in dampness levels. The IC measure, process this changed opposition esteems and change them into the advanced structure.

For estimating temperature this sensor utilizes a Negative Temperature coefficient thermistor, which causes a lessening in its obstruction esteem with an expansion in temperature. To get bigger opposition esteem in any event, for the littlest change in temperature, this sensor is generally comprised of semiconductor earthenware production or polymers.

The temperature scope of DHT11 is from 0 to 50 degrees Celsius with a 2-degree exactness. The dampness scope of this sensor is from 20 to 80% with 5% precision. The testing pace of this sensor is 1Hz .for example it gives one perusing for consistently. DHT11 is little in size with working voltage from 3 to 5 volts. The most extreme current utilized while estimating is 2.5mA.

DHT11 sensor has four pins-VCC, GND, Data Pin, and a not associated pin. A draw up resistor of 5k to 10k ohms is given to correspondence among sensor and smaller-scale regulator.

### 3.4.5.5 Advantages

- Can withstand underneath the temperature of 0oC
- It doesn't require any support for longer periods
- Flexibility to utilize
- Atm. pressure autonomous, it works when weight is being applied

### 3.4.5.6 Disadvantages

- It has limited long term stability.
- It is sensitive to dewing and certain aggressive substances.
- 

### 3.4.5.7 Applications

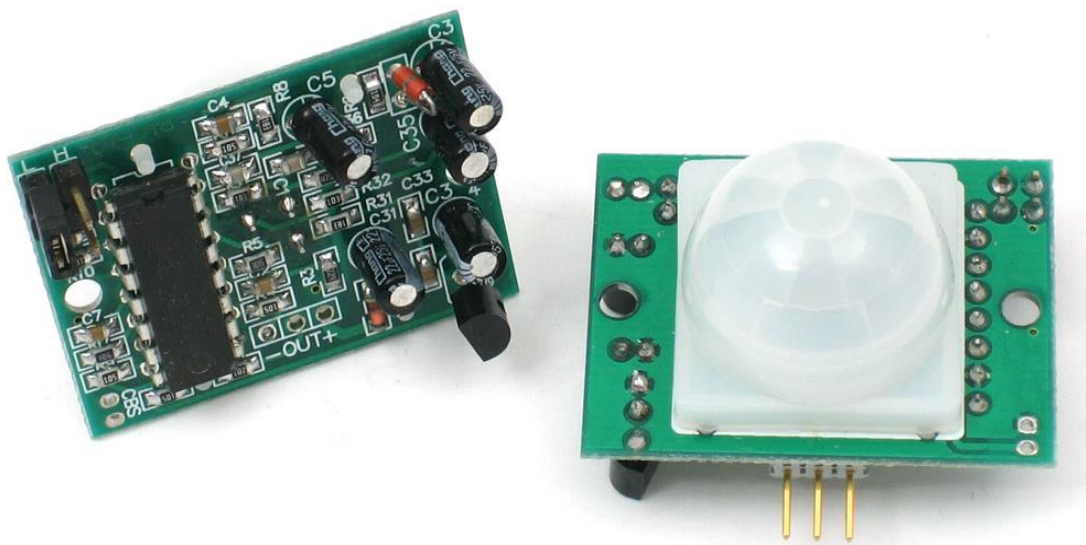
- Measure temperature and humidity
- Local Weather station
- Automatic climate control
- Environment monitoring



### 3.4.6 Passive Infrared (PIR) Sensor (Hc-Sr501)

#### 3.4.6.1 Introduction

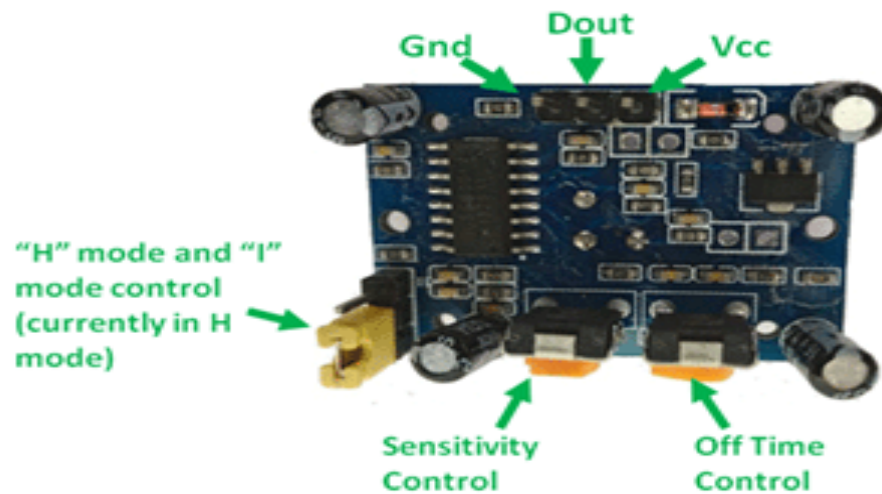
PIR sensors permit you to detect movement, quite often used to distinguish whether a human has moved in or out of the sensors go. They are little, cheap, low-power, simple to utilize, and don't wear out. Consequently, they are normally found in machines and contraptions utilized in homes or organizations. They are frequently alluded to as PIR, "Uninvolved Infrared", "Pyroelectric", or "IR movement" sensors.



**Figure 3.15- PIR Sensor (Hc-Sr501)**

PIRs are made of a pyroelectric sensor (which you can see beneath as the round metal can with a rectangular precious stone in the inside), which can identify levels of infrared radiation. Everything emanates some low-level radiation, and the more sizzling something is, the more radiation is transmitted. The sensor in a movement identifier is part of equal parts. The explanation behind that will be that we are hoping to distinguish movement (change), not normal IR levels. The two parts are wired up with the goal that they offset one another. If one half observes pretty much IR radiation than the other, the yield will swing high or low.

### 3.4.6.2 Pin Configuration



**Figure 3.16- Hc-Sr501 Pin Configuration**

**Table 3.10- Hc-Sr501 Pin Description**

Pin Name	Description
Vcc	Input voltage is +5V for typical applications. Can range from 4.5V- 12V
High/Low Output (Dout)	Digital pulse high (3.3V) when triggered (motion detected) digital low(0V) when idle(no motion detected)
Ground	Connected to the ground of the circuit

### 3.4.6.3 Features of Hc-Sr501

- Wide range on input voltage varying from 4.V to 12V (+5V recommended)
- The output voltage is High/Low (3.3V TTL)
- Can distinguish between object movement and human movement
- Has to operate modes - Repeatable(H) and Non- Repeatable(H)
- The cover distance of about 120° and 7 meters
- Low power consumption of 65mA
- Operating temperature from -20° to +80° Celsius

### 3.4.6.4 Working

The PIR sensor itself has two openings in it, each space is made of an exceptional material that is touchy to IR. The focal point utilized here isn't doing a lot thus we see that the two openings can 'see' out past some separation (essentially the affectability of the sensor). At the point when the sensor is inactive, the two spaces identify a similar measure of IR, the incorporating aggregate sent from the room or dividers or outside. Exactly when a warm body like a human or animal travels by, it first catches one segment of the PIR sensor, which causes a positive differential change between the two sections. Exactly when the warm body leaves the identifying zone, the opposite happens, whereby the sensor delivers a negative differential change. These change beats are what is perceived.

### 3.4.6.5 Advantage

- Detects movement dependably inside just as in a dry or dull.
- It expends less vitality (0.8W to 1.0W) contrast with the microwave sensor.
- They are less expensive in contrast with microwave sensors.
- They are useful for electrical applications utilized in littler and conservative premises.

### 3.4.6.6 Disadvantages

- They have lower sensitivity and less coverage compare to microwave sensors.
- It does not operate greater than 35 degrees C.
- It works effectively in LOS (Line of Sight) and will have problems in the corner regions.
- It is insensitive to the very slow motion of the objects.

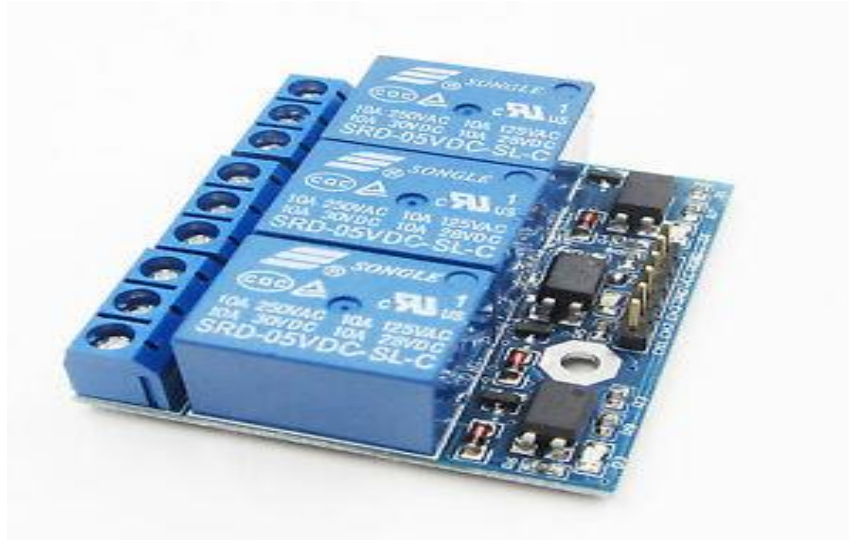
### 3.4.6.7 Applications

- Automatic Street/Garage/Warehouse or Garden Lights
- Burglar Alarms
- Security cams as motion detectors
- Industrial Automation Control

## 3.53-Channel Relay Module

### 3.5.1 Introduction

A transfer is an electrically worked switch that can be turned on or off, releasing the flow-through or not, and can be controlled with low



**Figure 3.17- Relay Module (3 Channel)**

voltages, similar to the 5V gave by the Arduino pins.

Controlling a transfer module with the Arduino is as basic as controlling some other yield as we'll see later on.

The hand-off module we are going to utilize is the SRD-05VDC-SL-C. It runs on 5V and we can control it with any miniaturized scale regulator yet we are going to utilize Arduino.

This transfer module has two channels (those blue blocks). There are different models with one, four, and eight channels. This module ought to be fueled with 5V, which is suitable to use with an Arduino. Other hand-off modules are fueled utilizing 3.3V, which is perfect for ESP32, ESP8266, and different microcontrollers.

The hand-off module is a different equipment gadget utilized for far off gadget exchanging. With it, you can distantly control gadgets over a system or the Internet. Gadgets can be distantly controlled on or off with orders originating from Clock Watch Enterprise conveyed over a nearby or

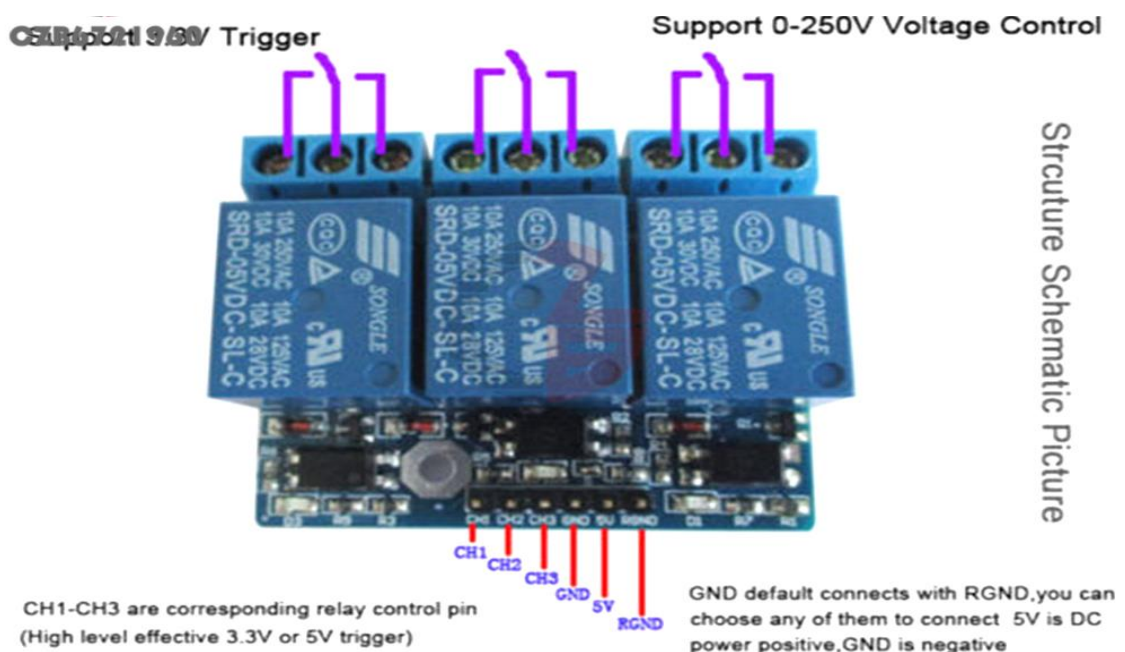
wide zone arrange. You can control PCs, peripherals, or other controlled gadgets from over the workplace or the world.

The Relay module can be utilized to detect outer On/Off conditions and to control an assortment of outside gadgets. The PC interface association is made through the sequential port.

The Relay module houses two SPDT transfers and one wide voltage run, optically disconnected information. These are brought out to screw-type terminal squares for simple field wiring. Singular LED's on the front board screen the info and two hand-off lines. The module is fueled with an AC connector.

### 3.5.2 Relay Pinout

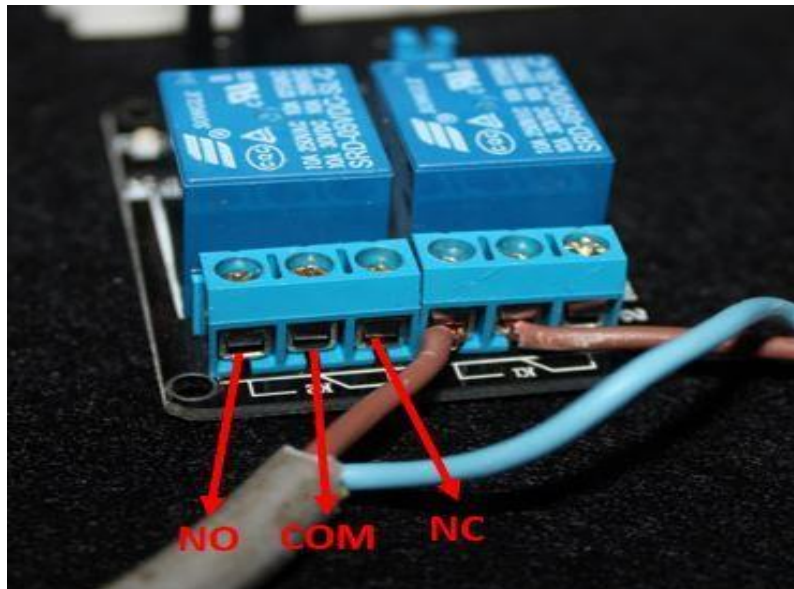
The following figure shows the relay module pinout.



**Figure 3.18- Relay Module Pinout**

The six pins on the left side of the relay module connect high volt, and the pins on the right side connect the component requires a low volt.

### 3.5.3 Mains voltage connections



**Figure 3.19- Relay Connections**

The high-volt side has two joints, each with three sockets: common (COM), normally closed (NC), and normally open (NO).

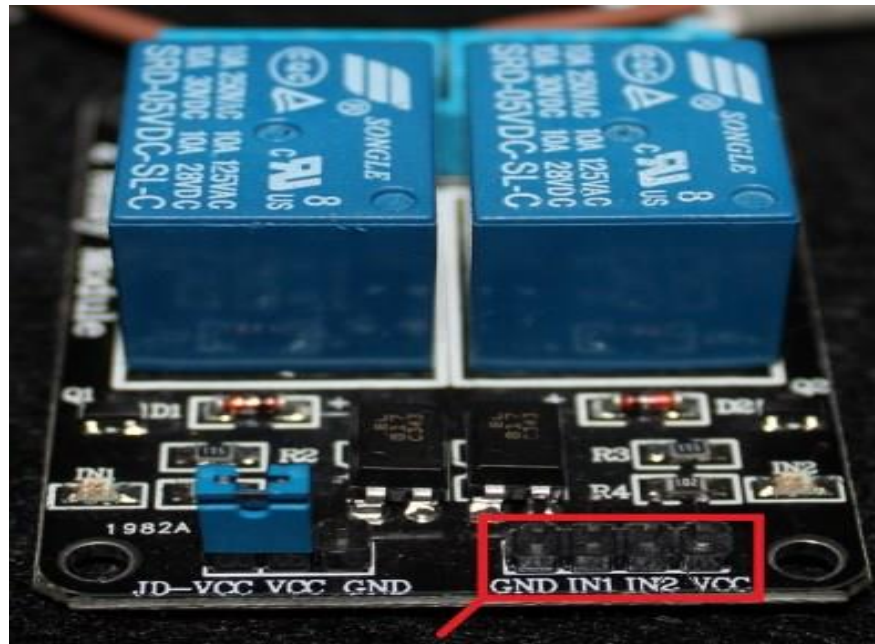
- **COM**
- **NC (Normally Closed)**
- **NO (Normally Open)**

### 3.5.4 Pin wiring

The low-volt side has a set of four pins and a set of three pins.

The set at the right consists of (VCC) and (GND) to power up the module, and input 1 and input 2 to control the bottom and top relays, respectively.





**Figure 3.20- Relay Pin Wiring**

The second arrangement of pins comprises of GND, VCC, and JD-VCC pins. The JD-VCC pin controls the electromagnet of the transfer.

Note: notice that the module has a jumper top interfacing the VCC and JD-VCC pins; the one appeared here is blue, however, yours might be an alternate shading. The jumper top permits you to pick whether the circuit is truly associated with the Arduino circuit or not, and you can decide to have it on or not. With the jumper top on, the VCC and JD-VCC pins are associated. That implies the hand-off electromagnet is legitimately controlled from the Arduino's capacity pin, so the hand-off module and the Arduino circuits are not truly detached from one another (this is the design we'll utilize). Without the jumper top, you have to give a free force source to control the hand-off's electromagnet through the JD-VCC pin. That arrangement genuinely segregates the transfers from the Arduino with the module's worked in optocoupler.

The associations between the transfer module and the Arduino are extremely straightforward:

- **GND:** goes to ground
- **IN1:** controls the main hand-off (it will be associated with an Arduino computerized pin)

- **IN2:** controls the subsequent transfer (it ought to be associated with an Arduino advanced pin on the off chance that you are utilizing this subsequent hand-off. Else, you don't have to associate it)
- **VCC:** goes to 5V

### 3.6 LED Strip

#### 3.6.1 Introduction

A LED strip light (otherwise called a LED tape or lace light) is an adaptable circuit board populated by surface mounted light-transmitting



**Figure 3.21- LED Strip (White)**

diodes (SMD LEDs) and different segments that typically accompany a glue backing.

Generally, strip lights had been utilized exclusively in highlight lighting, backdrop illumination, task lighting, and beautiful lighting applications. Expanded iridescent viability and higher-power SMDs have permitted LED strip lights to be utilized in applications, for example, high brilliance task lighting, fluorescent, and halogen lighting installation substitutions, circuitous lighting applications, and Ultra Violet assessment

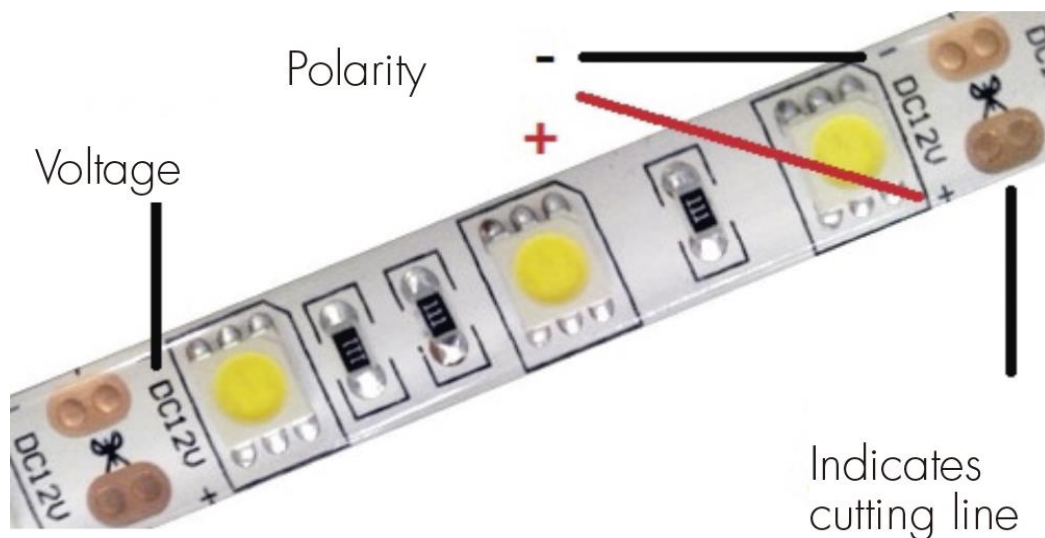


during assembling procedures, set and outfit structure, and in any event, developing plants.

### 3.6.2 Design

Factors in strip lighting comprise of water opposition, shading, cement, the decision of SMD, driving voltage, control type, and whether it is a consistent ebb and flow or steady voltage design.

Uncoated LED tape isn't considered to have any protection from water entrance yet might be appraised as IP20 for some physical entrance opposition. Such tapes are commonly low voltage and safe for skin to contact however can be shorted by fine metal particles. Water-safe strip lighting is canvassed in a warmth leading epoxy or silicone to shield the hardware from direct contact with water and can be evaluated IP65, IP67, or with appropriate fixed associations IP68. Both covered and uncoated LED tapes have two-sided glue support to adhere to dividers, work areas, entryways, and so forth.



### Figure 3.22- LED Strip Design

The most widely recognized structure contrasts are in how singular LEDs are controlled, explicitly contrasts in shading, and whether each LED is addressable.

- **Single Color, non-addressable:** Every LED on the strand is a solitary white shading, normally running from 2200K to 6500K in shading temperature or any of a few monochrome hues covering the scope of the obvious range. (generally from 400-700 nanometres in wavelength).
- **Dynamic Tunable White, non-addressable:** Allows the client to change the shading temperature yield from a solitary strip light. They are fabricated with substituting LEDs of various shading temperatures, so 50% of the LEDs are a lower temperature and half are a higher shading temperature, permitting the strip to create a particular shading temperature between the two shading temperatures of the LEDs.
- **Multicolors, non-addressable:** Each LED is equipped for showing red, green, blue, or every one of the three (white), driven by three information power rails. All the LEDs show a similar shading at any one time, yet the shading can be controlled by differing the voltage applied to every one of the three force inputs.
- **RGB, addressable:** Multiple hues and addresses. Each LED has its chip meaning they can be independently set off for pursuing, strobing, and shading evolving.

Driven strip plans are accessibly populated with a wide range of kinds of SMD, not just in various hues and addressable or non-addressable, by various shapes, sizes, and force levels. The most widely recognized kinds of SMD are 3528, single shading, non-addressable, exceptionally low force; 5050, containing three LEDs taking into account RGB and addressable strips just as higher force levels; 2835, a more current single-shading SMD having indistinguishable surface measurements from the 3528 yet a bigger producer zone and more slender plant with a coordinated heatsink considering higher force levels; 5630/5730, a more up to date trade for single-shading 5050 SMDs which can work at somewhat higher force levels and have high viability. More uncommon structures may have 3014, 4014, 7020, 8020, or different SMDs. Notwithstanding the LED

SMD type, the amount of LEDs per foot (or meter) is likewise a significant factor in deciding the general force and brilliance.

Driven strip lights most usually work on 12 or 24 volts of the direct ebb and flow from a force flexibly, here and there alluded to as a driver. USB strip lights work on the standard 5-volt direct current utilized by USB gadgets. Mains voltage LED strips are additionally accessible. These have the upsides of being usable in any longer single runs without a brilliance drop along the length, yet are less adaptable and heavier because of higher voltage and flow evaluations and thick coatings for stun wellbeing and high IP appraisals in their expected open-air positions, with restricted cut focuses. No different force flexibly is required, even though there must be a rectifier between the mains gracefully and the finish of the LED strip. The most well-known PCB structures utilize different equal circuits comprising of detached dropper resistors in arrangement with a specific number of LED SMDs, to work at a specific current and force level with the normal information voltage. This plan is alluded to as steady voltage and is somewhat delicate to little varieties in input voltage and to the voltage drop that happens along long lengths of the strip when driven from a solitary force input. An elective structure is the "consistent current" plan where each equal circuit of a few SMDs incorporates a little coordinated circuit to give a fixed current to that gathering of LEDs, inside a wide scope of applied voltages. This permits the strip to work at a similar force level and splendor along its whole length, or with some variety in the driver voltage.

Any customizations require a LED regulator to alter brilliance, shading, or individual LED movement. This should be possible with an included regulator or tweaked with a microcontroller.

'Neon' or 'flex' LED tape alludes to LED tape developed in such a manner to copy neon lights. The LED tape is installed on a silicone-filled, plastic C-channel; the silicone both diffuses the light from the LED tape and guides it out aside, 90 degrees to the heading the SMD LEDs face. This structure permits the lights to be bowed in what gives off an impression of being the other way to how customary LED tape can be

twisted, permitting one to spell words and take pictures with it much like neon signs.

### 3.6.3 Applications

- **Superior Lighting impact and Higher execution:**

A high CRI LED strip light duplicates hues all the more adequately and produces a higher caliber of light yield. These strip lights likewise uncover the articles' real nature.

- **Safety:**

Lighting assumes a significant job in the wellbeing of the residents. Driven lights can be utilized for way lighting in dull territories to forestall injury. A high lumens LED strip light can be utilized to illuminate pathways or passages. Strip lights are likewise used to identify movement for security purposes.

- **Home Interiors:**

Driven lights have boundless applications with regards to inside stylistic layout. One can go through these lights to light the closet, cupboard, drawers, kitchen, or living space. Closet lighting is an absolute necessity in each home particularly for current and design cognizant men and ladies. It gives clear permeability and adds visual intrigue to the insides. This very much engaged in undertaking lighting with high CRI chooses appropriate clothing for the correct events.

- **Driven open-air lighting:**

Driven tape lights are likewise used to make scene lighting to draw the consideration of the watcher. These lights are additionally utilized for bay lighting which delicately enlightens the space and essentially upgrades the magnificence of the room. It is utilized prevalently in featuring outsides building exteriors, highlight lighting, brushing, media veneers, direction and signage, gardens, scene, deck, pools, connected lighting, and so forth.

- **Malls, theater, retail outlets:**

Driven Lighting is generally utilized in shopping centers, theaters, and retail outlets to make encompassing lighting and to draw in guests. Retail outlets use LED tape lights to show items, which give clear permeability and adds visual intrigue to the insides.

Warm white for bread, light pink for meat. Splendid blue and white in chilled cupboards, cafés, and fish shops. RGB LED strips help to set the disposition and can be constrained by a regulator.

- **Projects**

LED strips are widely used as a functional or decorative component in projects, models, etc.

### 3.7 Buzzer

#### 3.7.1 Introduction

A buzzer or beeper is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.



**Figure 3.23- Buzzer**

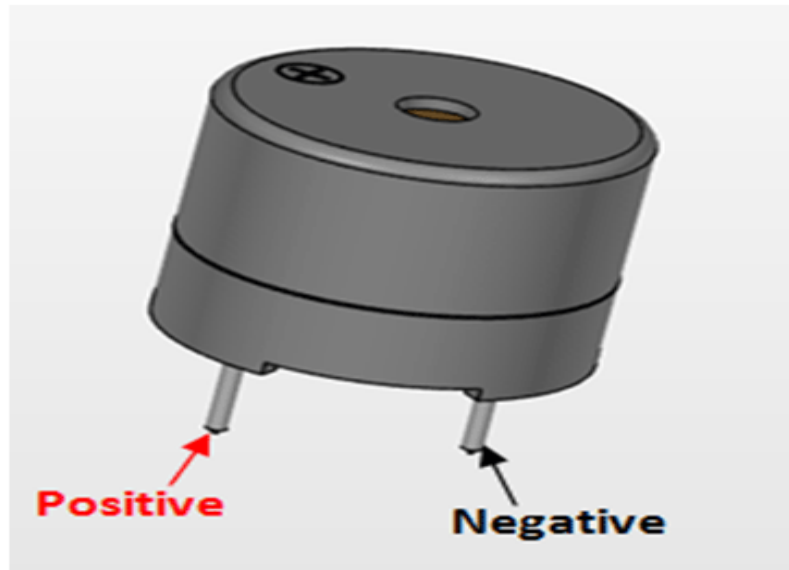
The signal is an incorporated structure of electronic transducers, DC power flexibly, broadly utilized in PCs, printers, copiers, cautions, electronic toys, car electronic gear, phones, clocks, and other electronic items for sound gadgets. Dynamic bell 5V Rated force can be straightforwardly associated with a nonstop solid, this area committed sensor development module and the board in the blend, can finish basic circuit structure, to "attachment and play."

This ringer can be utilized by basically controlling it utilizing a DC power flexibly going from 4V to 9V. A straightforward 9V battery can likewise be utilized, yet it is prescribed to utilize a directed +5V or +6V DC flexibly. The bell is regularly connected with a changing circuit to kill ON or turn the ringer at the necessary time and require stretch.

### 3.7.2 Pin Configuration

**Table 3.11- Buzzer Pin Description**

Pin Name	Description
Positive	Identified by (+) symbol or longer terminal lead. Can be powered by 6V DC
Negative	Identified by short terminal lead. Typically connected to the ground of the circuit



**Figure 3.24- Buzzer Pin Configuration**

### **3.7.3 Buzzer Features and Specifications**

- Rated Voltage: 6V DC
- Operating Voltage: 4-8V DC
- Rated current: <30mA
- Sound Type: Continuous Beep
- Resonant Frequency: ~2300 Hz
- Small and neat sealed package
- Breadboard and Perf board friendly

### **3.7.4 How to use a Buzzer**

A buzzer is a little yet proficient part to add sound highlights to our task/framework. It is a little and smaller 2-pin structure subsequently can be effectively utilized on a breadboard, Perf Board, and even on PCBs which makes this a broadly utilized segment in most electronic applications.

Two sorts are signals that are usually accessible. The one appeared here is a basic signal which when controlled will make a Continuous Beeeeeeppp.... sound, the other kind is known as a readymade signal which will look bulkier than this and will deliver a Beep. Signal. Signal. Sound because of the interior wavering circuit present inside it. Be that as it may,

the one appeared here is most broadly utilized because it very well may be altered with the assistance of different circuits to fit effectively in our application.

This bell can be utilized by just fueling it utilizing a DC power flexibly running from 4V to 9V. A straightforward 9V battery can likewise be utilized, yet it is prescribed to utilize a controlled +5V or +6V DC gracefully. The bell is typically connected with a changing circuit to kill ON or turn the signal at the necessary time and require stretch.

### 3.7.5 Applications

- 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

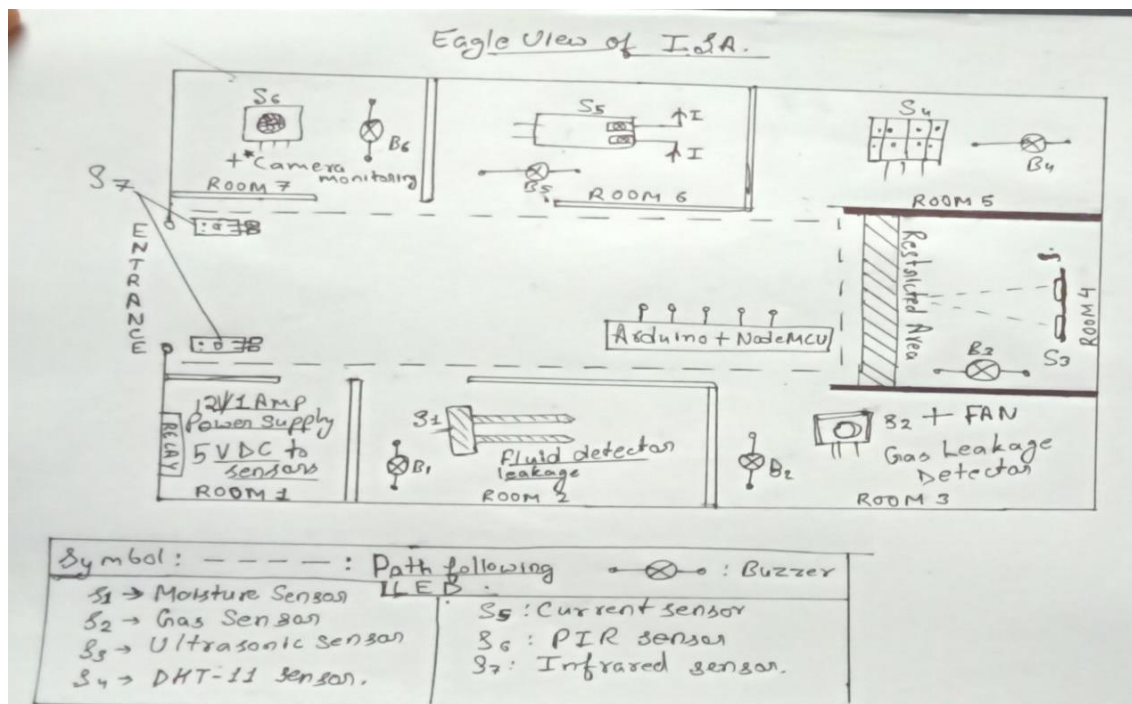


## CHAPTER-4

### WORKING

#### 4.1 Hardware Implementation

For hardware implementation, we need to deal with each sensor individually and after that, we will combine all these sensors to work with harmony with each other.



**Figure 4.1- Eagle View of ISA Project**

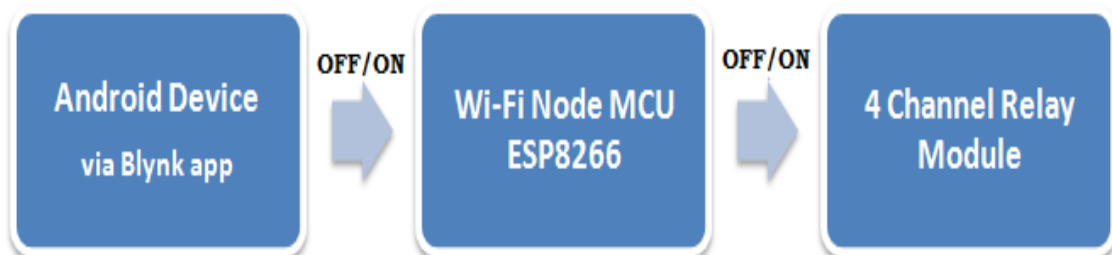
First thing first-1.

- **Power Supply-** For powering the Industrial Security Automation system, there is a 12v/1amp Adapter and one 5v/1amp adapter to power all circuit's components and sensors along with microcontroller.



**Figure 4.2- 12V DC Power Adapter 1A**

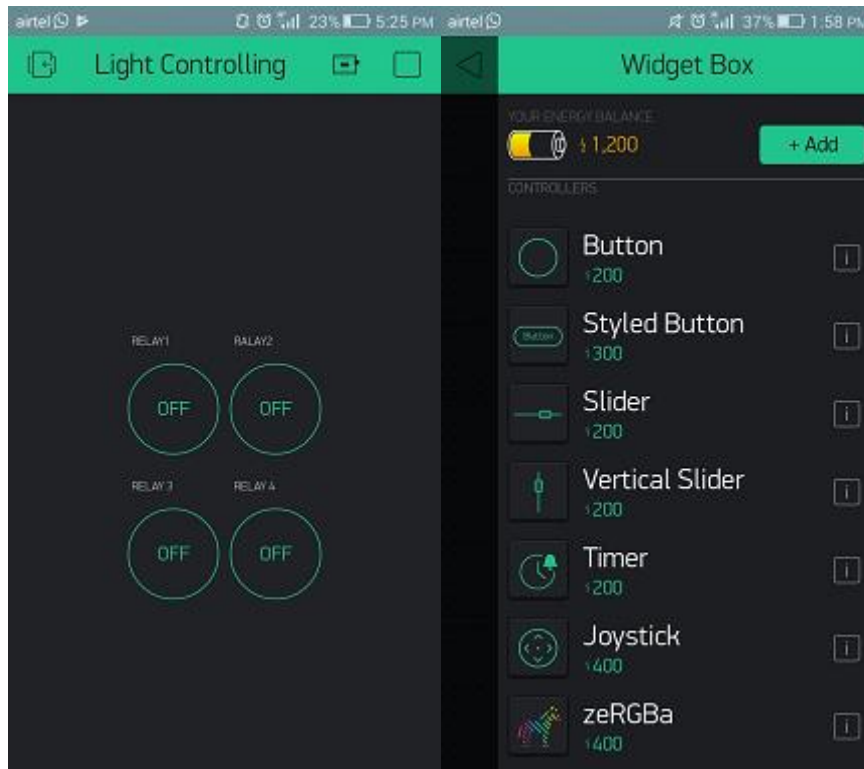
- **4 Channel Relay Control using IOT-** In this project, there are three main components used an Android Blynk app, Wi-Fi Node MCU, and 4 Channel RelayModule.



**Figure 4.3- Process Flow Diagram of Relay Module**

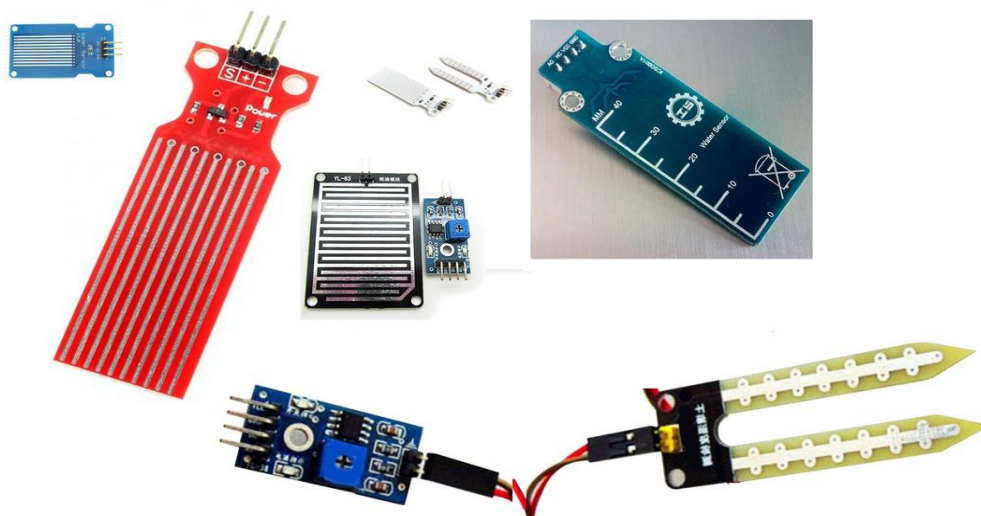
The Android Blynk app sends the serial data to the Wi-Fi Node MCU by clicking the ON button. The Wi-Fi Node reads the input data and processes it according to the program uploaded inside it and generate the output to 4 Chanel Relay Module.

When the Blynk app's button turns on, it turns ON the Relay, and when the Blynk app's buttons turn OFF, it turns OFF the home light.



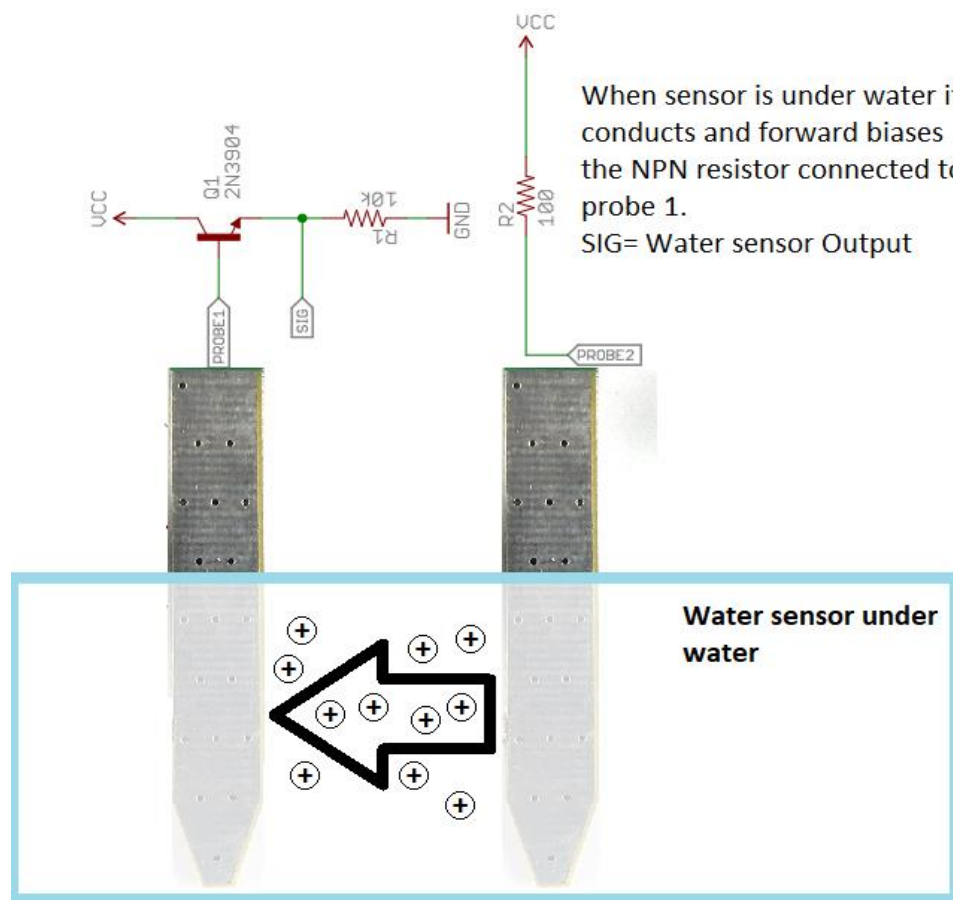
**Figure 4.4- Blynk App controller**

- **Fluid level sensor/detector interfacing-** To detect the presence of fluid.



**Figure 4.5- Different types of Moisture sensors**

- In the above picture, you can see various kinds of water sensors accessible in the market. Most well known is the last one with two legs and a little circuit behind it.
- All the sensors are simple. This implies they give a simple yield. Simple yield is in the range from 0 to 5 volts. We have to peruse this simple voltage utilizing ADC (simple to the advanced converter) and convert it to a proportionate computerized an incentive for future calculations.



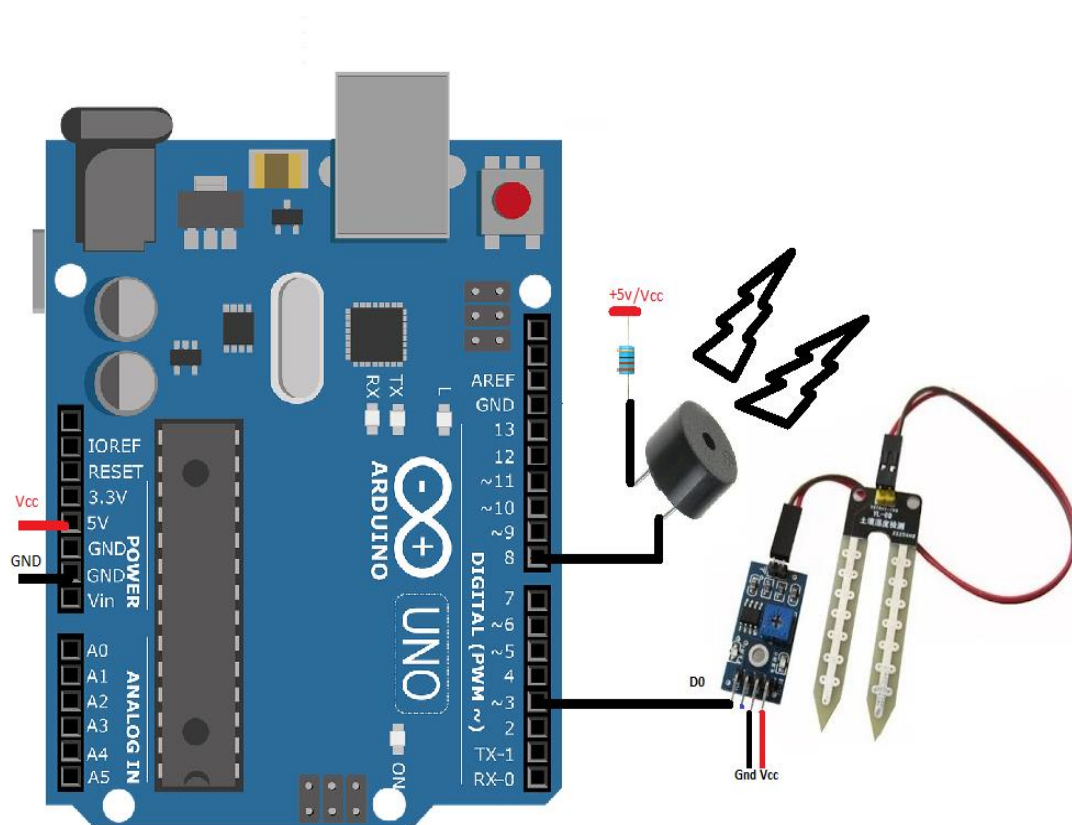
**Figure 4.6- Working of Soil Moisture Detector**

- All water sensors have two legs. Some have numerous stripes. Every leg or strip is plated with a directing material frequently copper. The two legs of the water level sensor go about as a variable resistor. To one leg we flexibly +voltage and together we make ground. At the point when both the legs are plunged in the water and the electric way is made between the two legs and the sensor begins directing ebb and flow. The estimation of conductance/ebb and flow relies upon the proportion or level of water. In

the beneath chart water sensor circuit and how it works are broadly highlighted.

Arduino soil dampness level sensor which accompanies an additional module or circuit contains a comparator alongside a variable resistor/potentiometer. This module can yield computerized and simple worth. During computerized yield, the client sets an edge as an incentive for input voltage. At the point when the info esteem ascends over the limit comparator sets the advanced yield high. The advanced yield is valuable if there should arise an occurrence of alerts to check when the limit level of water is crossed. A simple yield for this circuit takes a shot at a similar standard clarified previously. The proportional circuit of the board is given underneath.

- **Interfacing water level sensor with Arduino Uno-**



**Note:** Digital output of water sensor is connected to pin3 of arduino. On some sensors pinout is different. Be sure to connect the right pin.

**Figure 4.7- Circuit Diagram of Fluid Level Detector**

In the analog water detector circuit, we used the sensor with multiple copper stripes on it. Note there is no extra circuit only bare sensor with some resistors and a single transistor on it.

Presently we should begin the advanced part. The water sensor will yield a high 5-volt signal as a yield on its D0 pin when the water contacts the legs of the sensor. The limit likewise assumes a crucial job here. On the off chance that the amount of water builds the edge level (clarified above) at exactly that point, the D0 pin goes high. Arduino computerized pin 3 is utilized to check the status of the water finder D0 pin. On the off chance that it's high, at that point Arduino will buzz an alert that is associated with pin 8 of Arduino.

Same as simple sensor code Arduino water indicator computerized code is basic, straightforward forward, and straightforward. Initially, the Arduino pins are characterized by utilizing characterize a large scale.

```
#define Danger 3
```

```
#define ALARM 8
```

Arduino pin 3 is named as Danger and 8 as ALARM. In the arrangement() work both the pins are pronounced OUTPUT. The announcements-

```
pinMode(Danger, INPUT)
```

```
pinMode(ALARM, OUTPUT)
```

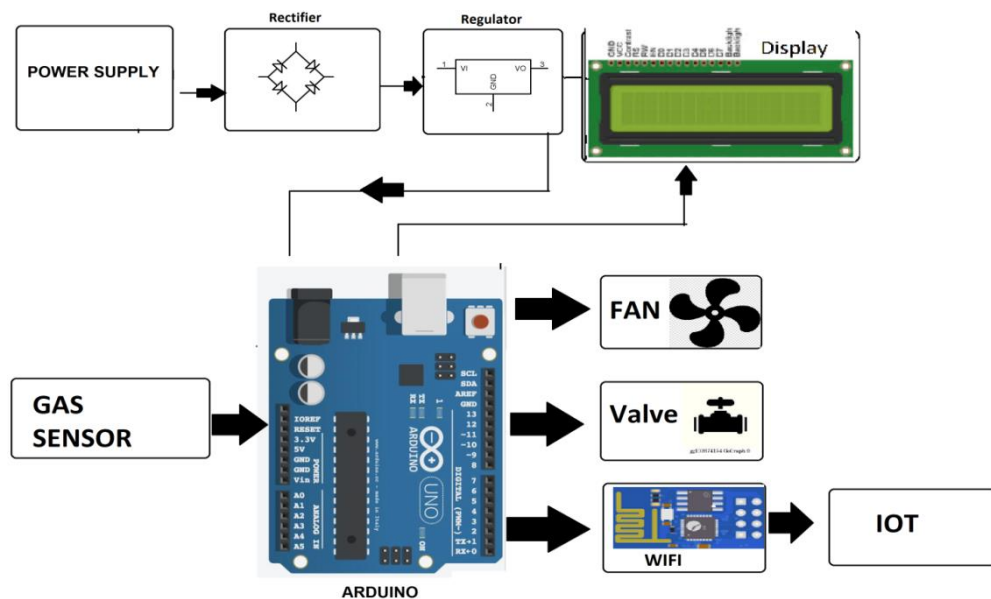
pronounces the pins as yield

On the up and up() work We are perusing the Danger pin. The if explanation if( digitalRead(Danger) == LOW) is perusing the status of Danger pin. Whenever discovered high I switch ON the ALARM. Whenever discovered low we switch OFF the ALARM. The announcement digitalWrite(ALARM, LOW/HIGH) turns the alert ON and OFF.

- **IoT based Intelligent Gas Leakage Detector Using Arduino-** Many mishaps happen in everyday life like a blast as a result of LPG spillage. Significant damage is caused if the gas spillage isn't recognized early. Be

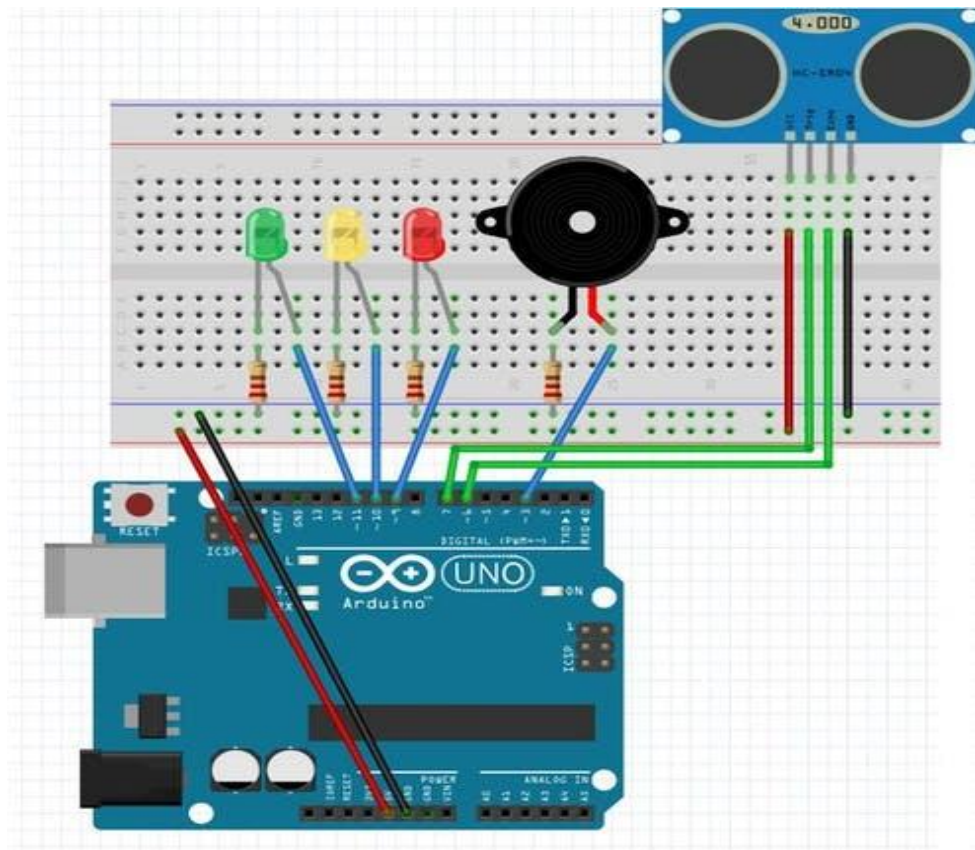


that as it may, presently we can identify the gas spillage utilizing the MQ5 gas sensor. In this IOT gas spillage locator, the gadget will get associated with WIFI, the base and most extreme boundary can be set as needs be. Such IoT just as Arduino based gas spillage indicator frameworks can be introduced in homes, lodgings LPG gas stockpiling regions. This LPG gas identifier framework detects the LPG gas utilizing the MQ5 gas sensor. This gadget will consistently screen the degree of LPG gas present noticeable all around. While checking, if the estimation of LPG gas in air is inside as far as possible then the RGB LED on the circuit will shine green offering a sheltered hint. Also, at whatever point the gas surpasses over the predefined limit than the RGB LED will sparkle red and all the while solenoid worth will kill and update it over IoT. This Arduino and IOT venture will help in recognizing gas spillage in the encompassing.



**Figure 4.8- Circuit Diagram of IoT based Gas Sensor**

- **Restricted Area Monitoring using Ultrasonic sensor-** This system can detect the thieves and inform you about them. As the ultrasonic waves are not visible to human the thief are unaware of it and can be caught easily.



**Figure 4.9- Circuit Diagram of Ultrasonic security Monitoring**

### **Equipment Setup**

#### **Stage 1:**

Connect a red wire from the 5V rail to the Arduino to the positive channel of the breadboard. Interface a dark wire from the GND rail to the Arduino to the negative channel of the breadboard:

Bell = pin 7

On Ultrasonic Sensor:

Reverberation = pin 3

Trig = pin 2

LEDs:

RedLED = pin 4



yellowed = pin 5

Greenlee = pin 6

The green wires associated with the LEDs ought to be associated in line to the positive side of the LED, while the negative side of the LED ought to be associated with the negative channel of the breadboard utilizing a 220-ohm resistor.

### **Stage 2: Assembly - Breadboard**

Right off the bat, we should associate the 5V and GND nail to the Arduino to the breadboard. As I referenced previously, be certain that the wire joined to the 5V pin is associated with the positive channel of the breadboard, and the wire appended to the GND pin is associated with the negative channel of the breadboard.

### **Stage 3: Assembly - Ultrasonic Sensor**

Time to interface the HC-SRO4 ultrasonic sensor! An incredible tip is to put the ultrasonic sensor as far-right to the breadboard as could be expected under the circumstances and ensure that it is looking out. Alluding back to the arrangement pictured, you ought to interface the GND nail to the ultrasonic sensor to the negative channel on the breadboard. Next, associate the Trig pin on the sensor to nail 2 to the Arduino and interface the Echo nail to the sensor to nail 3 to the Arduino. Ultimately, interface the VCC nail to the ultrasonic sensor to the positive channel on the breadboard. Allude to the image above on the off chance that anything gets befuddling.

### **Stage 4: Assembly - LEDs**

The subsequent stage is to associate the LEDs to the breadboard and Arduino. On the off chance that you have to, I energetically prescribe that you allude back to the arrangement picture (Step 2), joining the LEDs is simple, there's a great deal of redundancy. We should initially connect the Green LED. So the best approach to do this is to associate the anode (the more extended leg) to nail 6 to the Arduino with green wire, and to interface the cathode (the shorter leg) to the negative channel on the

breadboard, utilizing a 220-ohm resistor. At that point rehash that progression for the Yellow and afterward the Red LED, make a point to associate the anode (the more drawn out leg) of the yellow LED to nail 5 to the Arduino, and afterward interface the anode of the red LED to stick 6.

Resistors are redundant, notwithstanding, they are strongly prescribed to be utilized.

### **Stage 5: Assembly - Buzzer**

The last piece of the arrangement for this is interfacing the bell to the breadboard and the Arduino. This is perhaps the least demanding piece of the entire arrangement. All that is required to do is to associate the more drawn out leg of the bell to stick 7 of the Arduino utilizing a green wire and afterward interface the shorter leg of the signal to the negative channel of the breadboard utilizing a 220-ohm resistor.

It is HIGHLY prescribed to utilize a resistor in interfacing the shorter leg of the signal to the negative channel of the breadboard. This enormously diminishes the volume of the signal and keeps it from drying to rapidly.

- **Interface DHT11 DHT22 w/ESP8266 NodeMCU Using Web Server-**

Have you at any point needed to have sensors spread all around your home and nursery detailing their temperature normally to a focal worker? At that point, this IoT task may be the strong propelling point for you! This task utilizes ESP8266 NodeMCU as the control gadget that effectively associates with the current WiFi arrange and makes a Web Server. At the point when any associated gadget gets to this web worker, ESP8266 NodeMCU peruses in temperature and relative mugginess from the DHT11, DHT22/AM2302 sensor and sends it to the internet browser of that gadget within the pleasant interface.

Wiring – Connecting DHT11, DHT22/AM2302 sensor to ESP8266 NodeMCU.

Associating the DHT11/DHT22/AM2302 sensor to ESP8266 NodeMCU is genuinely straightforward. Start by putting the NodeMCU on

to your breadboard, guaranteeing each side of the board is on a different side of the breadboard.

Presently place the sensor on to your breadboard other than NodeMCU. Associate the VCC nail to the sensor to the 3.3V pin on the NodeMCU and ground to ground. Additionally, interface the Data nail to the sensor to the D8 pin of the ESP8266 NodeMCU. At long last, we have to put a draw up resistor of  $10K\Omega$  among VCC and information line to save it HIGH for appropriate correspondence among sensor and NodeMCU. On the off chance that you happen to have a breakout leading body of the sensor, you need not include any outer draw up. It accompanies an inherent draw up resistor.

### **Introducing DHT Sensor Library**

Speaking with DHT11, DHT22/AM2302 sensors is a lot of work, as they have their single wire convention for information move. Also, this convention requires exact planning. Luckily, we don't need to stress a lot over this since we are going to utilize the DHT library from Adafruit which deals with nearly everything. The library is incredible to such an extent that it runs on both Arduino and ESP design.

To introduce the library explore the Sketch > Include Library > Manage Libraries... Wait for Library Manager to download libraries list and update the rundown of introduced libraries.

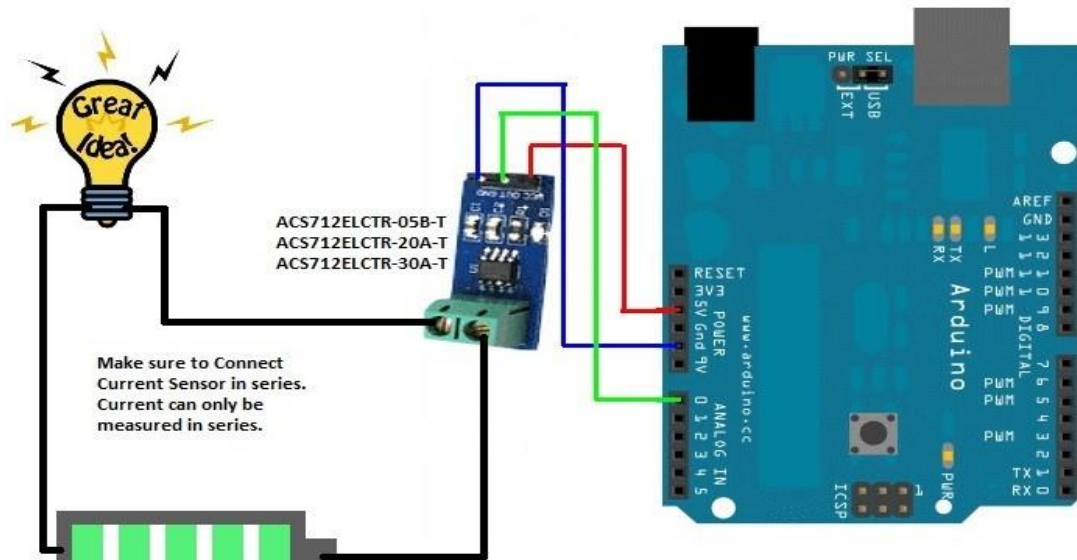
Arduino Library Installation - Selecting Manage Libraries in Arduino IDE

Channel your inquiry by composing the 'DHT sensor'. There ought to be two or three sections. Search for the DHT sensor library by Adafruit. Snap-on that section, and afterward select Install.

### **Adafruit DHT library Installation**

The DHT sensor library utilizes the Adafruit Sensor support backend. Along these lines, scan the library chief for Adafruit Unified Sensor and introduce that as well (you may need to look over a piece)

- **Current Measurement/Detector-** We are going to gauge DC utilizing Acs712 Hall Effect-Based Linear Current Sensor and Arduino Uno. Acs712 can gauge current exactly and precisely if appropriately overseen.

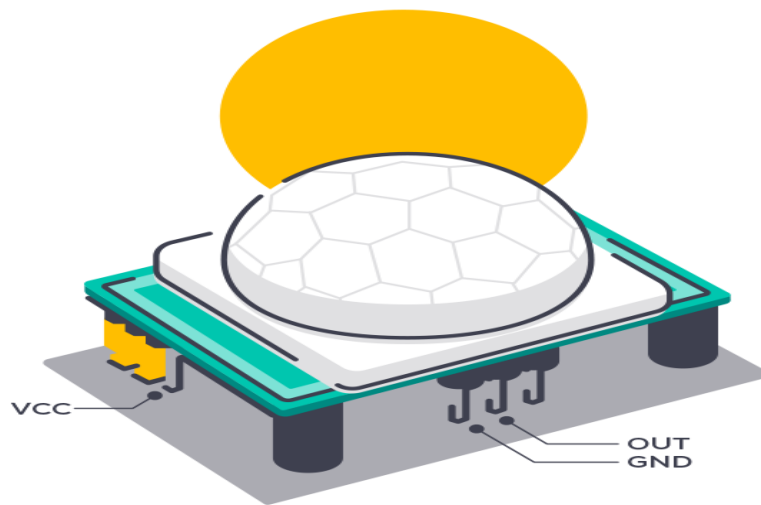


**Figure 4.10- Circuit diagram of Current Detector/Measurement**

Arduino UNO interfacing with acs712 current sensor circuit diagram is given below. The circuit is universal and all the above three codes for different versions of acs712 current sensor can work with the same circuit given below. You just need to insert your acs712 current sensor in the circuit and its corresponding code in Arduino Uno, the rest of the connections are the same for all the different acs712 rated current sensors.

In the wake of making the circuit and the code in Arduino Uno. Open the Arduino sequential screen from Arduino IDE. When you open the Arduino sequential screen you will see the deliberate current worth showing in the Arduino ide sequential screen window. On the off chance that you didn't see anything in Arduino sequential screen check for all the associations. Experience all the conceivable physical associations. If you see broken letter sets in Arduino sequential screen window, at that point set the baud pace of Arduino sequential screen window to 9600 bps to see the best possible information characters and numbers.

- **Security Sensor Using PIR Sensor and ESP8266-**



**Figure 4.11- Pin out Diagram of PIR Sensor**

### **Connecting the Hardware**

Connect your wires as below:

PIR Sensor - ESP8266

GND - GND

OUT - D7

VCC - 3.3V

The PIR sensor runs on an operating range — DC 4.5-20V. The H pin on the sensor is denoted by VCC in the image above and is connected to a voltage regulator that converts the 3.3V source.

### **Turning on the Alarm**

To turn on your alarm, press the flash button on the Esp 8266. The blue LED should turn on. To turn it off, press and hold the flash button for at least 2 seconds or more, the inbuilt LED will turn off.

### **Setting Up Your Flow**

Lets set up a flow that will send a notification to your phone when motion is detected by the PIR Motion Sensor.

Go to the Dashboard and click Flows in the side menu. Create a new Flow with any name.

### **PIR Sensor Sensitivity Measures**

The PIR sensor permits you to change the postpone time and the affectability level.

The PIR Sensor is an advanced gadget. This implies it peruses two qualities: HIGH and LOW. At the point when the sensor identifies development, it understands HIGH. Else, it understands LOW.

The defer setting decides how long the PIR Sensor will peruse HIGH after it has identified movement. The affectability sensor decides the closeness at which the PIR Sensor will enlist a development. This sensor is more exact when it is set to a lower nearness level. You can control these settings utilizing the orange boards found legitimately opposite the pins you used to wire your gadget

- **Path LED Automatic Control Using IR Sensor-**

### **Circuit Design**

A LED is associated with pin 13 of Arduino to demonstrate whether the light is turned ON or OFF.

The IN1 pin of the Relay Module is associated with Pin 9 of Arduino. A LED strip is associated with the 12v gracefully through the hand-off. One terminal of the LED strip is associated with one wire of the 12v gracefully. The other terminal of the LED strip is associated with the NO (Normally Open) contact of the Relay Module.COM (Common) contact of the transfer is associated with the other wire of the mains gracefully. Be cautious while interfacing this piece of the undertaking.

**Working:** As the individual goes into the room, the adjustment in infrared radiation in the IR sensor is distinguished.

Therefore, the yield of the IR Sensor turns out to be HIGH. Since the Data OUT of the IR Sensor is associated with Digital Pin 8 of Arduino, at whatever point it turns out to be HIGH, Arduino will initiate the transfer by making the hand-off pin LOW (as the hand-off module is a functioning LOW module).

This will turn the light ON. The light remains turned ON as long as there is a few enter individual is more prominent than the quantity of an individual leaving.

On the off chance that there is no individual inside, at that point it will make the Arduino turn OFF the transfer (make the hand-off pin HIGH) and the room light will be killed.

## 4.2 Software Implementation

- **IOT Based Gas Detector-**

```
#include <ESP8266WiFi.h>
```

```
#include <BlynkSimpleEsp8266.h>
```

```
#include <SimpleTimer.h>
```

```
#define BLYNK_PRINT Serial // Comment this out to disable prints and  
save space
```

```
char auth[] = "44q9hy7Fv0I0bbbXgr5fL0BymuYkw2G8";
```

```
/* WiFi credentials */
```

```
char ssid[] = "hasan";
```

```
char pass[] = "hasan123"
```

```
SimpleTimer timer;
```

```
int mq135 = A0; // smoke sensor is connected with the analog pin A0
```

```
int data = 0;
```

```
void setup()
{
  Serial.begin(115200);
  Blynk.begin(auth, ssid, pass);
  timer.setInterval(1000L, getSendData);
}

void loop()
{
  timer.run(); // Initiates SimpleTimer
  Blynk.run();
}

/*****

* Send Sensor data to Blynk

*****/

void getSendData()
{
  data = analogRead(mq135);
  Blynk.virtualWrite(V2, data); //virtual pin V3

  if (data > 600 )
  {
    Blynk.notify("Smoke Detected!!!");
```



```
    }  
}  
  
void loop(){}
```

- **Fluid Leakage Detector-**

```
int sensor_pin = A0;  
  
int output_value ;  
  
void setup() {  
    Serial.begin(9600);  
  
    Serial.println("Reading From the Sensor ...");  
  
    delay(2000);  
  
    pinMode(7, OUTPUT);  
  
    pinMode(10, OUTPUT);  
  
    }  
  
void loop() {  
  
    // read the input on analog pin 0:  
  
    int sensorValue = analogRead(A1);  
  
    // Convert the analog reading (which goes from 0 - 1023) to a voltage (0 -  
    5V):  
  
    float voltage = sensorValue ;  
  
    // print out the value you read:  
  
    Serial.println(voltage);  
  
    if(sensorValue< 700)  
  
    { digitalWrite(10, HIGH); // turn the LED on (HIGH is the voltage level)
```

## Industrial Security Automation Using IoT

```
delay(2000); }           // wait for a second

digitalWrite(10, LOW);  // turn the LED off by making the voltage LOW

output_value= analogRead(sensor_pin);

output_value = map(output_value,550,0,0,100);

Serial.print("Mositure : ");

Serial.print(output_value);

Serial.print("no MOISTURE PRESENT");

    if(output_value>-40)

{ digitalWrite(7, HIGH); delay(2000);  Serial.print("onnnnnnlue");

    }

digitalWrite(7, LOW);

Serial.println("%");

delay(1000);

}
```

- **Restricted Area Monitoring Using IOT Based Ultrasonic Sensor-**

```
#define trigPin 12

#define echoPin 13

int Buzzer = 8; // Connect buzzer pin to 8

int ledPin= 6; //Connect LEd pin to 6

int duration, distance; //to measure the distance and time taken

void setup() {

Serial.begin (9600);
```

```
//Define the output and input objects(devices)

pinMode(trigPin, OUTPUT);

pinMode(echoPin, INPUT);

pinMode(Buzzer, OUTPUT);

pinMode(ledPin, OUTPUT);

}

void loop()

{

digitalWrite(trigPin, HIGH);

delayMicroseconds(10);

digitalWrite(trigPin, LOW);

    duration = pulseIn(echoPin, HIGH);

    distance = (duration/2) / 29.1;

    //when distance is greater than or equal to 200 OR less than or equal to
0,the buzzer and LED are off

    if (distance >= 200 || distance <= 0)

    {

Serial.println("no object detected");

digitalWrite(Buzzer,LOW);

digitalWrite(ledPin,LOW);

    }

    else {

Serial.println("object detected \n");

Serial.print("distance= ");
```

```
Serial.print(distance);    //prints the distance if it is between the range 0
                             to 200

tone(Buzzer,400);          // play tone of 400Hz for 500 ms

digitalWrite(ledPin,HIGH);

}

}
```

- **IOT Based DHT 11 Sensor-**

```
#define BLYNK_PRINT Serial

#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>

#include <DHT.h>

// You should get Auth Token in the Blynk App.

// Go to the Project Settings (nut icon).

char auth[] = "-E-e239gseDmQypePo5i0kt2pwXSJLUe";

// Your WiFi credentials.

// Set password to "" for open networks.

char ssid[] = "Redmi";

char pass[] = "hasan123";

#define DHTPIN 0           // D3

// Uncomment whatever type you're using!

#define DHTTYPE DHT11      // DHT 11

// #define DHTTYPE DHT22    // DHT 22, AM2302, AM2321

// #define DHTTYPE DHT21    // DHT 21, AM2301
```

```
DHT dht(DHTPIN, DHTTYPE);

BlynkTimer timer;

// This function sends Arduino's up time every second to Virtual Pin (5).

// In the app, Widget's reading frequency should be set to PUSH. This
means

// that you define how often to send data to Blynk App.

void sendsensor()

{

    float h = dht.readHumidity();

    float t = dht.readTemperature(); // or dht.readTemperature(true) for
Fahrenheit

    if (isnan(h) || isnan(t)) {

Serial.println("Failed to read from DHT sensor!");

        return;

    }

    // You can send any value at any time.

    // Please don't send more than 10 values per second.

    Blynk.virtualWrite(V5, t);

    Blynk.virtualWrite(V6, h);

}

void setup()

{

    // Debug console
```

```
Serial.begin(9600);

Blynk.begin(auth, ssid, pass);

// You can also specify server:

//Blynk.begin(auth, ssid, pass, "blynk-cloud.com", 8442);

//Blynk.begin(auth, ssid, pass, IPAddress(192,168,1,100), 8442);


dht.begin();


// Setup a function to be called every second
timer.setInterval(1000L, sendSensor);

}

void loop()

{

Blynk.run();

timer.run();

}
```

- **Current Detector For Appliances-**

```
#include <Filters.h>

float testFrequency = 60;           // test signal frequency (Hz)

float windowLength = 20.0/testFrequency; // how long to average the
signal, for statistist

int sensorValue = 0;
```

## Industrial Security Automation Using IoT

```
float intercept = -0.1310; // to be adjusted based on calibration testing
float slope = 0.04099; // to be adjusted based on calibration testing
float current_amps; // actual measure current
unsigned long printPeriod = 1000; // in milliseconds
// Track time in milliseconds since last reading
unsigned long previousMillis = 0;

void setup() {
  Serial.begin( 57600 ); // start the serial port
}

void loop() {
  RunningStatisticsinputStats; // create statistics to look at the raw
  test signal
  inputStats.setWindowSecs( windowLength );
  while( true ) {
    sensorValue = analogRead(A0); // read the analog in value:
    inputStats.input(sensorValue); // log to Stats function

    if((unsigned long)(millis() - previousMillis) >= printPeriod) {
      previousMillis = millis(); // update time

      // display current values to the screen
      Serial.print( "\n" );

      // output sigma or variation values associated with the inputValueitsel
      Serial.print( inputStats.sigma() );
```

```
}  
  
}  
  
}
```

- **Relay Control Using Blynk-**

```
#define BLYNK_PRINT Serial  
  
#include <ESP8266WiFi.h>  
  
#include <BlynkSimpleEsp8266.h>  
  
char auth[] = "authtoken"; // PASTE YOUR AUTHENTICATION CODE  
HERE  
  
// Your WiFi credentials.  
  
char ssid[] = "ssid"; //WIFI NAME  
  
char pass[] = "password"; //PASSWORD  
  
void setup()  
{  
  Serial.begin(9600);  
  Blynk.begin(auth, ssid, pass);  
}  
  
void loop()  
  
{  
  Blynk.run();  
}
```



- **Entrance LED Automatic ON-OFF Using Infrared Sensor-**

```
int in1 = 9;

int sensor = 8;

int led = 13;

unsigned long t=0;

void setup()
{
  Serial.begin(9600);
  pinMode(in1, OUTPUT);
  pinMode(sensor, INPUT);
  pinMode(led, OUTPUT);
  digitalWrite(in1,HIGH);
  digitalWrite(led,LOW);
  while(millis()<13000)
  {
    digitalWrite(led,HIGH);
    delay(50);
    digitalWrite(led,LOW);
    delay(50);
  }
  digitalWrite(led,LOW);
}
```

```
void loop()
{
digitalWrite(in1,HIGH);
digitalWrite(led,LOW);
if(digitalRead(sensor)==HIGH)
{
t=millis();
while(millis()<(t+5000))
{
digitalWrite(in1,LOW);
digitalWrite(led,HIGH);
if((millis())>(t+2300))&&(digitalRead(sensor)==HIGH))
{
t=millis();
}
}
}
}
```

## **CHAPTER-5**

### **RESULT**

Modern robotization assumed control over the control of creative tasks. Somehow or another, the execution of this framework will in general sub for the work done by people. To put it plainly, supplanting people in an industry. The time devoured in assembling has been deducted since robots never get troubled and skilled to take part in hazardous occupations. Along these lines, work openings might be decreased up to half as it turned the robotization framework to be a financial plan benevolent. In any case, innovation was demonstrated to make employments as opposed to demolished the open door through mechanical technology, blockchain innovation, man-made brainpower, media transmission, and then some. The usage of computerization in any size of the organization could be an incredible other option. In some way or another, there is an obstruction made by individuals to keep the use of robots from being generally utilized. Subsequently, human administrators may need to perform errands in exceptionally dangerous situations like limits temperature, radioactive and poisonous environments.



**Figure 5.1- ISA Project in working**

## **CHAPTER-6**

### **ADVANTAGES & DISADVANTAGES**

When deciding whether or not to automate an industrial process, or if this automation will be partial or total, we must take into account different factors. This is especially critical when it is not a large company since the impact of decisions is more noticeable.

Although each company is different and has its particularities, industrial processes can be adapted to each one to comply with the minimum technical specifications.

#### **6.1 Advantages**

- **Open Source Platform**

Open-source IoT platform can be used to develop the security automated industry.

- **Efficient Data Analysis**

Data analysis is efficient as the processing of data is automated and the errors are minimized.

- **High level of safety**

The safety level is at its best as all the fields are covered under the Security Automation Analysis.

- **Optimal quality levels**

Automation allows processes to be executed at a much higher level of precision than in a manual process. The measurements, weights, or mixtures are calculated with the minimum unit. Also, there is no downtime or interruptions due to errors or changes in the process.

- **Cost savings**

Once a process is automated, fewer base personnel are needed in the production chain. On the other hand, automation increases energy efficiency and the use of raw materials. Thus, the costs associated with supplies and stocks are reduced.

- **Production time**

Given the efficiency and precision of the automated process, production time is significantly reduced.

- **Staff security**

The safety of personnel is increased, especially in processes that include heavyweights, high temperatures, or dangerous environments (with harmful chemical products, radioactive ...).

- **Permanent repetition**

In processes already purified, this is repeated continuously without alterations or failures, which allows producing without interruption with 24 h availability. This advantage is especially interesting in companies with a marked seasonality in production, which presents very marked increases.

- **More flexible production**

China's electronic manufacturing allows the product to be adapted to the specific characteristics and requirements of each company. Also, it allows performing tasks impossible to carry out manually.

- **Improved data flow**

There is better integration in data communication networks, which allows reducing the reaction time to changes or alterations in production, as well as to make more precise decisions.

- **Tasks beyond human capabilities**

Tasks that are beyond human capabilities are now performed by automated machines. Some tasks are physically impossible or beyond human capabilities. Thanks to automation, these physically challenging tasks can now be completed.

- **Workers are freed to do other tasks.**

Since most of the tasks are now being accomplished by machines, employees have more time to spend on other business processes.

- **Competitive advantage**

All the above increase the competitiveness in the market, since it can give a better response to the needs of this, offer better quality products in less time, react more quickly, and flexibly to changes.

## **6.2 Disadvantages**

- **Less versatility**

By having a machine that can perform a certain task limits to the flexibility and variety of tasks that an employee could do.

- **Need technical support for maintenance**

For maintenance, skilled or technical support is needed as the procedure is complex for unskilled individuals.

- **Need strong Internet connection**

Internet connection is not strong in all areas and fluctuates, the functioning may suffer in such areas.

- **Increase in unemployment**

By increasing the amount of automation, there are fewer employees required causing large unemployment rates.

- **Unpredictable costs**

There can be a few erratic costs that may surpass the real cost spared by the robotization itself. A portion of these expenses could incorporate innovative work expenses of robotizing a procedure, protection support costs, and the expense of preparing representatives to work computerized machines.

While computerization has become an asset for staying serious in the assembling business, there are a few components to be viewed as serious and to get an arrival on the speculation. Contingent upon the activities, robotization could conceivably be a solid match. On the off chance that it is a little activity with low creation amounts, the underlying venture of buying a computerized machine would not be conservative. Then again, if the activity has a bigger office with numerous workers on the shop floor two create medium to huge runs, mechanized machines would be more qualified.



## **CHAPTER-7**

### **CONCLUSION**

Security is a primary concern for everywhere. Fault can be detected and alarm or notification to concerned authority can be received on their smartphones from the spot. Sophisticated security monitors all hazards and threats, alert message to a mobile phone to any time, automates security, remote monitoring, and logistics. This system can be interfaced with the future generation control system.

Mechanical security is an idea that alludes to a progression of security exercises that ensure assets and limit hazard and misfortune to forestall spillage of key innovations and secret data at the undertaking level and influence national issues. Faults due to negative outcomes may be avoided or prevented by recognizing the fault or knowing the negative outcomes prior. By using this project we will get the location where the fault occurs. IoT platform is used to interface with the remote authorized member. This project can also be used in various other locations such as schools, homes, etc.

This system is very easy to implement and reduce the percentage of damaging large systems in industries using wireless communication technologies.

With new technologies coming up from time to time. The need for an adaptable security system is certainly required to deliver the best security and safety of the different assets. This includes machinery, workers,

maintenance, and storage of products and refineries. The value of the commodity itself decides the level of risk upon security breach. So having a security system fast, easy to operate, and hard to break-in-through is the demand of the current industry. At first glance, it seems impossible for the security to link with automation. As security is one of the important concerns are of any industry And any issue in that will ultimately result in the loss of data and money to the industry.

However, this can be easily overcome by the most reliable sensors, backup, feedback, algorithms, and hard to penetrate programs. Together these ensure the functioning of automation. With every upcoming technology, they come with limitations and so there is in this project too. It can be easily seen that this project is fully automated with no human need for its normal working. Still, there is a need for an employee for inspecting the errors, faults, updating the version, and replacing the odd ones. The risk of damage to part of the system is very less. However, if that happens there is no need of replacing the whole system. A new substitute is always there in that condition. This provides the project immune to damages and cost risk. Varying fields of operation and easy to use mechanics increases the nature of user-friendliness. And can be easily learned by any staff/employee working at any level without much effort.

### **7.1 Future Scope**

Ideally, this project could be made more convenient and secure with the use of satellite modems instead of cell phones as tracking devices as the system may fail when there is no network coverage. This design can be made more enhanced in the future to support the camera, mobile data LCD, web-based tracking software, and also PC based stand-alone software.

In our project, the fault analysis system is based on embedded control which monitors the fault using IoT. IoT is used as an interfacing medium between the system and the concerned authority. This system can also be interfaced with the future generation control system.

Also, energy consumption is the most important aspect of any project. Even at a small energy consumption rate, the operation time and range of applications make energy consumption noticeable. The dependency of the project on energy and electrical power is one of the factors which make the project vulnerable to deficiencies. This issue can be overcome using renewable sources of energy for powering the project.

However, the power required shall be calculated and an estimate of power consumption should be made accordingly, especially in the case of solar energy, wind energy. Currently due to limitation of cost of the project, a better alternative like using 60% grid power and rest 40% using a renewable source. This will not only reduce the energy consumption cost but also better for the environment.

Also, this project uses Arduino, NodeMCU, and various other sensors. For future modifications, we can print PCB, inbuilt Wi-Fi module, and sensors linked with it. This not only reduces the overall size of the Security Automation System. But also gives the benefit of copyright products. So that other competitors won't claim or copy our original products. This is one of the important aspects in terms of product authenticity and giving credits to true founders. Currently, the whole world is in the starting phase of transforming things over the internet i.e. IoT. So there are several possibilities for the project to overcome its current limitations and enhance the project capabilities.

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