SMART HELMET

ABSTRACT

A smart helmet is a type of protective headgear used by the rider which makes bike driving safer than before. The main purpose of this helmet is to provide safety for the rider. This can be implemented by using advanced features like alcohol detection, helmet wear detection. This makes it not only a smart helmet but also a feature of a smart bike. It is compulsory to wear the helmet, without which the ignition switch cannot turn ON. A WiFi Module can be used as wireless link for communication between transmitter and receiver. If the rider didn't weared an helmet or he/she is drunk then the ignition gets automatically locked.

CONTENTS

1. INTRODUCTION

1.1 Project objective:

The objective of the Smart Helmet project is to design and develop an intelligent safety system that enhances user protection by integrating technology into a traditional helmet. The Smart Helmet will incorporate features such as alcohol level monitoring, and wireless communication to ensure the rider's safety. Additionally, the helmet will automatically off the engine. The system aims to improve road safety standards and create a reliable solution for both daily commuters and professional riders.

1.2 Project outline:

The main aim of the project is to make the public responsible by following the traffic rules and to reduce the accidents happening.

LITERATURE SURVEY

According to the recent Research paper in 2016 titled '2 Helmet using GSM and GPS technology for accident detection and reporting system', The author specially developed this project to improve the safety of the bikers. The objective of this project is to study and understand the concept of RF transmitter and RF receiver circuit. The project uses ARM7, GSM and GPS module. The project also uses buzzer for indication purpose. Whenever the accident will occur then accident spot will be note down and information will send out on the registered mobile number. The major disadvantage of this project is they are not using any display device for showing the current status. Also the cost of helmet is still high since helmet is designed for only one purpose.

According to the Research paper in 2015 titled 'Microcontroller based smart wear for driver safety', In this paper author has discussed on the speed of the vehicle. In this application the project will be monitoring the areas in which the vehicle will be passing. On entering any cautionary areas like schools, hospitals, etc the speed of the vehicle will be controlled to a predefined limit. LCD is used for showing the various types of messages after wearing the helmet. The author has worked only on the phenomenon of accident which is generally happens due to drunk and drive. But as we know that the accident in the area is not happens only due to consuming alcohol but also other parameters like speed are also responsible. According to the Research paper in 2016 titled 'Smart Helmet', In this paper the main objective of author is to force the rider to wear the helmet. In this competitive world one of the survey says that the death trolls due to motor bike accidents are increasing day by day out of which most of these casualties occurs because of the absence of helmet. Traffic police cannot cover remote roads of city. Thats why over primary objective is to make the usage of the helmet for two wheelers "compulsory ". Thus ,no one other than the owner himself ,who doesn't have "password" which would have been created by the owner, can use the bike. In this author has proposed the feature that the bike will not start unless the bike rider does not wear the helmet .The other this module basically deals with the checksum of rider if he is wearing the helmet or not on first place to achieve this ultrasonic sensor is been used .based on this the signal are been sent to the next module voice recognition module use for authentication purpose. Arduino is also used in this project which is an open source tool for making computer that can sense.

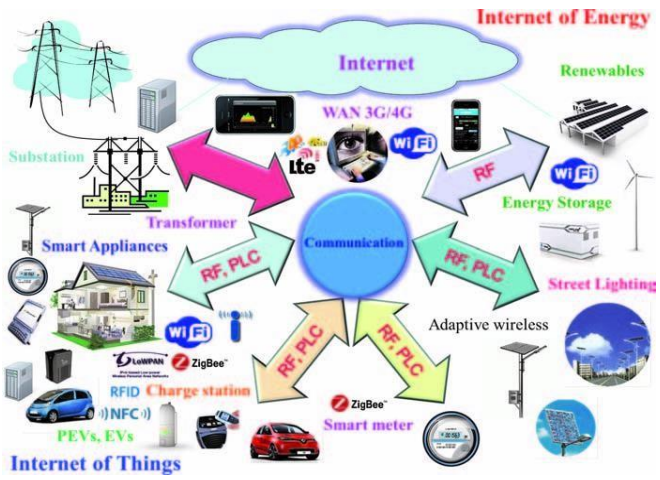
According to the Research paper in 2015 titled 'Smart Helmet', In this project the author has proposed the smart helmet because of growing bike accident. People get injured or might be dead because of not wearing helmet. Continuously no one follows road rules .So to overcome these problem this helmet is been designed. The middle class families prefer to buy motor bike over four wheelers, because of the low prices, various variety available in the market. Author has also used encoder IC that receives parallel data in the form of address bits and control bits the other author has used smart system for helmet. But in this project author have not focused on the major issue that will occur in future regarding the alcohol and many other.

CHAPTER 3

Internet of things (IoT) describes devices with sensors, processing ability, software and other technologies that connect and exchange data with other devices and systems over the Internet or other communication networks. The IoT encompasses electronics, communication, and computer science engineering. "Internet of things" has been considered a misnomer because devices do not need to be connected to the public internet; they only need to be connected to a network and be individually addressable.

IoT applications promise to bring immense value into our lives. With newer wireless networks, superior sensors and revolutionary computing capabilities, the Internet of Things could be the next frontier in the race for its share of the wallet. IoT applications are expected to equip billions of everyday objects with connectivity and intelligence. It is already being deployed extensively, few applications of IoT:

- Wearables
- Smart Home Applications
- Smart Buildings
- Smart Infrastructure
- Health Care
- Smart Cities
- Agriculture
- Industrial Automation



IoT Applications:Smart Home, Smart Buildings and Infrastructure

IoT home automation is the ability to control domestic appliances by electronically controlled, internet-connected systems. It may include setting complex heating and lighting systems in advance and setting alarms and home security controls, all connected by a central hub and remote-controlled by a mobile app.

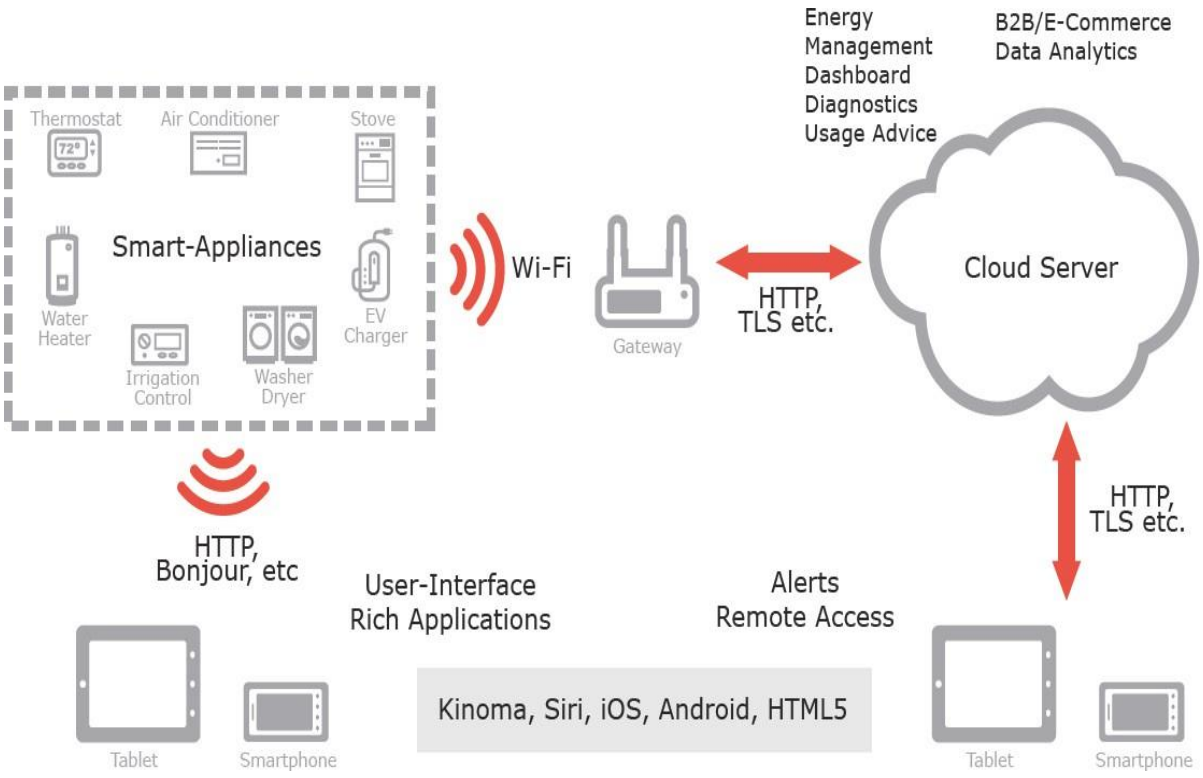


Figure .Smart home platform.

The rise of Wi-Fi's role in home automation has primarily come about due to the networked nature of deployed electronics where electronic devices (TVs and AV receivers, mobile devices, etc.) have started becoming part of the home IP network and due the increasing rate of adoption of mobile computing devices (smartphones, tablets, etc.), see above Figure.

The networking aspects are bringing online streaming services or network playback, while becoming a mean to control of the device functionality over the network. At the same time mobile devices ensure that consumers have access to a portable 'controller' for the electronics connected to the network. Both types of devices can be used as gate ways for IoT applications. In this context many companies are considering building platforms that integrate the

building automation with entertainment, healthcare monitoring, energy monitoring and wireless sensor monitoring in the home and building environments.

IoT applications using sensors to collect information about the operating conditions combined with cloud hosted analytics software that analyzes disparate data points will help facility managers become far more proactive about managing buildings at peak efficiency.

Issues of building ownership (i.e., building owner, manager, or occupants) challenge integration with questions such as who pays initial system cost and who collects the benefits over time. A lack of collaboration between the subsectors of the building industry slows new technology adoption and can vent new buildings from achieving energy, economic and environmental performance targets.

Integration of cyber physical systems both within the building and with external entities, such as the electrical grid, will require stakeholder cooperation to achieve true interoperability. As in all sectors, maintaining security will be a critical challenge to overcome.

Within this field of research the exploitation of the potential of wireless sensor networks (WSNs) to facilitate intelligent energy management in buildings, which increases occupant comfort while reducing energy demand, is highly relevant.

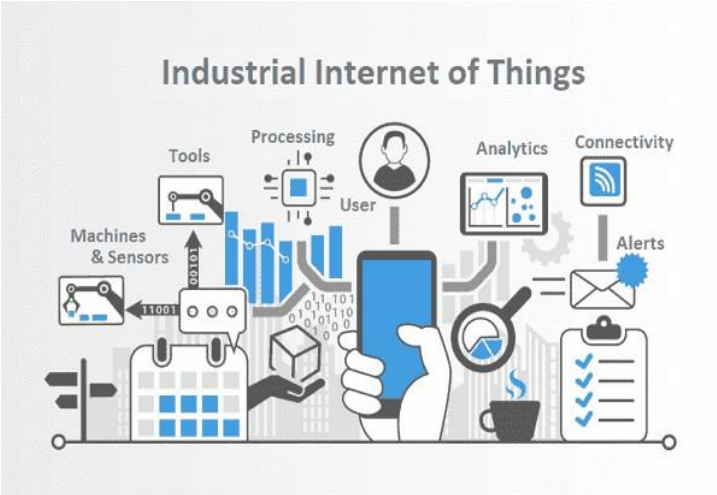
In addition to the obvious economic and environmental gains from the introduction of such intelligent energy management in buildings other positive effects will be achieved. Not least of which is the simplification of building control; as placing monitoring, information feedback equipment and control capabilities in a single location will make a buildings' energy management system easier to handle for the building owners, building managers, maintenance crews and other users of the building. Using the Internet together with energy management systems also offers an opportunity to access a buildings' energy information and control systems from a laptop or a Smart phone placed anywhere in the world. This has a huge potential for providing the managers, owners and inhabitants of buildings with energy consumption feedback and the ability to act on that information.

In the context of the future Internet of Things, Intelligent Building Management Systems can be considered part of a much larger information system. This system is used by facilities managers in buildings to manage energy use and energy procurement and to maintain buildings systems. It is based on the infrastructure of the existing Intranets and the Internet, and therefore utilizes the same standards as other IT devices. Within this context reductions in the cost and reliability of WSNs are transforming building automation, by making the maintenance of energy

efficient healthy, productive work spaces in buildings increasingly cost effective.

IoT Application in industries:

IoT in industry is a rapidly developing area. Numerous IoT research and application projects have been done by universities or in joint industry- university consortia in recent years.



Internet of things (IoT) has become part of your daily life. The "things connected to the internet" idea is continuously evolving in content, areas of applications, visions and technology. New real life and industrial projects have been done and joint future oriented industry and government initiatives such as Industry 4.0 in Germany, have been started [1].Since Industrial production is one of the world's the IoT to the factories enabling them to cope with the challenges raised by popular mega trends.

Biggest economic factors one of the major objectives of these initiatives is to bring the paradigms of The foremost megatrends relevant for factories are globalization, progressing technological evolution, the dynamization of product life cycles, the aging work force and the shortage of resources. Central effects are the acceleration of innovation cycles and the increasing customer demand for individualized mass produces with highest quality expectations. Within the context of industrial production IoT projects and applications are developing in manufacturing, supply chain, supervision and servicing. A major question in all projects is about the value, the benefit such application can bring to the user, to the owner or to society.

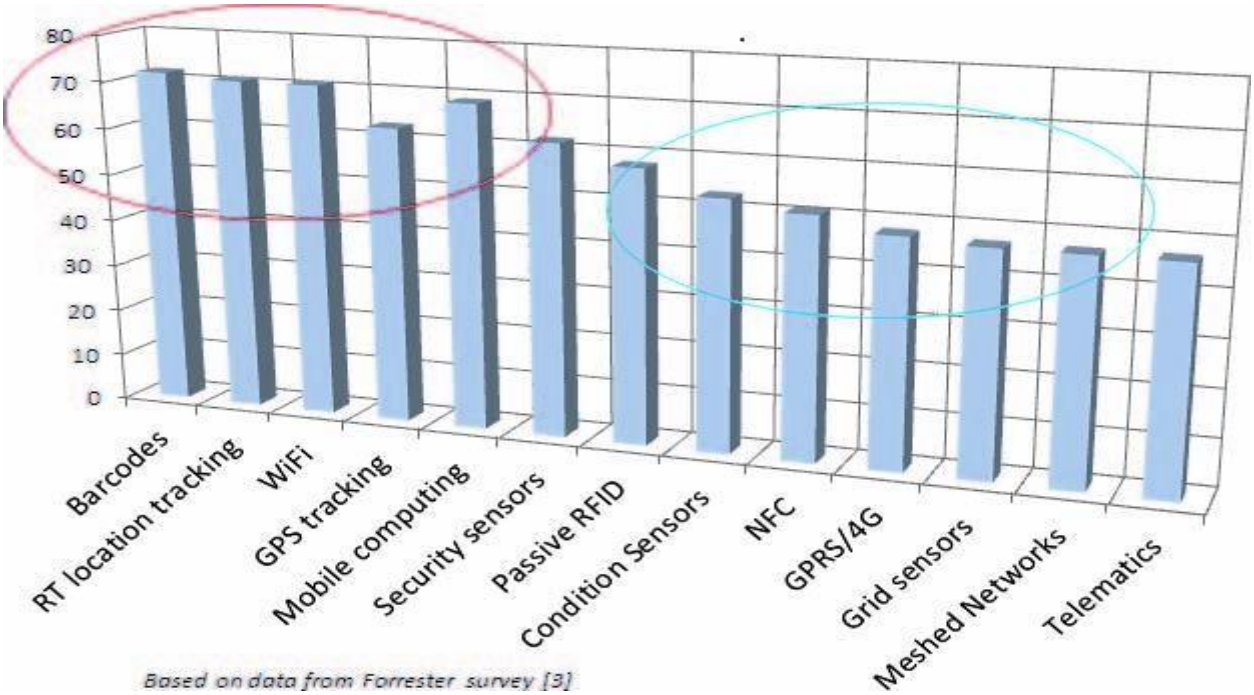
The value question is extremely pertinent in the industry: in the manufacturing industry entire factory related processes, but also in industrial applications where it comes to ensure operation of industrial installations and provide supervision, and improved life service. It is the value which such applications bring which will determine their adoption, acceptance and wide use. However, this value is very difficult to quantify and prove, and it depends on multiple aspects which are strongly application area dependent.

IoT applications form the value creation for industry and brings together expert opinions from academia, research and industry. The industrial application of IoT is multi- facetted and each of the subsections in this paper will highlight an aspect related to industrial application, discuss or show a case or the evolution and potential of a specific technology from industry application point of view. The paper is having a holistic manner to industrial challenges and requirements. Also it will refer to factory concepts and applications supported by IoT, including processes and flows taking a view on related technologies and their evolution.

IoT applications benefit and value creation in an industrial environment may have its origin in different aspects, depending on the application type. There is no value but "values" each contributing to the total benefit such as:

- Value from visibility identification, location tracking
- Value form IoT-supported safety in hard industrial environments
- Value from right information providing or collecting
- Value form improved industrial operation and flows in industry
- Value from reduced production losses
- Value from reduced energy consumption
- Value from new type of processes made possible by IoT applications
- Value form new type of maintenance and lifetime approaches
- Value enabled by smart objects, connected aspects

- Value from sustainability.



View on very important perceived IoT technologies expected to bring value in applications.

The status and estimated potential of IoT applications is presented in the Figure considering three major areas: supply chain, future industry/future factory and over lifetime applications and activities such as logistics, manufacturing and service/maintenance. A strong potential and additional application is expected in industry operation and industry lifetime applications including lifetime service.

Areas	Supply chain	Industry	Lifetime
Activities	Logistics	Manufacturing	Service
IoT **present** Applications and Value	Many	Some	Few
IoT **additional** Applications **Potential**	Increase	Strong	Strong

Figure. Status and estimated potential of IoT applications.

IoT application requirements and capabilities:

The expectations toward IoT applications in industry are high. The capabilities they have to offer are depending strongly on the industrial area and the concrete application. For example the environment where IoT application may be used may range from clean room condition and normal ambient temperatures to heavy and dirty environment, locations with high temperatures, areas with explosion risk, areas with metallic surroundings, and corrosive environment on sea or underground.

A list of a set of industry related capabilities and requirements is presented below, without claiming completeness. The list items are related to the IoT hardware, software and to serviceability and management aspects. Comments have been added to all items to make the requirement more specific. The IoT application capabilities for industrial application should meet requirements such as:

RFID TECHNOLOGY

3.1 Defining RFID:

RFID or Radio Frequency Identification System is a technology-based identification system which helps identifying objects just through the tags attached to them, without requiring any light of sight between the tags and the tag reader. All that is needed is radio communication between the tag and the reader.

Radio Frequency Identification (RFID) technology has been attracting considerable attention with the expectation of improved supply chain visibility for both suppliers and retailers. It will also improve the consumer shopping experience by making it more likely that the products they want to purchase are available.

As the technology keeps on changing day to day with the advancement of science new field of technology is being implemented in industry.

Previously before the introduction of RFID technology, barcodes have been implemented.

3.1.1 BARCODE HISTORY:

The barcode has been introduced in the year 1932 a small group of students from Harvard University, London first developed the concept of Automatic Product identification by passing a high intensity light through Morse code. Which gradually developed to Bar-coding system from the year,1948 soon the bar-coding technology opened for public use from 1967.

In 1967, the first the first bar coding was introduced to the retail world on a packet of Wrigley's Gum. Thirty-eight years later the number of applications bar code technology has exploded, going far beyond.

RFID advantages over barcodes.

1. No line of sight required for reading
2. Multiple items can be read with a single scan

3. Each tag can carry a lot of data (read/write)

4. Individual items identified and not just the category.

5. Passive tags have a virtually unlimited lifetime.

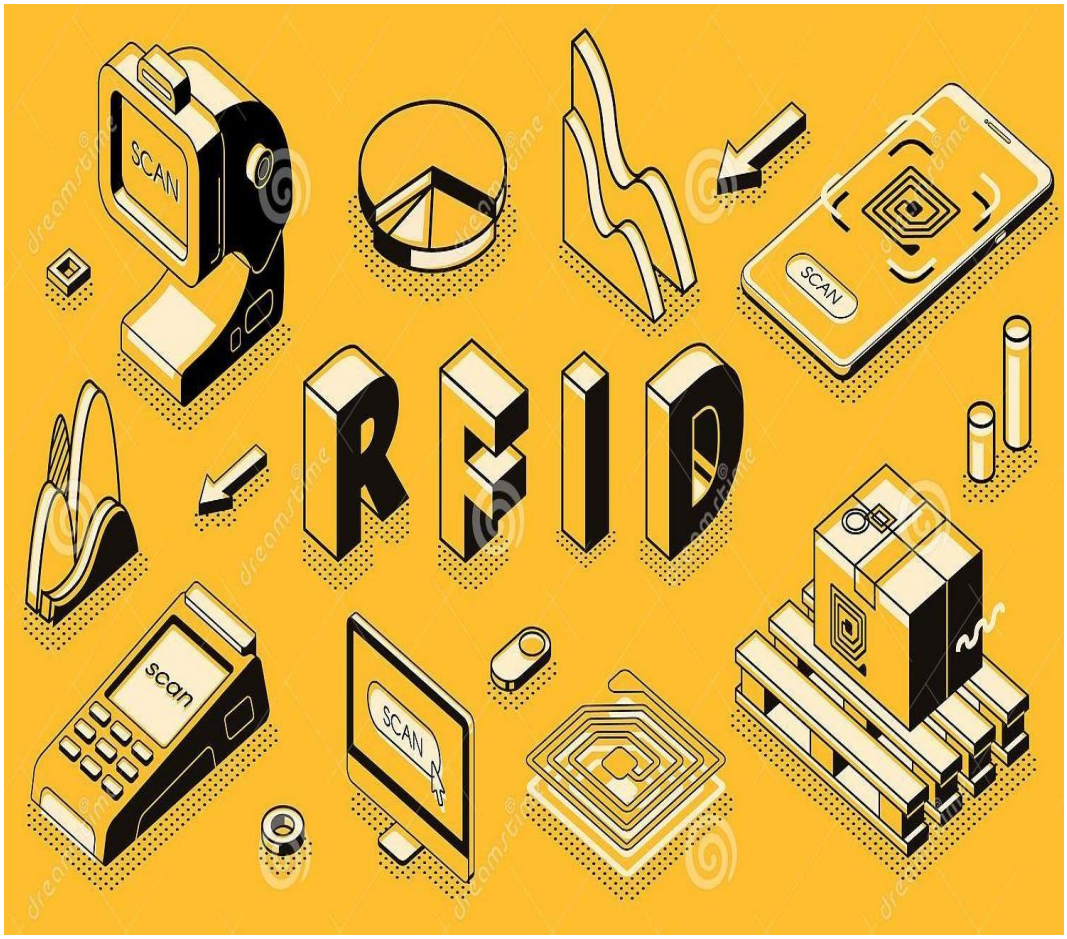


FIG1.1RFID TECHNOLOGY

3.2 RFID IMPLEMENTATION:

The RFID chip has come a long way since its invention, see the journey below:

1940's - Radar technology was used to identify enemy and friendly aircrafts in WWII. Technically this was the first use of RFID

1948 - Scientist and inventor Harry Stockman creates RFID and is credited with the invention.

1963 - Inventor RF Harrington formulates new RFID ideas which include scattering data and information.

1977 - The first RFID transmitting license plate is created.

2000 - By this time over 1000 patents have been submitted using the RFID technology.

Experts believe that RFID will be ubiquitous in 20 years, this may be hard to believe if you are not one of the business on the cutting edge of RFID technology but may have adopted this technology to reduce the cost and streamline operation.

Radio frequency identification (RFID) is a general term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object wirelessly, using radio waves.

RFID technologies are grouped under the more generic Automatic Identification (Auto ID) technologies.

The barcode labels that triggered a revolution in identification systems long time ago, are inadequate in an increasing number of cases. They are cheap but the stumbling block is their low storage capacity and the fact that they cannot be reprogrammed.

A feasible solution was putting the data on silicon chips. The ideal situation is contactless transfer of data between the data carrying device and its reader. The power required to operate the electronic data carrying device would also be transferred from the reader using contactless technology.

These procedures give RFID its name.

One grand commercial vision for RFID is to change the way demand-supply chain moves. In the current almost stone-age scenario, manufacturer produces goods based on forecasts and hopes all of them will be consumed before the shelf life gets them. Good, if the market is consistent. Horrible, if a sudden surge makes the supply fall short and hence everyone in the chain miss on profits. Disastrous, if demand dies suddenly and losses are passed along the chain.

In a not so distant future, RFID enabled stores will monitor the consumption in real time. Shelf will signal the inventory when it needs more stuff and

inventory will pull supplies from the manufacturer based on its level of stock.

Simple concept, not-so-difficult implementation and revolutionary results in the pipeline. That's RFID, in short.

3.3 RFID Technology and Architecture:

Before RFID can be understood completely, it is essential to understand how Radio Frequency communication occurs.

RF (Radio Frequency) communication occurs by the transference of data over electromagnetic waves. By generating a specific electromagnetic wave at the source, its effect can be noticed at the receiver far from the source, which then identifies it and thus the information.

In an RFID system, the RFID tag which contains the tagged data of the object generates a signal containing the rESPective information, which is read by the RFID reader, which then may pass this information to a processor for processing the obtained information for that application.

Thus, an RFID System can be visualized as the sum of the following three components:

1. RFID tag or transponder
2. RFID reader or transceiver
3. Data processing subsystem

An RFID tag is composed of an antenna, a wireless transducer and an encapsulating material. These tags can be either active or passive. While the active tags have on-chip power, passive tags use the power induced by the magnetic field of the RFID reader. Thus, passive tags are cheaper but with lower range (<10mts) and more sensitive to regulatory and environmental constraints, as compared to active tags.

An RFID reader consists of an antenna, transceiver and decoder, which sends periodic signals to inquire about any tag in vicinity. On receiving any signal from a tag, it passes on that information to the data processor.

The data processing subsystem provides the means of processing and storing the data.

3.4 RFID Standards

Standards are critical in RFID. Be it payment systems or tracking goods in open supply chains. A great deal of work has been going on to develop standards for different RFID frequencies and applications.

RFID standards deal with the following: -

- Air Interface Protocol - The way tags and readers communicate
- Data Content - Organizing of data
- Conformance - Tests that products meet the standard
- Applications - How applications are used.

The way the world has gone about developing the standards is a bit complex. There are two major and somewhat conflicting organizations into the business - ISO and Auto-ID Centre (now handled by EPC Global). Without going too much into the conflict, we'll review the standards proposed by both these organizations.

Tags are required to be disposable (manufacturer may not get the tags back from the retailer to reuse it). Hence, the primary mission for any standard developer is to make the tags low cost. It should operate in UHF, as only UHF delivers read range needed for supply chain applications. And since the goods are needed to be tracked as they move across the globe, the standards must be open and globally accepted. There should also be an accompanying network architecture, which would enable anyone to look up information associated with a serial number stored on a tag. The network too needs to be based on open standards.

EPC standards for tags are the class 0 and class 1 tags:

Class 1: a simple, passive, read-only backscatter tag with one-time, field- programmable non-volatile memory.

Class 0: read-only tag that was programmed at the time the microchip was made.

Class 1 and Class 0 have a couple of shortcomings, in addition to the fact that they are not interoperable. One issue is that they are incompatible with ISO standards. The new EPC standard ~V Gen2 is designed to be fast tracked with ISO standards but for some disagreements over the 8-bit Application Family Identifier (AFI).

ISO has developed RFID standards for automatic identification and item management. This standard, known as the ISO 18000 series, covers the air interface protocol for systems likely to be used to track goods in the supply chain. They cover the major frequencies used in RFID systems around the world.

The seven parts are:

- 18000~V1: Generic parameters for air interfaces for globally accepted frequencies
- 18000~V2: Air interface for 135 KHz
- 18000~V3: Air interface for 13.56 MHz
- 18000~V4: Air interface for 2.45 GHz
- 18000~V5: Air interface for 5.8 GHz
- 18000~V6: Air interface for 860 MHz to 930 MHz
- 18000~V7: Air interface at 433.92 MHz

3.5 RFID Applications:

There are two main area of applications, defined broadly as proximity (short range) and vicinity (long range).

Long range or vicinity applications can generally be described as track and trace applications, but the technology provides additional functionality and benefits for product authentication.

RFID enables greater automation of data collection process. Most companies spend considerable effort in knowing what's in their warehouse. RFID will help them dig deeper and much more easily, tracking to the detail of even each unit, long after it has left the factory or warehouse.

RFID allows all this data to be transferred securely. Companies use independent suppliers, data from each of them can be carried on tags and uploaded to the Company's central system.

Imagine the control that the Company will have on a product's life cycle. The creation of successes and defeats can be better understood. There have been numerous instances when companies had to recall the entire product due to a fault in a minor component. Imagine the costs involved in recalling a whole car for a mistake in the AC system! RFIDs can make such recalls much more focussed.

There would be better data about postproduction performance. A car could have individually tagged components. Data could be collected everywhere, accident sites, repair shops, even the garage. Even inside the factory, tags could enable faster and focussed fault tracing.

The Just in Time (JIT) practice followed by many companies, where components are used when they are delivered and delivered just before being needed, can lead to out of stock situations. RFID will eliminate the problem. The eventual aim of RFID in retail and manufacturing ~W eliminate the intermediary. A perfect supply chain would require no distribution center.

Products would be delivered directly from the factory to the retail center. Some other areas where passive RFID has been applied in recent past are:

Person Identification

Food Production Control

Vehicle Parking Monitoring

Toxic Waste Monitoring

Valuable Objects Insurance Identification

Asset Management

Access Control

Short range or proximity applications are typically access control applications. Some main areas are:

Access control

Mass transit ticketing

RFID Security:

Through RFID in the near future, every single object will be connected to the Internet through a wireless address and unique identifier, was quipped by the global head of life science and consumer product industries at Sun Microsystems Inc. Certainly, feels impressive, and let me just help your imagination by setting a perfect scenario. You are sitting at your home watching television on a Sunday afternoon, and you know that your television is connected to the internet. Your couch, table even your dining set is connected to the internet. That is great for the automation!? Now, imagine your shirt, jeans, even your undergarments connected to the internet! It is only a futuristic setup, but the privacy implications of RFID are equivalent in any application of RFID. The basic privacy concerns associated with an RFID system is the ability of ubiquitous tracking of anybody without consent. And with RFID tags getting smaller and smaller, it is now even possible to hide tags in such a way that the consumer may be unaware of the presence of tags.

For example, the tags may be sewn up within garment, or moulded within plastic or rubber. To the extent that researchers have already developed tiny coded beads invisible to human eye that can be embedded in inks to tag currency and other documents, or added to substances like automobile paint, explosives, or other products that law enforcement officers or retailers have a strong interest

in tracking. Researchers say that the technology should be ready for commercial use in 3-6 years.

In summary we can note the following ways in which RFIDs can be used to bypass personal privacy:

By placing RFID tags hidden from eyes and using it for stealth tracking.

Using the unique identifiers provided by RFID for profiling and identifying consumer pattern and behaviour.

Using hidden readers for stealth tracking and getting personal information.

With all these privacy concerns, there is bound to be some effort to thwart such attempt at privacy and maintain the popularity of RFIDs. Researches at various places have yielded the following methods of avoiding above-mentioned attacks. RSA Blocker Tags: These tags are similar in size and appearance to RFID tags, helps in maintaining the privacy of consumer by SpammingT any reader that attempts to scan tags without the right authorization, thus confusing the reader to believe that there are many tags in its proximity.

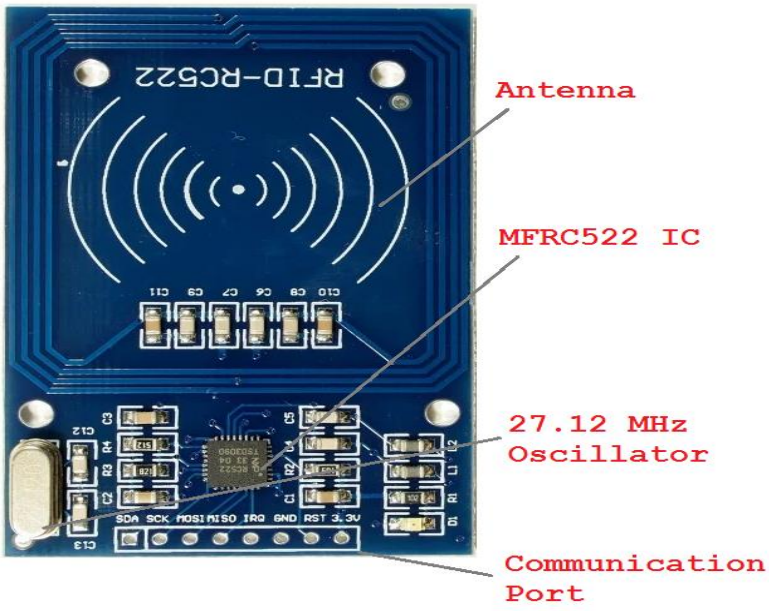
A Basic RFID System:

3 **Main Components of a RFID System**

A RFID tag: It consists of a silicon microchip attached to a small antenna and mounted on a substrate and encapsulated in different materials like plastic or glass veil and with an adhesive on the back side to be attached to objects.

A reader: It consists of a scanner with antennas to transmit and receive signals and is rESPonsible for communication with the tag and receives the information from the tag.

A Processor or a Controller: It can be a host computer with a Microprocessor or a microcontroller which receives the reader input and process the data.



3.6.1 TYPES OF RFID TAGS:

Passive Tags – It is the cheaper version using no battery. The Tag uses radio energy transmitting from the reader. So, the Reader must be close to the tag to transfer energy to power the Tag. Since the tags have unique serial number, the reader can recognize them individually.

Active Tags– These have an on-board battery and periodically transmits ID signals to the reader.

Battery Assisted Passive or BAP– These Tags have small battery on board and will be activated in the presence of signals from the reader.

Read only Tags – These have a unique factory assigned serial number used as the key for the data base.

Read/ Write Tags – These can write object specific data give by the system user.

Field programmable Tags– These can write once but read many times. Black tags can be written with an electronic product code by the user.

3.7 Operating Frequencies:

Different types of RFID systems operate at different radio frequency. Eachradio frequency has its own read distance, power requirements and performance. The choice of frequency depends on the

application. Mostly four types of frequencies are used in RFID technology:

A. Low frequency (120-140 KHz) - Low frequency RFID tags operate in low frequency range. Low frequency tags are used for depositing and withdraw and controlling following with the assets.

B. High frequency (13.56 MHz) - High frequency RFID tags operate in high frequency range. HF tagsare useful for asset-tracking applications, contact- less credit cards and ID badges.

C. The ultra-high frequency (869 MHz-928 MHz)-UHF RFID tag operate in 869 MHz - 928MHz.UHFtags are used in supply chain management applications. tags offer the longer reading range and are cheaper to manufacture in bulk.

D. Microwave (2.4 GHz-2.5 GHz) - Microwave system offers higher read rate. Microwave tags are expensive than UHF tags. Microwave tags are used in electronic toll applications.

3.8 RFID NEAR FIELD AND FAR FIELD:

Near-field RFID Faraday's principle of magnetic induction is the basis of near-field coupling between a reader and tag. A reader passes a large alternating current through a reading coil, resulting in an alternating magnetic field in its locality. If you place a tag that incorporates a smaller coil in this field, an alternating voltage will appear across it. If this voltage is rectified and coupled to a capacitor, a reservoir of charge accumulates, which you can then use to power the tag chip. Tags that use near-field coupling send data back to the reader using load modulation. Because any current drawn from the tag coil will give rise to its own small magnetic field—which will oppose the reader's field—the reader coil can detect this as a small increase in current flowing through it. This current is proportional to the load applied to the tag's coil (hence load modulation). This is the same principle used in power transformers found in most homes today—although usually a transformer's primary and secondary coil are wound closely together to ensure efficient power transfer. However, as the magnetic field extends beyond the primary coil, a secondary coil can still acquire some of the energy at a distance, similar to a reader and a tag. Thus, if the tag's electronics applies a load to its own antenna coil and varies it over time, a signal can be encoded as tiny variations in the magnetic field strength representing the tag's ID. The reader can then recover this signal by monitoring the change in current through the reader coil. A variety of modulation encodings are possible depending on the number of ID bits required, the

data transfer rate, and additional redundancy bits placed in the code to remove errors resulting from noise in the communication channel. Near-field coupling is the most straightforward approach for implementing a passive RFID system. This is why it was the first approach taken and has resulted in many subsequent standards, such as ISO 15693 and 14443, and a variety of proprietary solutions. However, near-field communication has some physical limitations.. Thus, as the frequency of operation increases, the distance over which near-field coupling can operate decreases. A further limitation is the energy available for induction as a function of distance from the reader coil. The magnetic field drops off at a factor of 1/r3, where r is the separation of the tag and reader, along a center line perpendicular to the coil's plane. So, as applications require more ID bits as well as discrimination between multiple tags in the same locality for a fixed read time, each tag requires a higher data rate and thus a higher operating frequency. These design pressures have led to new passive RFID design.

Far-field RFID tags based on far-field emissions capture EM waves propagating from a dipole antenna attached to the reader. A smaller dipole antenna in the tag receives this energy as an alternating potential difference that appears across the arms of the dipole. A diode can rectify this potential and link it to a capacitor, which will result in an accumulation of energy in order to power its electronics. However, unlike the inductive designs, the tags are beyond the range of the reader's near field, and information can't be transmitted back to the reader using load modulation. The technique designers use for commercial far-field RFID tags is back scattering. If they design an antenna with precise dimensions, it can be tuned to a frequency and absorb most of the energy that reaches it at that frequency. However, if an impedance mismatch occurs at this frequency, the antenna will reflect some of the energy (as tiny waves) toward the reader, which can then detect the energy using a sensitive radio receiver. By changing the antenna's impedance over time, the tag can reflect more or less of the incoming signal in a pattern that encodes the tag's ID. In practice, you can detune a tag's antenna for this purpose by placing a transistor across its dipole and then turning it partially on and off. As a rough design guide, tags that use far-field principles operate at greater than 100 MHz typically in the ultra-high- frequency (UHF) band (such as 2.45 GHz); below this frequency is the domain of RFID based on near-field coupling. A far-field system's range is limited by the amount of energy that reaches the tag from the reader and by how sensitive the reader's radio receiver is to the reflected signal. The actual return signal is very small, because it's the result of two attenuations, each based on an inverse square law—the first attenuation occurs as EM waves radiate from the reader to the tag, and the second when reflected

waves travel back from the tag to the reader. Thus, the returning energy is 1/r4 (again, r is the separation of the tag and reader). Fortunately, thanks to Moore's law and the shrinking feature size of semiconductor manufacturing, the energy required to power a tag at a given frequency continues to decrease (currently as low as a few microwatts). So, with modern semiconductors, we can design tags that can be read at increasingly greater distances than were possible a few years ago. Furthermore, inexpensive radio receivers have been developed with improved sensitivity so they can now detect signals, for a reasonable cost, with power levels on the order of – 100 dBm in the 2.4-GHz band. A typical far-field reader can successfully interrogate tags 3 m away, and some RFID companies claim their products have read ranges of up to 6 m. EPC global's work was key to promoting the design of UHF tags , which has been the basis of RFID trials at both Walmart and Tesco . EPC global was originally the MIT Auto-ID Centre, a non-profit organization set up by the MIT Media Lab. The centre later divided into Auto-ID labs, still part of MIT, and EPC global, a commercial company. This company has defined an extensible range of tag standards, but its Class-1 Generation-1 96-bit tag is the one receiving the most attention of late. This tag can label over 50 quadrillion (50 1015) items, making it possible to uniquely label every manufactured item for the foreseeable future—not just using generic product codes. This isn't necessary for basic inventory control, but it has implications for tracing manufacturing faults and stolen goods and for detecting forgery. It also offers the more controversial post-sale marketing opportunities, enabling direct marketing based on prior purchases.

3.8.1 RFID communication:

1. Host manages Reader(s) and issues Commands
2. Reader and tag communicate via RF signal
3. Carrier signal generated by the reader
4. Carrier signal sent out through the antennas
5. Carrier signal hits tag(s) Tag receives and modifies carrier signal –sends back‖ modulated signal (Passive Backscatter – also referred to as ―field disturbance device‖).
6. Antennas receive the modulated signal and send them to the Reader.

7. Reader decodes the data.

8. Results returned to the host application.

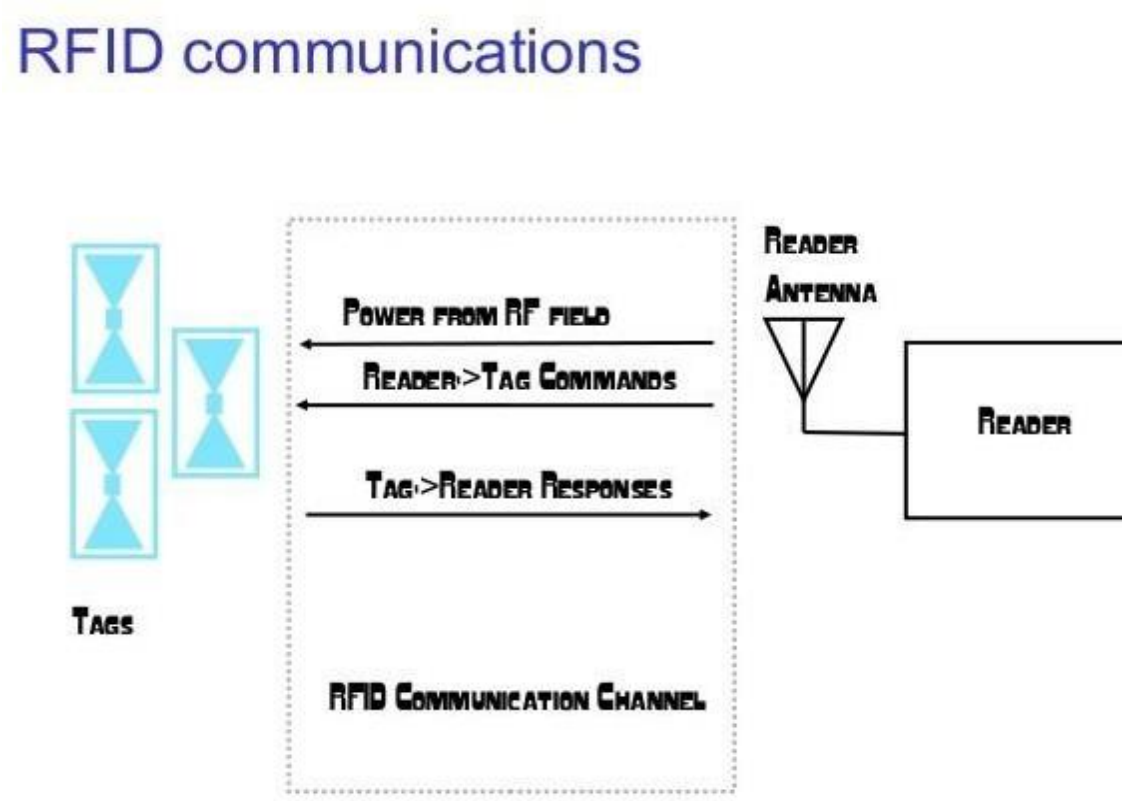
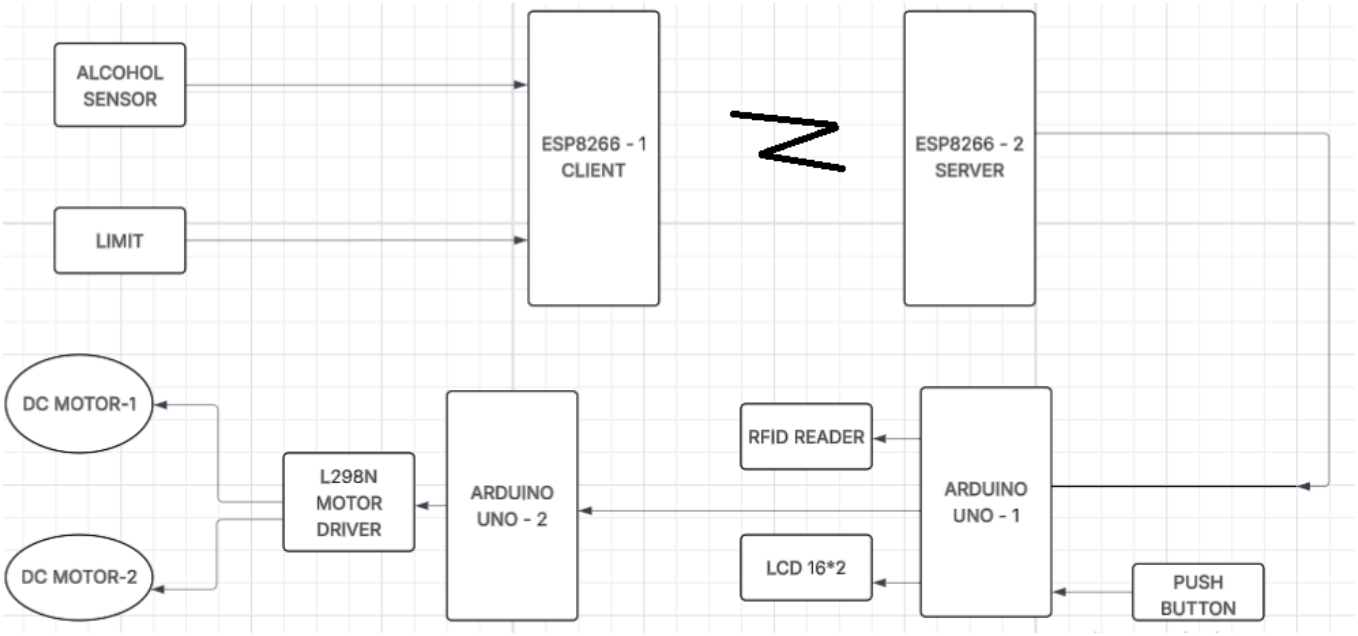


FIG: RFID COMMUNICATION

BLOCK DIAGRAM OF PROPOSED METHOD:-



Block Diagram of SMART HELMET

ALGORITHM:-

Step-1: First before giving power supply check your device properly, so that to prevent power glitches which may damage your device.

Step-2. Charge the batteries fully as DC motors are drawing much current.

Step-3. Power up two ESP866 controller and two arduino boards.

Step-4. Turn on HOTSPOT of your mobile.

Step-5. Connect both the ESP8266 with your mobile hotspot.

Step-6. Dump the given respective codes on ESP8266 and check whether client and server are connected to each other with the same wifi or not.

Step-7.Dump the other two codes on two arduino's.

Step-8.Now press push button which is connected to Arduino uno-1, then check the LCD which shows a message to wear helmet.

Step-9. Please wear helmet and wait for some time, then ESP8266 – 1(helmet) sends a message to ESP8266-2 (Velhicle). Then check the LCD which shows “Successfully weared helmet”.

Step-10. Now on LCD it shows a message to scan License.

Step-11.Scan a tag at RFID reader.

Step-12.It will show License Scanned and your dc motors started rotating.

HARDWARE COMPONENTS:

Arduino is an open-source AREF stands for Analog Reference. It is sometimes, used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input pins. electronics prototyping platform based on flexible, easy-to-use hardware and software. It's intended for artists, designers, hobbyists, and anyone interested in creating interactive objects or environments.

Arduino can sense the environment by receiving input from a variety of sensors and can affect its surroundings by controlling lights, motors, and other actuators. The microcontroller on the board is programmed using the Arduino programming language (based on Wiring) and the Arduino development environment (based on Processing). Arduino projects can be stand-alone or they can communicate with software on running on a computer (e.g. Flash, Processing, MaxMSP).

Specifications:

Microcontroller	Atmel ATmega328 Operating Voltage (logic level) 5 V
Input Voltage (recommended)	7-12 V Input Voltage (limits) 6-20 V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	8
DC Current per I/O Pin	40 mA
Flash Memory	32 KB (of which 2KB used by bootloader)
SRAM	2 KB
EEPROM	1 KB
Clock Speed	16 MHz
Dimensions	0.70‖ x 1.70‖

Features:

- Automatic reset during program download
- Power OK blue LED
- Green (TX), red (RX) and orange (L) LED
- Auto sensing/switching power input
- Small mini-B USB for programming and serial monitor
- ICSP header for direct program download

- Standard 0.1‖ spacing DIP (breadboard friendly)
- Manual reset switch

BOARD DESCRIPTION:

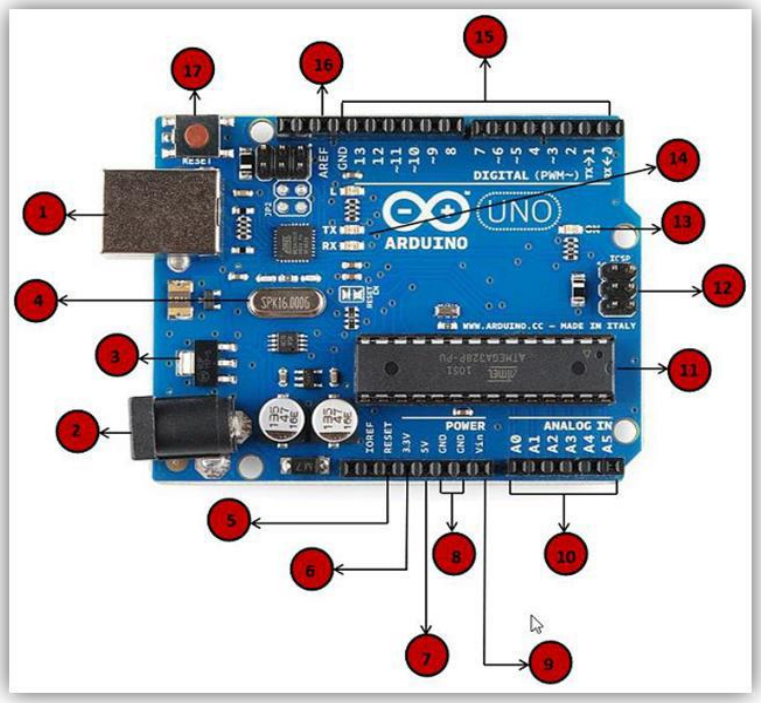


Fig: Arduino board description

1	Power USB Arduino board can be powered by using the USB cable from your computer. All you need to do is connect the USB cable to the USB connection (1).
2	Power (Barrel Jack) Arduino boards can be powered directly from the AC mains power supply by connecting it to the Barrel Jack (2).

Pin specification of Arduino:

3	Voltage Regulator The function of the voltage regulator is to control the voltage given to the Arduino board and stabilize the DC voltages used by the processor and other elements.

4	Crystal Oscillator The crystal oscillator helps Arduino in dealing with time issues. How does Arduino calculate time? The answer is, by using the crystal oscillator. The number printed on top of the Arduino crystal is 16.000H9H. It tells us that the frequency is 16,000,000 Hertz or 16 MHz.
5,17	Arduino Reset You can reset your Arduino board, i.e., start your program from the beginning. You can reset the UNO board in two ways. First, by using the reset button (17) on the board. Second, you can connect an external reset button to the Arduino pin labelled RESET (5).
6,7 8,9	Pins (3.3, 5, GND, Vin) • 3.3V (6) − Supply 3.3 output volt • 5V (7) − Supply 5 output volt • Most of the components used with Arduino board works fine with 3.3 volt and 5 volt. • GND (8)(Ground) − There are several GND pins on the Arduino, any of which can be used to ground your circuit. • Vin (9) − This pin also can be used to power the Arduino board from an external power source, like AC mains power supply.
10	Analog pins The Arduino UNO board has six analog input pins A0 through A5. These pins can read the signal from an analog sensor like the humidity sensor or temperature sensor and convert it into a digital value that can be read by the microprocessor.
11	Main microcontroller Each Arduino board has its own microcontroller (11). You can assume it as the brain of your board. The main IC (integrated circuit) on the Arduino is slightly different from board to board. The microcontrollers are usually of the ATMEL Company. You must know what IC your board has before loading up a new program from the Arduino IDE. This information is available on the top of the IC. For more details about the IC construction and functions, you can refer to the data sheet.

	ICSP pin Mostly, ICSP (12) is an AVR, a tiny programming header for the Arduino consisting of MOSI, MISO, SCK, RESET, VCC, and GND. It is often referred to as an SPI (Serial Peripheral Interface), which could be considered as an "expansion" of the output. Actually, you are slaving the output device to the master of the SPI bus.
	Power LED indicator This LED should light up when you plug your Arduino into a power source to indicate that your board is powered up correctly. If this light does not turn on, then there is something wrong with the connection.
	TX and RX LEDs On your board, you will find two labels: TX (transmit) and RX (receive). They appear in two places on the Arduino UNO board. First, at the digital pins 0 and 1, to indicate the pins rESPonsible for serial communication. Second, the TX and RX led (13). The TX led flashes with different speed while sending the serial data. The speed of flashing depends on the baud rate used by the board. RX flashes during the receiving process.
	Digital I/O The Arduino UNO board has 14 digital I/O pins (15) (of which 6 provide PWM (Pulse Width Modulation) output. These pins can be configured to work as input digital pins to read logic values (0 or 1) or as digital output pins to drive different modules like LEDs, relays, etc. The pins labeled ⎓~‖ can be used to generate PWM.
	AREF AREF stands for Analog Reference. It is sometimes, used to set an external reference voltage (between 0 and 5 Volts) as the upper limit for the analog input pins.

ESP8266:

The **ESP8266** is a low-cost Wi-Fi microcontroller, with built-in TCP/IP networking software, and microcontroller capability, produced by Espressif Systems[1] in Shanghai, China.

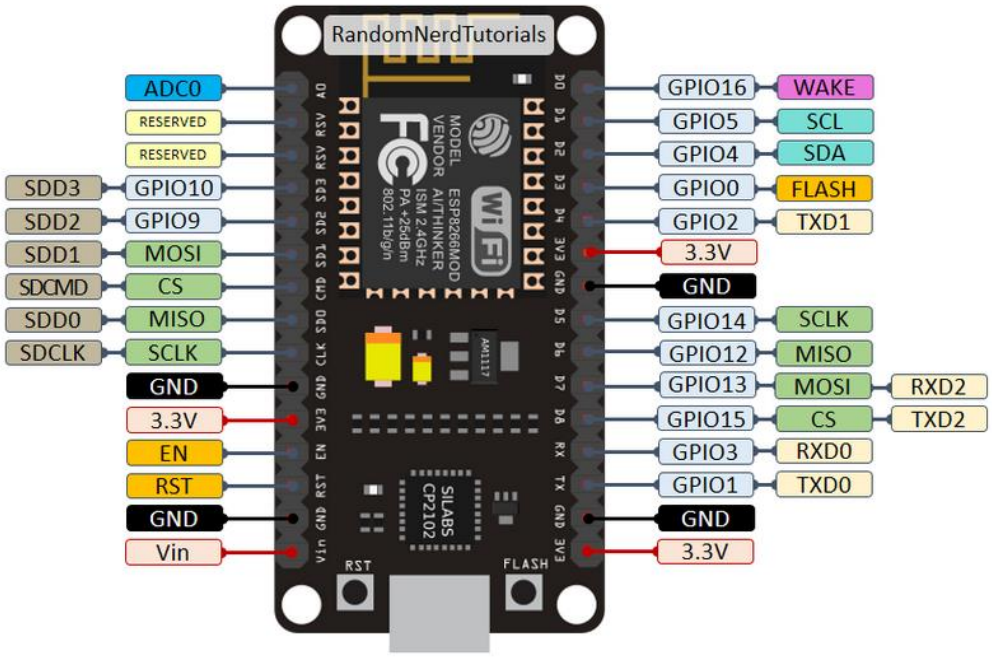
The chip was popularized in the English-speaking maker community in August 2014 via the **ESP-01** module, made by a third-party manufacturer Ai-Thinker. This small module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at first, there was almost no English-language documentation on the chip and the commands it accepted.[2] The very low price and the fact that there were very few external components on the module, which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, the chip, and the software on it, as well as to translate the Chinese documentation.[3]

The **ESP8285** is a similar chip with a built-in 1 MiB flash memory, allowing the design of single-chip devices capable of connecting via Wi-Fi.[4]

These microcontroller chips have been succeeded by the ESP32 family of devices.

Origin

- ESPressif Systems, a fabless semiconductor company based in Shanghai, China, is the developer of the ESP32 series.
- Before ESP32, ESPressif gained popularity with the ESP8266 in 2014, which became a game-changer for affordable Wi-Fi-enabled IoT projects.
- Due to the success of ESP8266 and increasing demand for more powerful features (dual-core, Bluetooth, better security), ESPressif developed the ESP32.



One important thing to notice about ESP8266 is that the GPIO number doesn't match the label on the board silkscreen. For example, D0 corresponds to GPIO16 and D1 corresponds to GPIO5.

The following table shows the correspondence between the labels on the silkscreen and the GPIO number as well as what pins are the best to use in your projects, and which ones you need to be cautious.

The pins highlighted in green are OK to use. The ones highlighted in yellow are OK to use, but you need to pay attention because they may have unexpected behavior mainly at boot. The pins highlighted in red are not recommended to use as inputs or outputs.

Label	GPIO	Input	Output	Notes
D0	**GPIO16**	no interrupt	no PWM or I2C support	HIGH at boot used to wake up from deep sleep
D1	**GPIO5**	OK	OK	often used as SCL (I2C)
D2	**GPIO4**	OK	OK	often used as SDA (I2C)
D3	**GPIO0**	pulled up	OK	connected to FLASH button, boot fails if pulled LOW
D4	**GPIO2**	pulled up	OK	HIGH at boot connected to on-board LED, boot fails if pulled LOW
D5	**GPIO14**	OK	OK	SPI (SCLK)
D6	**GPIO12**	OK	OK	SPI (MISO)
D7	**GPIO13**	OK	OK	SPI (MOSI)
D8	**GPIO15**	pulled to GND	OK	SPI (CS) Boot fails if pulled HIGH
RX	**GPIO3**	OK	RX pin	HIGH at boot
TX	**GPIO1**	TX pin	OK	HIGH at boot debug output at boot, boot fails if pulled LOW
A0	**ADC0**	Analog Input	X	

LCD (LIQUID CRYSTAL DISPLAY):

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels. It is is a thin, flat display device made up of any number of color or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other. Without the liquid crystals between them, light passing through one would be blocked by the other. The liquid crystal twists the polarization of light

entering one filter to allow it to pass through the other.

Types of LCDs

Types of LCDs include:

- Twisted Nematic (TN)- which are inexpensive while having high response times. However, TN displays have low contrast ratios, viewing angles and color contrasts.
- In Panel Switching displays (IPS Panels)- which boast much better contrast ratios, viewing angles and colour contrast when compared to TN LCDs.
- Vertical Alignment Panels (VA Panels)- which are seen as a medium quality between TN and IPS displays.
- Advanced Fringe Field Switching (AFFS)- which is a top performer compared IPS displays in colour reproduction range.

Many microcontroller devices use 'smart LCD' displays to output visual information. LCD displays designed around LCD NT-C1611 module, are inexpensive, easy to use, and it is even possible to produce a readout using the 5X7 dots plus cursor of the display. They have a standard ASCII set of characters and mathematical symbols. For an 8-bit data bus, the display requires a +5V supply plus 10 I/O lines (RS RW D7 D6 D5 D4 D3 D2 D1 D0). For a 4-bit data bus it only requires the supply lines plus 6 extra lines(RS RW D7 D6 D5 D4). When the LCD display is not enabled, data lines are tri-state and they do not interfere with the operation of the microcontroller.

FEATURES:

1. Interface with either 4-bit or 8-bitmicroprocessor.
2. Display data RAM
3. bits(80 characters).
4. Character generator ROM
5. 160 different dotmatrix character patterns.
6. Character generator RAM
7. 8 different user programmed dotmatrix patterns.
8. Display data RAM and character generator RAM may be Accessed by the microprocessor.
9. Numerous instructions

10. Clear Display, Cursor Home, Display ON/OFF, Cursor ON/OFF, Blink Character, Cursor Shift, Display Shift.
11. Built-in reset circuit is triggered at power ON.
12. Built-in oscillator.

PIN DESCRIPTION:

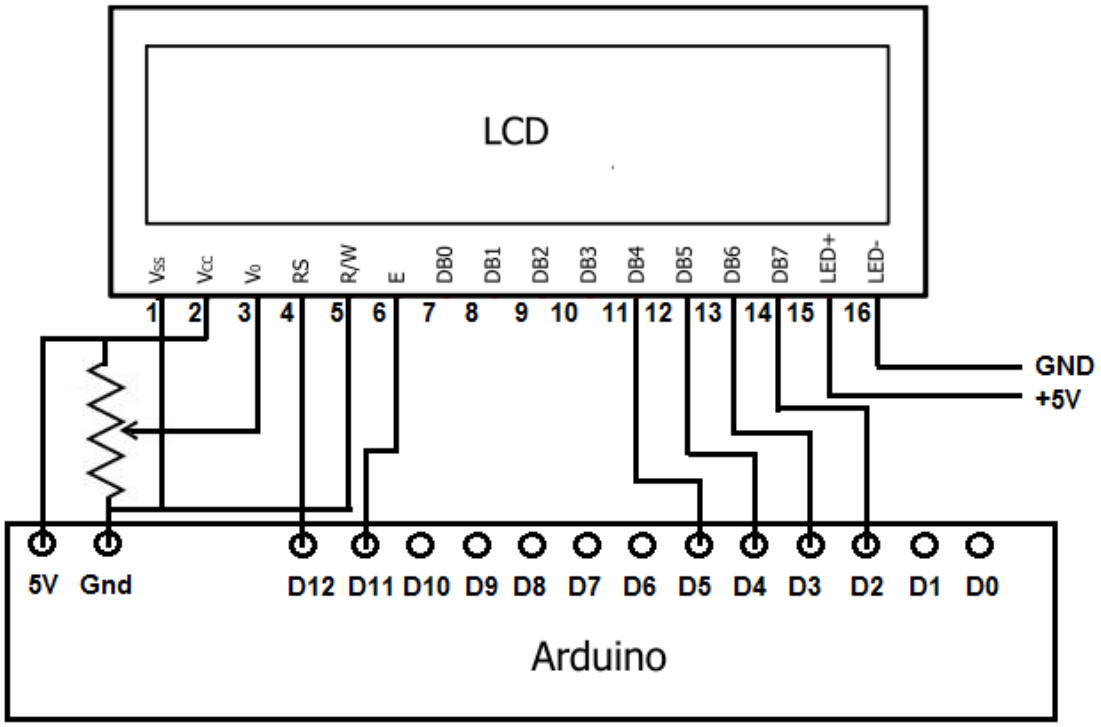


Fig: pin diagram of 1x16 lines LCD

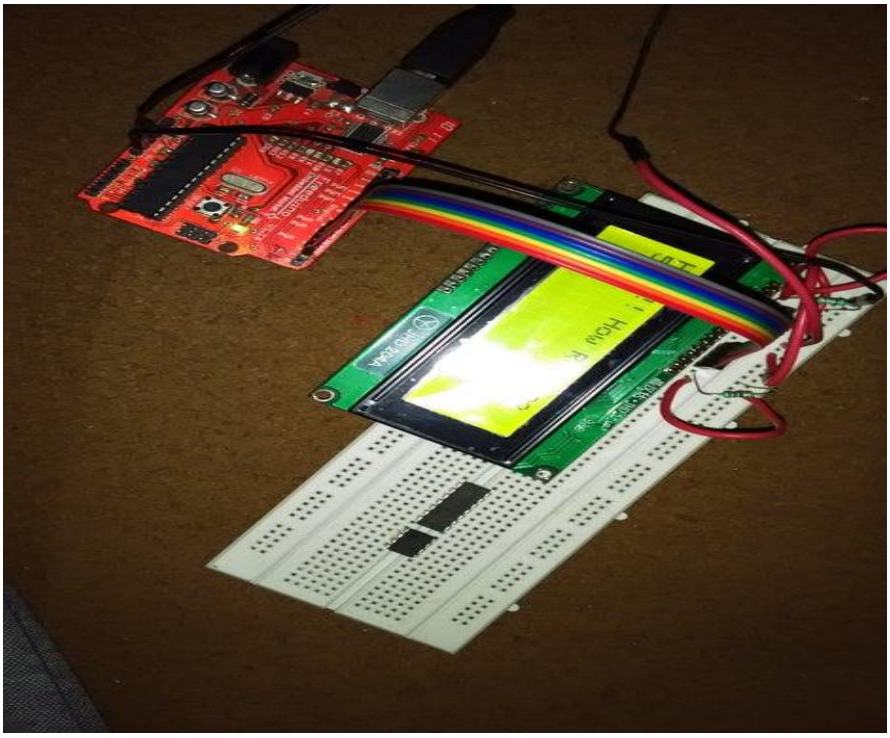


Fig: pin diagram of 1x16 lines LCD

Table: Pin Specifications of LCD:

PIN	SYMBOL	FUNCTION
1	Vss	Power Supply(GND)
2	Vdd	Power Supply(+5V)
3	Vo	Contrast Adjust
4	RS	Instruction/Data Register Select
5	R/W	Data Bus Line
6	E	Enable Signal
7-14	DB0-DB7	Data Bus Line
15	A	Power Supply for LED B/L(+)
16	K	Power Supply for LED B/L(-)

FEATURES:

- 5 x 8 dots with cursor
- Built-in controller (KS 0066 or Equivalent)
  - + 5V power supply (Also available for + 3V)
- 1/16 duty cycle
- B/L to be driven by pin 1, pin 2 or pin 15, pin 16 or A.K (LED)
- N.V. optional for + 3V power supply

PUSH BOTTON:

A push button is a simple type of switch that controls an action in a machine or some type of process. Most of the time, the buttons are plastic or metal.

The shape of the push button may conform to fingers or hands for easy use, or they may simply be flat. It all depends on the individual design. The push button can be normally open or normally closed.

WORKING:

Push button switches have three parts. The actuator, stationary contacts, and the grooves. The actuator will go all the way through the switch and into a thin cylinder at the bottom. Inside is a movable contact and spring. When someone presses the button, it touches with the stationary contacts, causing the action to take place. In some cases, the user needs to keep holding the button, or to press it repeatedly, for an action to take place. With other push buttons, a latch connects and keeps the switch on until the user presses the button again.

APPLICATIONS:

Push button switches are popular in a variety of different applications, including calculators, push button phones, and many home appliances. You can find them in the home, the office, and in industrial applications today. They can turn machines on and off, or cause the devices to perform specific actions, as is the case with calculators. In some cases, specifically for commercial and industrial usage, the buttons can connect through mechanical linkage, which means that pushing one button can actually cause another button to release.

In many cases, the buttons will have specific coloration to help denote their actions. This ensures that the chance of someone pushing the button by mistake is lower. Red will usually indicate stopping, while green generally indicates starting a machine. Emergency stop buttons, which tend to be large push buttons, are generally red, and they typically have larger heads for easier use.

MQ135 air quality sensor:

A device that is used to detect or measure or monitor the gases like ammonia, benzene, sulfur, carbon dioxide, smoke, and other harmful gases are called as an air quality gas sensor. The MQ135 air quality sensor, which belongs to the series of MQ gas sensors, is widely used to detect harmful gases, and smoke in the fresh air. This article gives a brief description of how to measure and detect gases by using an MQ135 air quality sensor.

The alternatives for the MQ135 air quality sensor/detector are MQ-2 (methane, LPG, butane, and smoke), MQ-3 (alcohol, smoke, and ethanol), MQ-4 (CNG gas and methane), MQ-5 (natural gas, and LPG), MQ-6 (butane and LPG), MQ-7 (CO), MQ-8 (Hydrogen), MQ-9 (CO, and flammable gases), MQ131 (ozone), MQ136 (Hydrogen sulfide gas), MQ137 (ammonia), MQ138 (benzene, alcohol, propane, toluene, formaldehyde gas, and hydrogen), MQ214 (methane, and natural gas), MQ303A (alcohol, smoke, Ethanol), MQ306A (LPG and butane), MQ307A(CO), MQ309A(CO and flammable gas).

What is an MQ135 Air Quality Sensor?

An MQ135 air quality sensor is one type of MQ gas sensor used to detect, measure, and monitor a wide range of gases present in air like ammonia, alcohol, benzene, smoke, carbon dioxide, etc. It operates at a 5V supply with 150mA consumption. Preheating of 20 seconds is required before the operation, to obtain the accurate output.

It is a semiconductor air quality check sensor suitable for monitoring applications of air quality. It is highly sensitive to NH3, NOx, CO2, benzene, smoke, and other dangerous gases in the atmosphere. It is available at a low cost for harmful gas detection and monitoring applications.

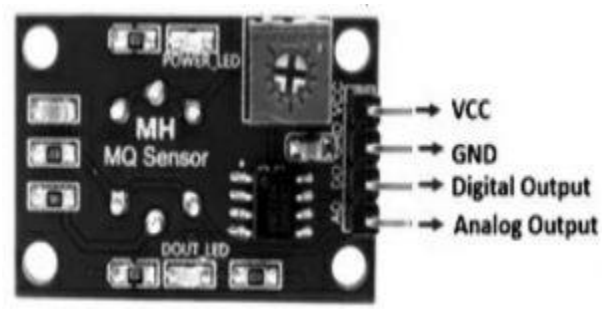
If the concentration of gases exceeds the threshold limit in the air, then the digital output pin goes high. The threshold value can be varied by using the potentiometer of the sensor. The analog output voltage is obtained from the analog pin of the sensor, which gives the approximate value of the gas level present in the air.

Pin Configuration:

The MQ135 air quality sensor is a 4-pin sensor module that features both analog and digital output from the corresponding pins. The **MQ135 air quality sensor pin configuration** is shown below.

For MQ135 Air Quality Sensor Module:

The MQ135 air quality sensor module is shown below.



MQ135 Air Quality Sensor Pin Configuration

Pin 1: VCC: This pin refers to a positive power supply of 5V that power up the MQ135 sensor module.

Pin 2: GND (Ground): This is a reference potential pin, which connects the MQ135 sensor module to the ground.

Pin 3: Digital Out (Do): This pin refers to the digital output pin that gives the digital output by adjusting the threshold value with the help of a potentiometer. This pin is used to detect and measure any one particular gas and makes the MQ135 sensor work without a microcontroller.

Pin 4: Analog Out (Ao): This pin generates the analog output signal of 0V to 5V and it depends on the gas intensity. This analog output signal is proportional to the gas vapor concentration, which is measured by the MQ135 sensor module. This pin is used to measure the gases in PPM. It is driven by TTL logic, operates with 5V, and is mostly interfaced with microcontrollers.

Limit Switch:

In electrical engineering, a **limit switch** is a switch operated by the motion of a machine part or the presence of an object. A limit switch can be used for controlling machinery as part of a control system, as a safety interlock, or as a counter enumerating objects passing a point.

Limit switches are used in a variety of applications and environments because of their ruggedness, ease of installation, and reliability of operation. They can determine the presence, passing, positioning, and end of travel of an object. They were first used to define the limit of travel of an object, hence the name "limit switch".

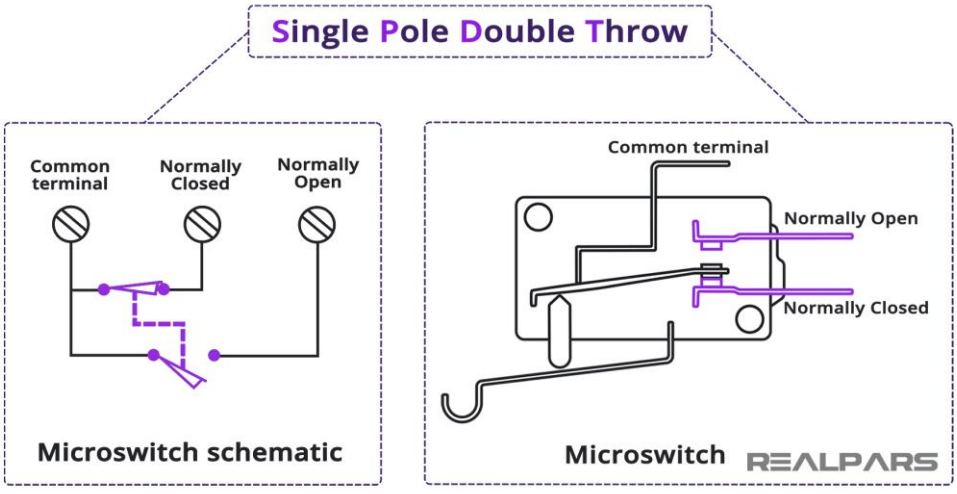
Standardized limit switches are industrial control components manufactured with a variety of operator types, including lever, roller plunger, and whisker type. Limit switches may be directly mechanically operated by the motion of the operating lever. A reed switch may be used to indicate proximity of a magnet mounted on some moving part. Proximity switches operate by the disturbance of an electromagnetic field, by capacitance, or by sensing a magnetic field.

How Do Limit Switches Work?

Alright….now that we've looked at a couple of limit switch applications where you might see them in action at home, let's have a closer look at the device itself.

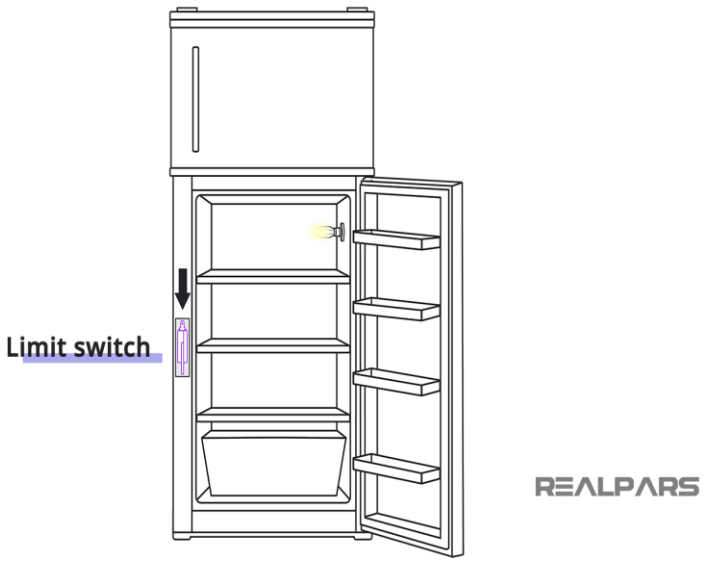
Limit switches are electromechanical devices consisting of an actuator mechanically linked to an electrical switch.

When an object contacts the actuator, the switch will operate causing an electrical connection to make or break.



Limit switches applications

When you open the fridge door, a light comes on inside. How does that happen? Yes…. you guessed it! A limit switch is used to detect if the fridge door is open or closed.



Let's look at another application of a limit switch that you may encounter at home. On many overhead garage doors, there is a limit switch that stops the movement of the door when it reaches its fully opened position.

L298N MOTOR DRIVER:

Controlling a DC Motor

We can only have full control over a DC motor if we can control its speed and spinning direction. This is possible by combining these two techniques.

- PWM – to control speed
- H-Bridge – to control the spinning direction

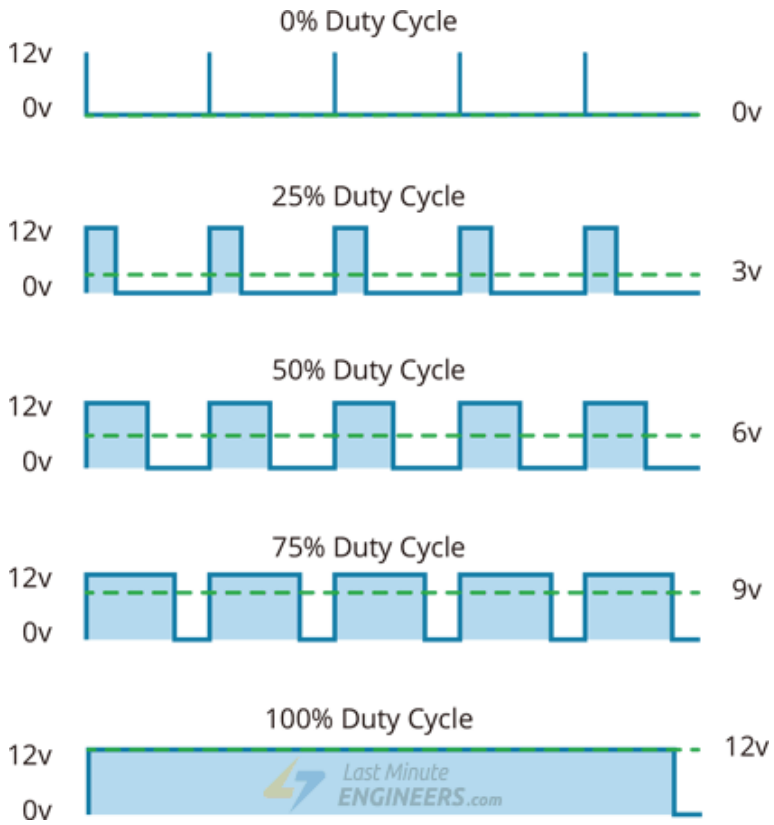
PWM – to control speed

The speed of a DC motor can be controlled by changing its input voltage. A widely used technique to accomplish this is Pulse Width Modulation (PWM).

PWM is a technique in which the average value of the input voltage is adjusted by sending a series of ON-OFF pulses. This average voltage is proportional to the width of the pulses, which is referred to as the Duty Cycle.

The higher the duty cycle, the higher the average voltage applied to the DC motor, resulting in an increase in motor speed. The shorter the duty cycle, the lower the average voltage applied to the DC motor, resulting in a decrease in motor speed.

The image below shows PWM technique with various duty cycles and average voltages.



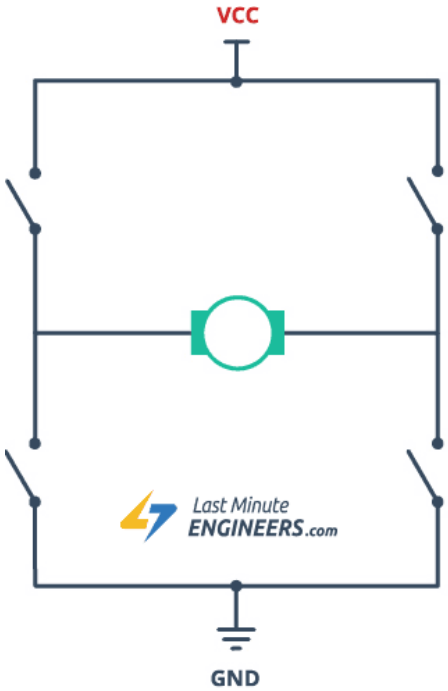
Pulse Width Modulation(PWM) Technique

H-Bridge – to control the spinning direction

The spinning direction of a DC motor can be controlled by changing the polarity of its input voltage. A widely used technique to accomplish this is to use an H-bridge.

An H-bridge circuit is made up of four switches arranged in a H shape, with the motor in the center. Closing two specific switches at the same time reverses the polarity of the voltage applied to the motor. This causes a change in the spinning direction of the motor.

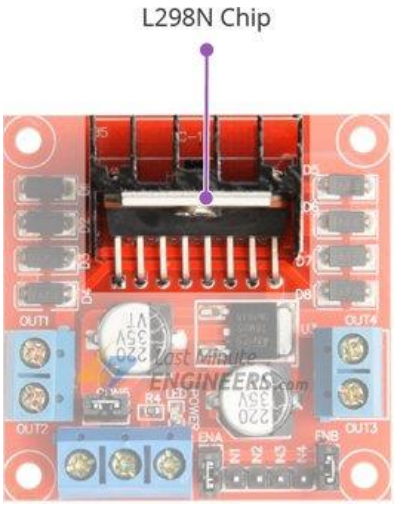
The following animation shows the working of the H-bridge circuit.



Working of H-Bridge

L298N Motor Driver Chip

At the center of the module is a big, black chip with a chunky heat sink – the L298N.



The L298N chip contains two standard H-bridges capable of driving a pair of DC motors, making it ideal for building a two-wheeled robotic platform.

The L298N motor driver has a supply range of 5V to 35V and is capable of 2A continuous current per channel, so it works very well with most of our DC motors.

Technical Specifications

Here are the specifications:

Motor output voltage	5V – 35V
Motor output voltage (Recommended)	7V – 12V

Logic input voltage	5V – 7V
Continuous current per channel	2A
Max Power Dissipation	25W

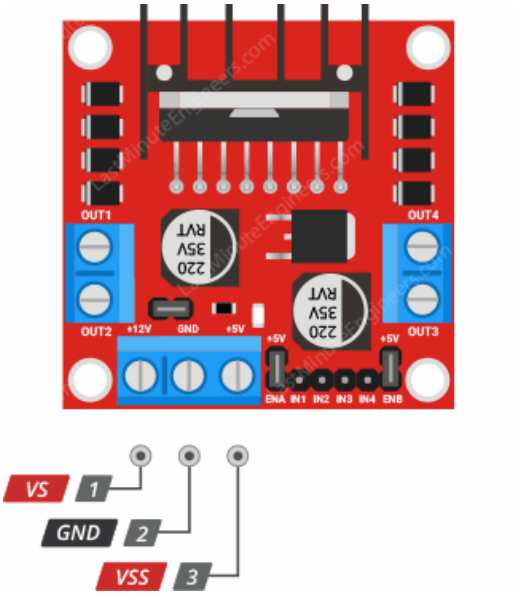
L298N Motor Driver Module Pinout

The L298N module has 11 pins that allow it to communicate with the outside world. The pinout is as follows:

Let’s get acquainted with each pin one by one.

Power Pins

The L298N motor driver module receives power from a 3-pin, 3.5mm-pitch screw terminal.



The L298N motor driver has two input power pins: VS and VSS.

VS pin powers the IC’s internal H-Bridge, which drives the motors. This pin accepts input voltages ranging from 5 to 12V.

VSS is used to power the logic circuitry within the L298N IC, and can range between 5V and 7V.

GND is the common ground pin.

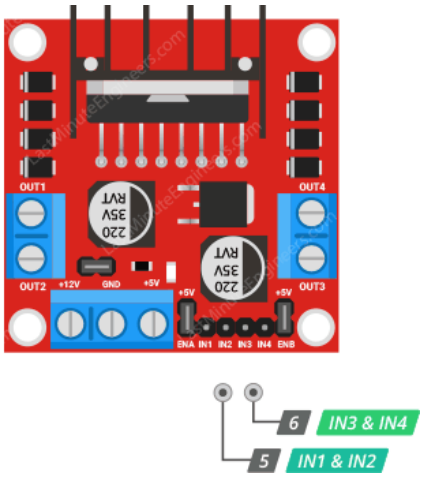
Output Pins

The output channels of the L298N motor driver, OUT1 and OUT2 for motor A and OUT3 and OUT4 for motor B, are broken out to the edge of the module with two 3.5mm-pitch screw terminals. You can connect two 5-12V DC motors to these terminals.

Each channel on the module can supply up to 2A to the DC motor. The amount of current supplied to the motor, however, depends on the capacity of the motor power supply.

Direction Control Pins

The direction control pins allow you to control whether the motor rotates forward or backward. These pins actually control the switches of the H-Bridge circuit within the L298N chip.



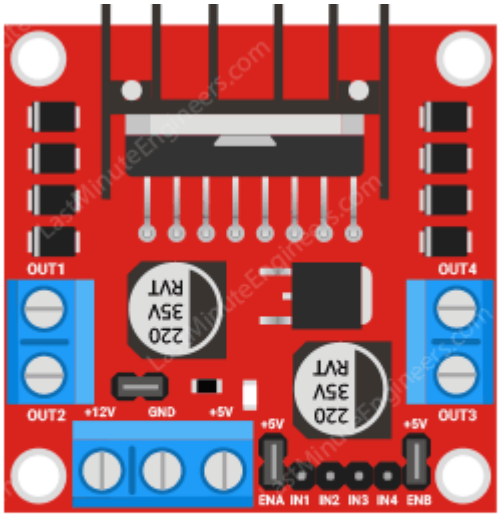
The module has two direction control pins. The IN1 and IN2 pins control the spinning direction of motor A; While IN3 and IN4 control the spinning direction of motor B.

The spinning direction of the motor can be controlled by applying logic HIGH (5V) or logic LOW (Ground) to these inputs. The chart below shows various combinations and their outcomes.

Input1	Input2	Spinning Direction
Low(0)	Low(0)	Motor OFF
High(1)	Low(0)	Forward
Low(0)	High(1)	Backward
High(1)	High(1)	Motor OFF

Speed Control Pins

The speed control pins ENA and ENB are used to turn on/off the motors and control their speed.

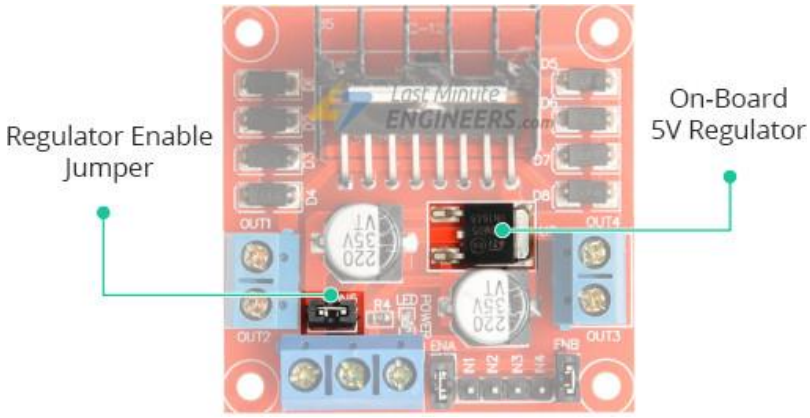


Pulling these pins HIGH will cause the motors to spin, while pulling them LOW will stop them. However, with Pulse Width Modulation (PWM), the speed of the motors can be controlled.

The module usually comes with a jumper on these pins. When this jumper is in place, the motor spins at full speed. If you want to control the speed of the motors programmatically, remove the jumpers and connect them to the Arduino's PWM-enabled pins.

On-board 5V Regulator and Jumper

The module includes a 78M05 5V regulator that can be enabled or disabled via a jumper.



When this jumper is in place, the 5V regulator is enabled, and the logic power supply (VSS) is derived from the motor power supply (VS). In this case, the 5V input terminal acts as the output pin, delivering 5V 0.5A. You can use it to power an Arduino or other circuitry that needs 5V power.

DC Motors:

This DC MOTOR 150 RPM. These motors are simple DC Motors featuring gears for the shaft for obtaining the optimal performance characteristics. They are known as Center Shaft DC Geared Motors because their shaft extends through the center of their gear box assembly.

These standard size DC Motors are very easy to use. Also, you don't have to spend a lot of money to control motors with an Arduino or compatible board. TheL298N H-bridge module with onboard voltage regulator motor driver can be used with this motor that has a voltage of between 5 and 35V DC.

This DC Motor – 150RPM – 12Volts can be used in all-terrain robots and a variety of robotic applications. These motors have a 3 mm threaded drill hole in the middle of the shaft thus making it simple to connect it to the wheels or any other mechanical assembly.

Nut and threads on the shaft to easily connect and internally threaded shaft for easily connecting it to the wheels.

These DC Geared motors with robust metal/Plastic gearbox for heavy-duty applications, available in the wide RPM range(Check the list below) and ideally suited for robotics and industrial applications.

SOFTWARE TOOLS

ARDUINO

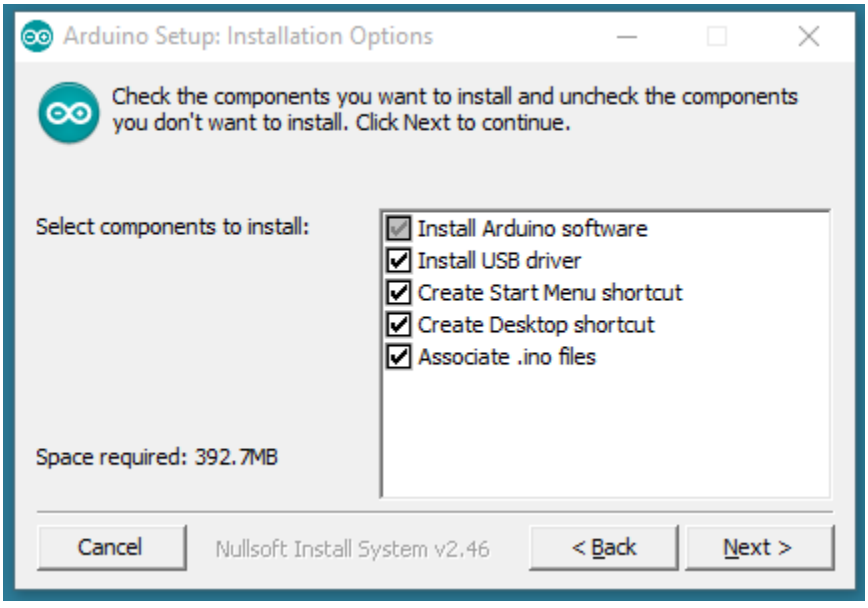
The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open- source software.

This software can be used with any Arduino board

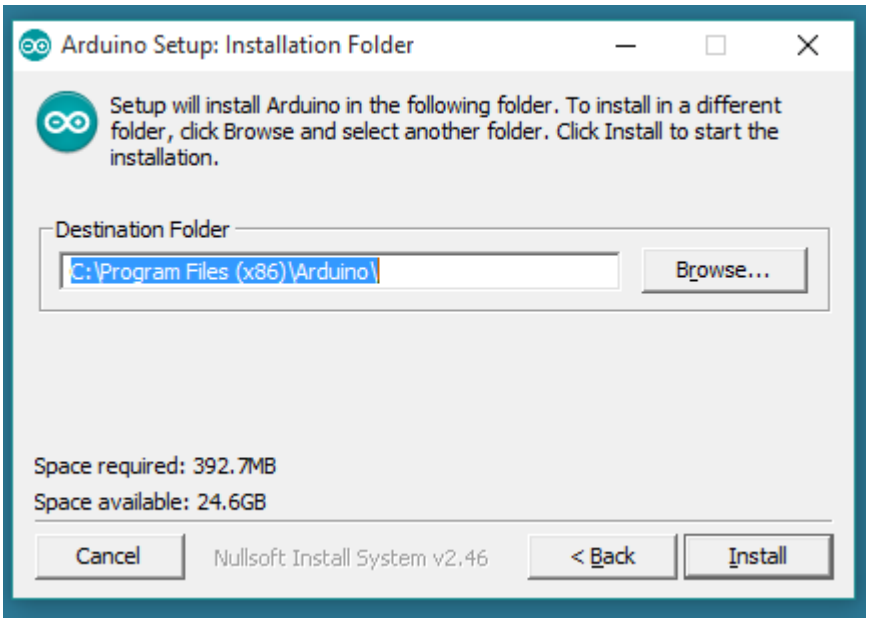
INSTALLATION

In this project Arduino 4.0is installed. We can choose between the Installer (.exe) and the Zip packages. If you use the first one that installs directly everything you need to use the Arduino Software (IDE), including the drivers. With the Zip package you need to install the drivers manually. The Zip file is also useful if you want to create a portable installation.

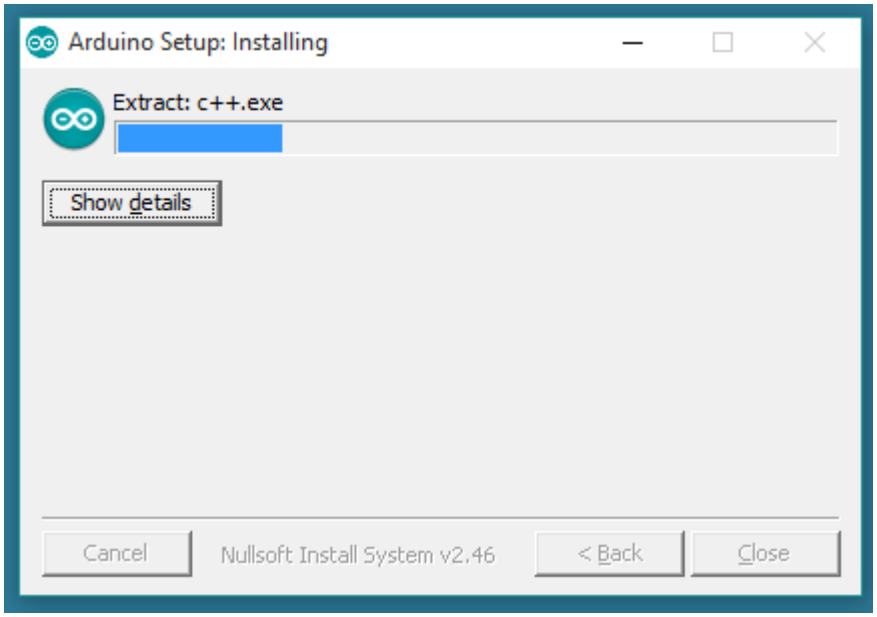
When the download finishes, proceed with the installation and please allow the driver installation process when you get a warning from the operating system.



Choose the components to install



Choose the installation directory (suggested to keep the default one)



The process will extract and install all the required files to execute properly the Arduino Software (IDE)

Code for ESP8266-1 at Helmet Part: Client

```
#include <ESP8266WiFi.h>

const char* ssid = "Mohammed";
const char* password = "arshiya@2606";
const char* serverIP = "192.168.43.157"; // Change this to your server's IP
const uint16_t port = 80;

WiFiClient client;
const int buttonPin = 5; // GPIO5 (D1)
#define MQ135_PIN A0  // Analog pin for sensor

void setup() {
  Serial.begin(115200);
  pinMode(buttonPin, INPUT_PULLUP); // Internal pull-up resistor
   pinMode(MQ135_PIN, INPUT);

  WiFi.begin(ssid, password);
  while (WiFi.status() != WL_CONNECTED) {
    delay(1000);
    Serial.println("Connecting...");
  }

  Serial.println("Connected to WiFi!");
}

void loop() {

  int sensorValue = analogRead(MQ135_PIN);  // Read sensor value
    float voltage = sensorValue * (3.3 / 1023.0); // Convert to voltage
    Serial.print("Sensor Value: ");
    Serial.print(sensorValue);
    delay(1000);

    int buttonState = digitalRead(buttonPin); // Read button

    int dataToSend;

  if (!client.connected()) {
    Serial.println("Reconnecting to server...");
    if (client.connect(serverIP, port)) {
      Serial.println("Connected to server");
    } else {
      Serial.println("Connection failed!");
      delay(3000);
      return;
    }
  }
```

```
  if(buttonState == HIGH && sensorValue > 300)
  {
    dataToSend = 1;
  }
  else if(buttonState == HIGH && sensorValue < 300)
  {
    dataToSend = 0;
  }
  else if(buttonState == LOW && sensorValue > 300)
  {
    dataToSend = 0;
  }
  else if(buttonState == LOW && sensorValue < 300)
  {
    dataToSend = 0;
  }

  Serial.print("Sending: ");
  Serial.println(dataToSend);
  client.println(dataToSend); // Send 1 or 0

  delay(2000); // Send every 5 seconds
}
```

Code for ESP8266-2 at Vehicle Part: Server

```
#include<ESP8266WiFi.h>

#define GREEN_LED  4  // GPIO4 (D2)
#define RED_LED    0  // GPIO0 (D3)

#define LED 5 // (D1)

const char* ssid = "Mohammed";
const char* password = "arshiya@2606";

WiFiServer server(80);

void setup() {
   Serial.begin(115200);
   pinMode(GREEN_LED, OUTPUT);
   pinMode(RED_LED, OUTPUT);
   pinMode(LED, OUTPUT);
   WiFi.begin(ssid, password);

   while (WiFi.status() != WL_CONNECTED) {
      delay(1000);
      Serial.println("Connecting...");
      }

   Serial.println("Connected to WiFi!");
   Serial.print("Server IP: ");
   Serial.println(WiFi.localIP());

   server.begin();
}

void loop() {
   WiFiClient client = server.available();

   if (client) {
      Serial.println("Client Connected!");
      while (client.connected()) {
         if (client.available()) {
              String data = client.readStringUntil('\n'); // Read received data
              data.trim(); // Remove extra spaces/newlines
              Serial.print("Received: ");
              Serial.println(data);

      // You can use the received value for further processing

      if (data == "1") {  // Button pressed
      digitalWrite(GREEN_LED, HIGH);
```

```
        digitalWrite(LED, HIGH);
        digitalWrite(RED_LED, LOW);
    }  else if (data == "0") {  // Button released
        digitalWrite(GREEN_LED, LOW);
        digitalWrite(LED, LOW);
        digitalWrite(RED_LED, HIGH);
    }

        client.println("ACK: " + data); // Send acknowledgment
      }
    }
    Serial.println("Client Disconnected");
    client.stop();  // Close connection properly
  }
}
```

Code for Arduino Uno - 1 at Vehicle Part:

```
#include <SPI.h>           // SPI for RFID
#include <MFRC522.h>       // RFID Library
#include <LiquidCrystal.h>

LiquidCrystal lcd(A0, A1, A2, A3, A4, A5);

//#include "SoftwareSerial.h"
//#include "DFRobotDFPlayerMini.h"

// Use pins 2 and 3 to communicate with DFPlayer Mini
//static const uint8_t PIN_MP3_TX = 5; // Connects to module's RX
//static const uint8_t PIN_MP3_RX = 3; // Connects to module's TX
//SoftwareSerial softwareSerial(PIN_MP3_RX, PIN_MP3_TX);

// Create the Player object
//DFRobotDFPlayerMini player;

const int distanceThreshold = 50;
long distance;
long dist;
// RFID MFRC522 Pins
#define SS_PIN 10
#define RST_PIN 8
MFRC522 mfrc522(SS_PIN, RST_PIN);

#define TRIG_PIN 7
#define ECHO_PIN 6

int rec_pin = 9;
//bool rec_st = false;

int out_pin = 4;
//bool out_st = false;

const int btn_pin = 2;
//bool btn_st = false;

void setup() {
  Serial.begin(9600);

  // RFID Setup
  SPI.begin();
  mfrc522.PCD_Init();

  pinMode(TRIG_PIN, OUTPUT);
  pinMode(ECHO_PIN, INPUT);
```

```
    pinMode(rec_pin, INPUT);

    pinMode(btn_pin, INPUT);

     lcd.begin(16, 2);
     lcd.setCursor(0,0);
     lcd.print("SMART - VEHICLE");

     lcd.setCursor(0,1);
     lcd.print("      VJIT      ");

    // Output Pins
    pinMode(out_pin, OUTPUT);
    //pinMode(OUT2, OUTPUT);
    digitalWrite(out_pin, LOW);
    //digitalWrite(OUT2, LOW);
    digitalWrite(btn_pin, LOW);
    digitalWrite(rec_pin, LOW);

  //  softwareSerial.begin(9600);

  // Start communication with DFPlayer Mini
  /*if (player.begin(softwareSerial)) {
   Serial.println("OK");

    // Set volume to maximum (0 to 30).
    player.volume(20);
    // Play the first MP3 file on the SD card
    player.play(1);
delay(2000);

  } else {
    Serial.println("Connecting to DFPlayer Mini failed!");
  }*/

    delay(500);
}

long measureDistance() {
    digitalWrite(TRIG_PIN, LOW);
    delayMicroseconds(2);
    digitalWrite(TRIG_PIN, HIGH);
    delayMicroseconds(10);
    digitalWrite(TRIG_PIN, LOW);

    long duration = pulseIn(ECHO_PIN, HIGH);
    long distance = duration * 0.034 / 2;  // Convert to cm
    return distance;
}
```

```
void loop() {

  if(digitalRead(btn_pin) == HIGH){
    clearLCDLine(0,0);
    lcd.setCursor(0, 0);
    lcd.print("PLZ WEAR HELMET:");
    //player.play(2);
    clearLCDLine(0,1);
    delay(10000);
    Serial.println("PLZ WEAR HELMET:");
    int helmet_st;
    helmet_st = digitalRead(rec_pin);
    Serial.print("Helmet status:");
    Serial.print(helmet_st);
    // Check for RF signal
    if(helmet_st == HIGH)
    {
        clearLCDLine(0,0);
        lcd.setCursor(0,0);
        lcd.print("HELMET WEARED");

        Serial.println("Helmet weared");
        delay(1000);

         clearLCDLine(0,1);
         lcd.setCursor(0, 1);
         lcd.print("PLZ SCAN LICENSE");
   //      player.play(3);
         delay(1000);

         String tagID = scanRFID();
        if (tagID != "") {
              clearLCDLine(0,1);
              lcd.setCursor(0,1);
              lcd.print("LICENSE SCANNED:");

              delay(1000);
              long dist = verifylicense(tagID);
              delay(500);

              if (dist > distanceThreshold) {
          digitalWrite(out_pin, HIGH);
          Serial.println("VEHICLE STARTED:");
          delay(5000);
          digitalWrite(out_pin, LOW);
        } else {
          digitalWrite(out_pin, LOW);
```

```
          Serial.println("OBSTACLE OCCURS:");
        }


              /*else
              {
                digitalWrite(out_pin, LOW);
                Serial.println("Vehicle should stop:");
                delay(100);
              }*/
          }
          /*else{
            digitalWrite(out_pin, LOW);
            Serial.println("Vehicle should stop:");
          }*/
        }
        else {
          clearLCDLine(0,0);
          lcd.setCursor(0,0);
          lcd.print("NO HELMET");
          digitalWrite(out_pin, LOW);

          clearLCDLine(0,1);
          lcd.setCursor(0,1);
          lcd.print("PLZ DONT DRIVE");
          delay(1000);
          Serial.println("No HELMET Con...");
        }
           delay(1000);
     }
    else if(digitalRead(btn_pin) == LOW)
    {
      lcd.setCursor(0,0);
      lcd.print("SMART - VEHICLE");
      digitalWrite(out_pin, LOW);

      lcd.setCursor(0,1);
      lcd.print("      VJIT      ");
    }
}

 // Function to check RFID tag
String scanRFID() {
  /*clearLCDLine(0,1);
  lcd.setCursor(0,1);
  lcd.print("PLEASE SCAN...");
*/
  String tagID = "";
  while(true) {
```

```
    // Check if a new RFID card is present
    if (mfrc522.PICC_IsNewCardPresent() && mfrc522.PICC_ReadCardSerial()) {
      for (byte i = 0; i < mfrc522.uid.size; i++) {
        tagID += String(mfrc522.uid.uidByte[i] < 0x10 ? "0" : "");
        tagID += String(mfrc522.uid.uidByte[i], HEX);
      }
      tagID.toUpperCase();
      mfrc522.PICC_HaltA();  // Stop reading
      break;
    }
  }
  delay(2000);
  return tagID;
}

long verifylicense(String tagID) {
  if(tagID == "A3340214")
  {
    clearLCDLine(0,1);
    lcd.setCursor(0,1);
    lcd.print("VALID LICENSE..");

     distance = measureDistance();
        Serial.print("Distance: ");
        Serial.print(distance);
        Serial.println(" cm");

        /*if (distance > distanceThreshold) {
            digitalWrite(out_pin, HIGH);
            Serial.println("Distance is high: Setting OUTPUT_PIN HIGH");
        } else {
            digitalWrite(out_pin, LOW);
            Serial.println("Distance is low: Setting OUTPUT_PIN LOW");
        }*/
    delay(1000);
  }
  else
  {
    clearLCDLine(0,1);
    lcd.setCursor(0,1);
    lcd.print("IN-VALID LICENSE");
    distance = 0;
    delay(1000);
  }
  return distance;
}

void clearLCDLine(int p,int line)
{
```

```
for(int n = p; n < 20; n++)
{ // 20 indicates symbols in line. For 2x16 LCD write - 16
lcd.setCursor(n,line);
lcd.print(" ");
}
lcd.setCursor(p,line); // set cursor in the beginning of deleted line
}
```

Code for Arduino Uno - 2 at Vehicle Part to control L298N motor driver:

```
#define IN1 5
#define IN2 6
#define IN3 9
#define IN4 10
#define ENA 3
#define ENB 11



#define SENSOR1 7

int sensor1;

void setup() {
   pinMode(IN1, OUTPUT);
   pinMode(IN2, OUTPUT);
   pinMode(IN3, OUTPUT);
   pinMode(IN4, OUTPUT);
   pinMode(ENA, OUTPUT);
   pinMode(ENB, OUTPUT);
   pinMode(SENSOR1, INPUT);



   // Set motor speed (0 - 255)
   analogWrite(ENA, 150);
   analogWrite(ENB, 150);

      digitalWrite(IN1, LOW);
      digitalWrite(IN2, LOW);
      digitalWrite(IN3, LOW);
      digitalWrite(IN4, LOW);

      //digitalWrite(sensor1, LOW);
      Serial.begin(9600);
      digitalWrite(sensor1, LOW);
}

void loop() {


   sensor1 = digitalRead(SENSOR1);
   Serial.print("sensor value:");
   Serial.println(sensor1);
   delay(1000);
```

```
   if (sensor1 == HIGH) {

       // Move Forward
      digitalWrite(IN1, LOW);
      digitalWrite(IN2, HIGH);
      digitalWrite(IN3, LOW);
      digitalWrite(IN4, HIGH);
   }
 else if(sensor1 == LOW)
{
      digitalWrite(IN1, LOW);
      digitalWrite(IN2, LOW);
      digitalWrite(IN3, LOW);
      digitalWrite(IN4, LOW);
      delay(500);  // Pause before turning
}
else
{
 digitalWrite(IN1, LOW);
      digitalWrite(IN2, LOW);
      digitalWrite(IN3, LOW);
      digitalWrite(IN4, LOW);
      delay(500);  // Pause before turning


}
delay(1000);
}
```