

SMART CAR PARKING SYSTEM USING IOT

Submitted in partial fulfilment of the requirements for the award of Bachelor of
Engineering degree in Electronics and Communication Engineering

By

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SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of RAYAPUREDDY NAGA SATYA SAI KUMAR (37130346) and SEGGAM YOGA AVINASH(37130366) who have done the Project work as a team who carried out the project entitled "SMART CAR PARKING SYSTEM USING IOT" under my supervision from September 2020 to April 2021.

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We, **RAYAPUREDDY NAGA SATYA SAI KUMAR (37130346)** and **SEGGAM YOGA AVINASH (37130366)** hereby declare that the Project Report entitled “**SMART CAR PARKING SYSTEM USING IOT**” done by us under the guidance of Dr. Z. Mary Livinsa M.E.,Ph.D at Sathyabama institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering.

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ABSTRACT

Internet of Things (IOT) assumes an imperative part in associating the encompassing natural things to the organization and made simple to get to those un-internet things from any distant area.

Furthermore, for the most part, individuals are dealing with issues on parking vehicles. In this study we plan a "Smart Parking System" (SPS) which empowers the vehicle owners to discover the closest parking slot and gives accessibility of stopping spaces in that particular region furthermore, it principally centers around lessening the time in discovering the parking slots and furthermore it stays away from the pointless going through filled parking slots in a stopping region. Accordingly, it decreases the fuel utilization which thus reduces the carbon releases in an environment.

Internet of Things (IOT) assumes a crucial part in connecting ecological things to organize and makes it simple to get to these non-internet things from any removed spot. It's inescapable for individuals update with the developing technology and usually, people manage parking problems in city car parks. In this study, we design a Smart Parking System (SPS) allows the user to find the nearest parking area availability of parking spaces in this respective parking area. And he focuses mainly on reducing the time to find the parking and also avoids unnecessary travel thanks to complete parking in a parking lot. So, it reduces fuel consumption which in turn reduces the carbon footprint in an atmosphere.

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CHAPTER 1

INTRODUCTION:

Road congestion caused by vehicles is alarming problem on a global scale and is growing exponentially. The problem of parking is an important factor and it was still a big problem with confined car parks urban cities. Looking for a parking spot is a routine regularly disappointing tasks for some individuals in the urban areas all throughout the planet. This task consumes around 1,000,000 barrels the oil of the world consistently.

These problems will get worse with the world's population continues to urbanize without removed from the car well planned, based on convenience. According to a report, Smart Parking could involve 2, 20,000 gallons of fuel until 2030 and approx. 3, 00,000 gallons fuels by 2050 if implemented properly as stated in Figure. Smart Parking systems get information about availability parking in a particular geographical area. This process is in real time to position the vehicles in the available positions.

Involved Real-time data collection with low-cost sensors automatic payment systems activated on the mobile phone allows people to book early parking. The importance of smart parking is: Detects and accurately preaches the occupation of premises / vehicles by real time. Guide residents and visitors to available parking. Optimize the use of the parking space. Simplify the parking experience and add value parking parties, such as dealers and drivers. Help the free flow of traffic in the city by exploiting the IOT technology. Enables smart decisions using data, including real data temporary status applications and historical analysis reports.

Smart parking plays an important role in the creation of urban environment by reducing CO2 emissions and other pollutants. Smart Parking allows better tracking in real time and manage the resulting free parking space significant revenue generation. Provides tools to optimize the management of

the workforce.

1.1 LITERATURE SURVEY:

+Smart Car Parking Management System Using Iot Aniket Gupta, Sujata Kulkarni, Vaibhavi Jathar, Ved Sharma, Naman Jain

Multiplication in the quantity of vehicles is prompting issues of vehicles parking at a fitting spot particularly in the parking area. This by implication prompts traffic. This is a direct result of the way that current transportation foundation and vehicle parking organisation can't adapt to the appearance of enormous number of vehicles out on the road. To lighten the previously mentioned issue, creators proposed a "Smart Parking Management System" that assists people with consequently tracking down a free parking spot with a more modest sum. This model includes utilization of Ultrasonic sensor, Arduino Uno, ESP8266-01 Wi-Fi Module, Cloud worker. IOT based new parking method empower to associate, investigate and robotize information assembled from gadgets and execute savvy stopping conceivable. smart parking would empower vehicle inhabitation, observing and overseeing of accessible parking spot continuously that decreasing the natural contamination. Proposed system gives upgrade utilization of parking spot and get significant income age.

Smart Car Parking System using Iot Idea Vrushali D. Ichake.1, 2, 3, Priya D. Shitole. 1, 2, 3 and Mohsina Momin.1, 2, 3 Kanchan S. Thakare, Assistant Proffessor 2, 3.

A significant issue in everyday life is leaving of vehicles particularly the vehicle leaving at a parking spot. Furthermore, this issue in a roundabout way prompts traffic. This paper presents the fundamental idea of server or cloud based smart parking services in urban areas as a significant utilization of the Internet of Things (Iot). This system will be open through a versatile application or through the page gave and can be utilized to screen or track down

the parking slots around there.

Survey paper on s Vishwanath , Aishwarya, D Kuchalli, Debarupa Rakshit

This paper proposes a Smart Parking system which gives an ideal answer for parking issues in urban communities. Because of fast expansion in vehicles particularly during the pinnacle hours of the day, it is a troublesome undertaking for the drivers to discover a parking spot to leave their vehicles. The point of the paper is to determine the previously mentioned issue which gives the Smart Parking system. This system utilizes distributed computing and Internet of Things (IOT) technology.

An appropriate most limited way calculation is utilized to track down the base distance between the vehicle and every parking slot in the area. Accordingly, the holding up season of the client is limited .The paper likewise presents the use of android application utilizing advanced mobile phone for the communication between the Parking slot and the person. RFID technology is utilized in this system to stay away from the human mediation which limits the expense

1.2 EXISTING SYSTEM:

This document provides a unique algorithm that increases the capacity of the current cloud intelligent parking system and is also developing a network architecture based on the Internet of Things technology. This system helps users find a free parking space with new minimum costs automatic performance measurement. This metric calculates user spaces in each parking space. To improve parking management, a smart parking system has been developed to reduce purpose of hiring people to maintain the parking system. In this article, we propose a cloud-based Internet-based intelligent parking system. Things. Data including the GPS position of the vehicle and the distance between the car parks and the number free parking in the car parks will be sent to the data center. Here the data server is introduced as cloud server that calculates the expenses of a client parking request and this data is standard

refreshed and made accessible to vehicles on the network whenever. In this proposed system, each parking lot is an IOT network and operates independently as a normal parking space.

1.3 DRAWBACKS:

- The vehicles may theft by others
- Man power is needed.
- It is not suitable for large no of vehicle car parking
- Maintenance cost is high
- Not automated

1.4 PROPOSED SYSTEM:

The Proposed system consist of the car parking system and street light control using the Raspberry pi.

The car parking system having the IR sensor to detect the vehicles count and send it to the mail in the entrance of the car parking lot. Whenever the vehicle is detected, the empty space will be displayed in the mail and The Car parking availability will be shown using LED's intimation.

When the vehicle is moving, we can able to switch on the light automatically then after leaving the vehicle we can switch of the vehicle. At the day time, LDR sensor detect automatically, it will switch of the light, then at the night time, we can able to switch on the light.

When light are having any trouble, we can sent the message to the management of the respective places and also we can able to monitor the distance between backside of the vehicle and parking place.

1.5 ADVANTAGES:

- NO man power
- Automated
- More security than existing system
- Less maintenance
- More comfortable.

1.6 BLOCK DIAGRAM:

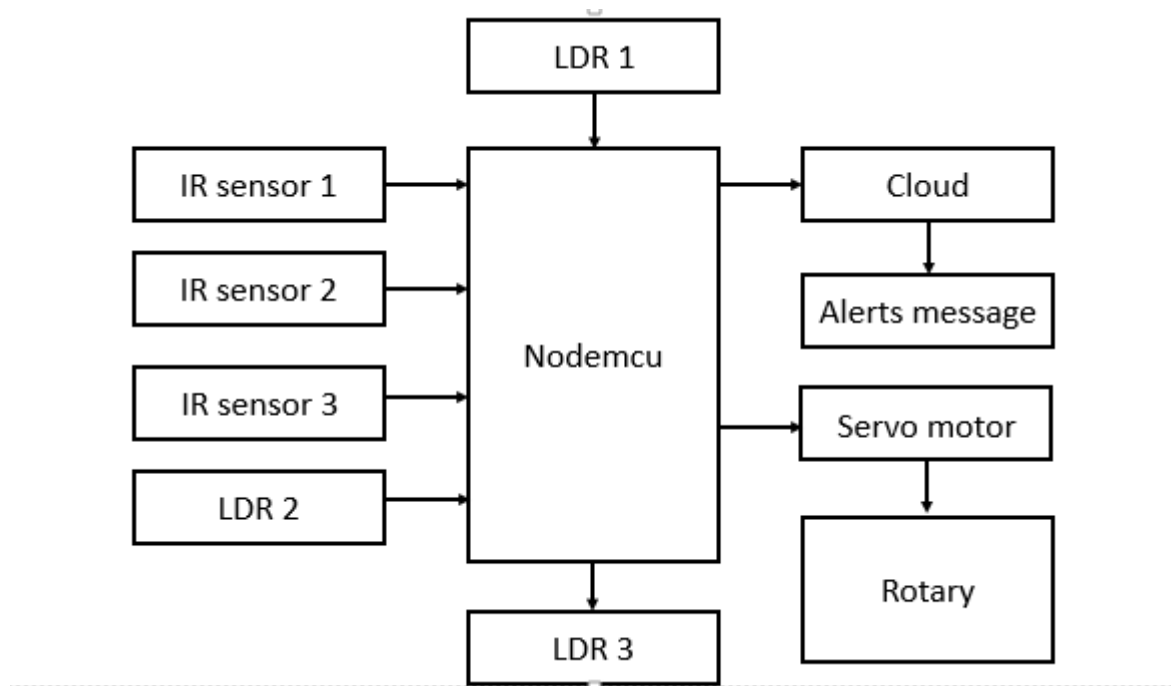


Figure 1.1 Block diagram

1.7 HARDWARE USED:

- Nodemcu
- IR sensor
- LDR
- Dc motor

1.8 SOFTWARE USED:

- Embedded C
- Arduino

1.9 BACKGROUND:

The Future Internet goal is to provide an infrastructure to have an immediate access to information about the physical world and its objects. physical objects can be applied to various application areas, for example, e-health, warehouse management, and so on. Every application space may have various kinds of

physical devices. Each physical device can have its own specifications, which is required to use in order to interact with it. To achieve the future Internet goal, a layered vision is required that can facilitate data access. Internet of Things (IoT) is a vision that aims to integrate the virtual world of information to the real world of devices through a layered architecture.

The expression "Internet of Things" comprises of two words, specifically Internet and Things. Internet alludes to the worldwide organization infrastructure with adaptable, configurable capacities dependent on interoperable and standard communication protocols. Things are actual items or devices, or virtual articles, gadgets or data, which have characters, actual credits and virtual characters, and utilize keen interface. For instance, a virtual object can represent an abstract unit of sensor nodes that contains metadata to identify and discover its corresponding sensor nodes. Therefore, IoT refers to the things that can provide information from the physical environment through the Internet.

Middleware is as an interface between the equipment layer and the application layer, which is liable for communicating with devices and data the board. The part of a middleware is to introduce a bound together programming model to collaborate with devices. A middleware is accountable for concealing the heterogeneity and dispersion issues that we face while cooperating with devices.

1.10 MOTIVATION:

IoT-based system is in charge of providing knowledge from an environment to an non-expert user. IoT-based system can be used in different environments, so it needs to be able to address many heterogeneous devices. Thus, a major concern within developing an IoT-based system is how to handle the interaction with the heterogeneous devices for non-expert users. This concern can be addressed by a middleware layer between devices and non-expert users. This layer is responsible to hide the diversity of devices from the user

perspective, and provides access transparency to the devices for the end users. The idea of creating abstractions of devices been addressed in the literature. The middleware we found in the literature can provide satisfaction by facilitating the interaction with devices, but they do not support low-level device configuration.

CHAPTER 2

IOT:

2.1. IOT DEFINITION:

In this section, we explain some of the IoT definitions. Also, we explain the layered architecture for IoT.

Internet of Things (IoT) has increasingly gained attention in industry to interact with different types of devices. IoT can have influence on industry and society by integrating physical devices into information networks [8]. IoT impacts can be on different perspectives, namely for private and business users. From the point of view of a private client, IoT has impact on both working and individual fields, like smart homes and workplaces, e-health and helped living. From the aspect of a business user the impacts would be in fields such as automation and industrial manufacturing, logistics, business process management, intelligent transportation of people and goods [9]

IoT integrates physical things into information networks. IoT covers the overall infrastructure, including software, hardware and services, which is used to support these information networks. The integrated physical things can exchange data about the physical properties and information that they sense in their environment. To identify devices, we can use identification technologies like for example RFID, which allow each device be uniquely identified [10]. International Telecommunication Union (ITU)¹ characterizes IoT as "A global foundation for the Information Society, empowering progressed benefits by interconnecting (physical and virtual) things dependent on, existing and developing, interoperable data and correspondence technologies"

Internet of Things-Architecture 2 (IoT-A) characterizes it as "The possibility of an all around the world interconnected continuum of devices, articles and things overall arose with the RFID technology, and this idea has extensively been extended to the current vision that envisages a plethora of heterogeneous objects interacting with the physical environment".

IoT has a layered architecture designed to answer the demands of various industries, enterprises and society. Fig. 2.1 shows a generic layered architecture for IoT that consist of five layers, which are discussed, in the following:[13]

- Edge Technology layer:

This is a hardware layer that consists of embedded systems, RFID tags, sensor networks and all of the other sensors in different forms. This hardware layer can perform several functions, such as collecting information from a system or an environment, processing information and supporting communication.

- Access Gateway layer:

This layer is concerned with data handling, and is responsible for publishing and subscribing the services that are provided by the Things, message routing, and hovelling the communication between platforms.

- Middleware layer:

This layer has some critical functionalities, such as aggregating and filtering the received data from the hardware devices, performing information discovery and providing access control to the devices for applications.

- Application layer:

This layer is responsible for delivering various application services. These services are provided through the middleware layer to different applications and users in IoT-based systems. The application services can be used in different industries such as, logistics, retail, healthcare, etc.

2.2 CHALLENGES:

IoT-based systems can be used for different purposes and areas, so that, we have to face different challenges. In this section, we explain some of the challenges that need to be considered in research activities [10]:

- Edgetechnology:

At the hardware level, more research efforts are required to develop the technology of embedded devices, sensors, actuators and (passive and active) identification, since an IoT-based system must be able to gather sufficient information about the real world by employing a large variety of devices and environments. Thus, there more work is still required to connect heterogeneous devices and deploy them in IoT applications, and to provide support for new devices.

- Networking technologies:

In IoT, things are connected through different kinds of networks, i.e. mobile, wired and wireless network. These networks support bi-directional communication at different levels among the real world objects, applications and services that are employed by the IoT applications. This highly distributed structure should provide interconnection with low energy consumption, while distributed data can cause privacy issues.

- Middleware system

In IoT, we have heterogeneous devices and networks. Their heterogeneity can potentially increase with new technologies. To facilitate the use of these devices by IoT applications, we should shield their heterogeneity. Therefore, we need to develop a secure, scalable and semantically enriched service-oriented middleware to cope with the heterogeneity of devices.

- Platform services

They support a superior management of all involved devices in an integrated way, ensuring scalability, high availability, and the safe and secure execution of the requested functionality from devices.

In continue, we focus on the middleware challenges, because we are looking for the functionalities that a middleware can provide for the application layer in the IoT-based systems.

2.3 IOT BASED MIDDLEWARE:

Bandyopadhyay, S. et. al. have studied the middleware systems that have been applied in IoT-based systems [1]. They classify the required functionality of middleware to manage interaction with a variety of devices in four functional components, namely (1) interface protocols, (2) device abstraction, (3) central control, context detection & management, and (4) application abstraction (shown in Fig. 2.2). In the following, we explain these components in details.

2.3.1 Interface protocols

This component is in charge of providing technical interoperability. Interoperability with regards to Interface protocols implies: the capacity of two frameworks to interoperate by utilizing similar correspondence protocols. As per ETSI (European Telecommunications Standards Institute) specialized interoperability is characterized as the relationship of equipment or programming parts, frameworks and stages that empower machine-to-machine correspondence to occur. This sort of interoperability is regularly fixated on (correspondence) protocols and the infrastructure required for those protocols to work.

The Interface Protocol component defines protocols for exchanging information among different networks that may work based on different communication protocols, in order to allow technical interoperability. This component is responsible for handling basic connectivity in the physical and data link, network, transport, and sometimes the application layer of the TCP/IP stack.

To cope with the heterogeneity of devices, we can use a wrapper for each device to translate the protocol supported by the device to a common

protocol. This wrapper can be placed either on the device side or the middleware side. If we want to have direct interaction with devices, we should place the wrapper in the middleware side. Devices usually have limited capability of computational process, so this would be a reason to implement wrapper on the middleware side. In contrast, in case of indirect interaction with devices we can develop an intermediary wrapper between the middleware and the devices. The interface protocol component is responsible to allow the middleware to support both direct and indirect interactions.

2.3.2 Device Abstraction (DA):

This component is responsible for providing an abstract format to facilitate the interaction of the application components with devices. This abstraction provides syntactic and semantic interoperability, which are defined by ETSI [14] as follows:

- Syntactic interoperability is related with information designs. The messages transferred by correspondence conventions should have a very much characterized language structure and encoding design, which can be addressed by utilizing significant level exchange syntaxes, for example, HTML and XML.
- Semantic interoperability is usually associated with the meaning of the content of message which is understandable for human. Consequently, interoperability on this level implies that there is a typical understanding among individuals on the significance of the data being traded among them. However, since DA does not communicate directly with human, semantic interoperability in the context of DA is in charge of providing this common understanding for applications.

Semantic interoperability relies on semantic models which tends to be domain specific. For example, one way to provide semantic interoperability in Service Oriented (SOA) [15] based middleware is by using Devices Profile for Web Services (DPWS) [16] . In this context, each device type refers to a

distinguished service type

DA component provide two general functionalities: (1) to ask devices to perform some functionality and (2) to define and configure devices DPWS uses the XML format that is shown in Code 2.1.

2.3.3 Central control, Context detection & Management (CCM):

Context characterizes the situation of an entity, which can be a place, a person or an object that is relevant to the user, applications and their interactions [1]. The CCM functional component is responsible to support context-aware computation that is a computational style that take to account the context of the entities that interact with the system. A middleware for IoT-based systems must be context-aware to work in smart environments. Smart environments allude to an physical world that is lavishly and imperceptibly joined with sensors, actuators, displays, and computational elements, inserted flawlessly in the regular objects of our lives, and associated through a consistent network.

Context-awareness includes two functionalities:

- Context detection, which consists of collecting data from resources, and selecting the information that can have an impact on the computation.
- Context processing, to use the gathered information to perform a task or make a decision.

2.3.4 Application Abstraction :

This functional component provides an interface for both high-level applications and end-users to interact with devices. For instance, this interface can be a RESTful interface or can be implemented with some query-based language.

A. Malatras. et. al. propose a SOA-based middleware to perform data management and data monitoring services [18]. This middleware uses a RESTful interface to facilitate the interaction of high-level applications with sensors, which can communicate with Wireless Sensor Network (WSN)

through the HTTP operations: (1) GET to issue a query on an existing resource, (2) DELETE to remove an existing resource, (3) POST to create a new resource, and (4) PUT to update an existing resource. For instance, a client application gets the result of a domain task by sending a GET request through the URL: „http ://{ hostname}/REST/ {version}/DomaintaskResult/id’. In this URI that reference to an „id“ leads to a unique result.

In the TinyDB middleware [19], an end-user can use a query language to interact with devices. For instance, a user can send the following query to get the id of a sensor (nodeid) nearby and temperatures that are sensed by this sensor during the past 10 seconds before executing the query:

```
SELECT nodeid, temp
FROM sensors
SAMPLE PERIOD 1s FOR 10s
```

2.4 CONCLUSION:

In this chapter, we defined IoT and identified common IoT layers. Furthermore, we discussed a reference middleware architecture for IoT-based systems. This architecture has been proposed by Bandyopadhyay, S. et. al based on a study on the existing middleware frameworks for IoT-based systems .

CHAPTER 3

REVIEW OF IOT-BASED MIDDLEWARE:

The term Internet of Things (IoT) refers to a wide set of applications and research areas such as, distributed computing and knowledge management. Much of the IoT research we found in the literature is related to the field of pervasive computing. World Wide Web Consortium defines pervasive computing as a vision about our future computing life style. In this vision, computer systems will be consistently coordinated into our regular daily existence, expecting our requirements and offering significant types of services and data for us in a whenever and-anyplace style. Pervasive Computing is all about making the human's life easier by exploiting the available computing

technologies. This motivates scientists to develop new technologies for the everyday people's lives.

Since the vision of IoT is almost similar to Pervasive computing, we reviewed the literatures that address both IoT and Pervasive systems. To select the middleware to discuss we had the following approaches:

- We looked at typical IoT middleware such as ISMP, ASPIRE GSN. We selected HYDRA to review, because it is the most popular and well-documented middleware in comparer to the mentioned middleware. Also, based on the study of Bandyopadhyay, S. et. al, those middleware does not support the discussed functional components in Chapter 3, while HYDRA supports them.
- We looked at typical Pervasive system middleware such as [25], [26], [27]. We selected the following middleware to review:
- AURA [28] because this middleware focus on elaboration and manipulation of the gathered data from devices. we aim to provide ease of configuration and deployment for end user and developer. Since to meet this goal, we require to facilitate the gathered data manipulation, we reviewed AURA that was the only middleware among the reviewed paper that considered the data manipulation.
- TinyDB [19] focus on gathering data from devices. Since in an IoT-based system we need to gather data from environment through different devices, we reviewed TinyDB that is a popular middleware.
- WiseMID [29] is the only middleware among the reviewed middleware that is specific for energy saving purpose. As saving the energy of devices is important issue, we reviewed this middleware.

In this chapter, we the mentioned middleware in more detail. Also, we analyze the discussed middleware with respect to the functional components mentioned in Chapter 2.

3.1 IR (INFRARED) SENSOR :

An infrared sensor is an electronic gadget that transmits to detect a few parts of the environmental factors. An IR sensor can quantify the warmth of an article just as identifies the movement. These sorts of sensors estimates just infrared radiation, as opposed to producing it that is called as a passive IR sensor. Typically in the infrared range, every one of the items emanate some type of warm radiations. These kinds of radiations are invisible to our eyes that can be distinguished by an infrared sensor. The producer is essentially an IR Driven (Light Radiating Diode) and the identifier is basically an IR photodiode which is touchy to IR light of the very frequency as that discharged by the IR Drove. At the point when IR light falls on the photodiode, the protections and these yield voltages, change in relation to the greatness of the IR light got.

3.1.1 IR Sensor Circuit Diagram And Working Principle:

An infrared sensor circuit is one of the fundamental and famous sensor module in an electronic gadget. This sensor is closely resembling human's visionary detects, which can be utilized to recognize snags and it is one of the regular applications continuously. This circuit contains the accompanying segments

- LM358 IC 2 IR transmitter and receiver pair
- Resistors of the range of kilo ohms.
- Variable resistors.
- LED (Light Emitting Diode).

In this undertaking, the transmitter segment incorporates an IR sensor, which sends persistent IR beams to be gotten by an IR collector module. An IR yield terminal of the beneficiary changes relying on its getting of IR beams. Since this variety can't be examined thusly, accordingly this yield can be taken care of to a comparator circuit. Here an operational amplifier (op-amp) of LM 339 is utilized as comparator circuit. At the point when the IR recipient doesn't get a sign, the potential at the reversing input goes higher than that non-modifying contribution of the comparator IC (LM339). Accordingly the yield of the comparator goes low, yet the LED doesn't glow. At the point when the IR recipient module gets sign to the potential at the altering input goes low. In this way the yield of the comparator (LM 339) goes high and the LED starts glowing.

IR Sensor circuit:

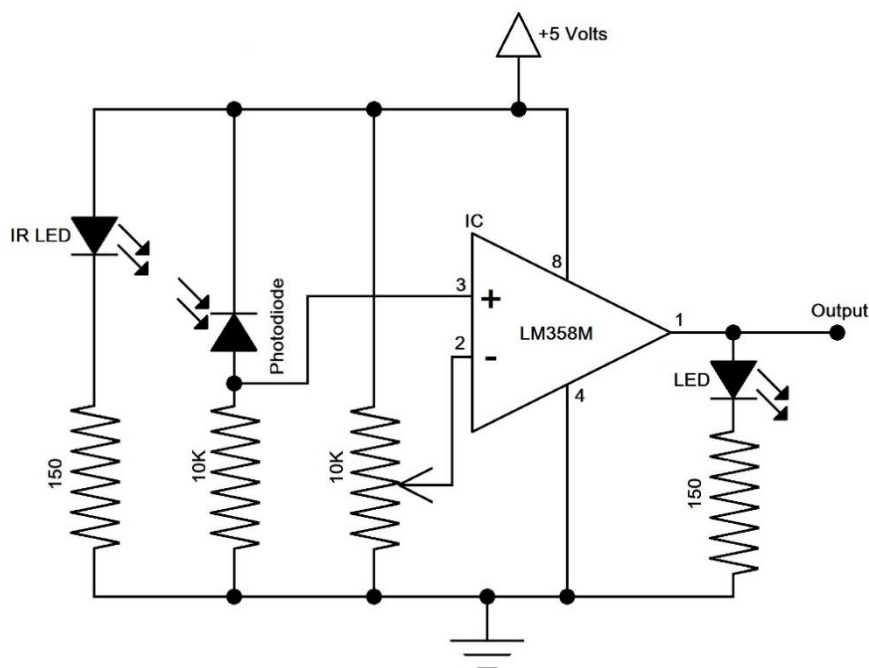


Figure 2.1 IR Sensor Circuit diagram

Resistor R1 (100 Ω), R2 (10k Ω) and R3 (330 Ω) are utilized to guarantee that base 10 mA current goes through the IR LED Devices like Photodiode and typical

LEDs individually. Resistor VR2 (preset=5k) is utilized to change the output terminals. Resistor VR1 (preset=10k) is utilized to set the affectability of the circuit Diagram. Peruse more about IR sensors.

3.1.2 Different Types of IR Sensors and Their Applications:

IR sensors are requested into different sorts depending upon the applications. The speed sensor is used for synchronizing the speed of different motors. The temperature sensor is used for mechanical temperature control. PIR sensor is utilized for programmed entryway opening framework and Ultrasonic sensor are utilized for distance estimation.

3.1.3 IR Sensor Applications:

IR sensors are utilized in various Sensor based projects and likewise in different electronic gadgets which estimates the temperature that are talked about in the below.

3.2 RADIATION THERMOMETERS:

IR sensors are utilized in radiation thermometers to quantify the temperature rely on the temperature and the material of the item and these thermometers have a portion of the accompanying highlights

- Measurement without direct contact with the object
- Faster response
- Easy pattern measurements

3.3 FLAME MONITORS:

These kinds of gadgets are utilized for identifying the light discharged from the flares and to screen how the blazes are copying. The Light discharged from blazes reach out from UV to IR area types. PbS, PbSe, Two-colour detector, pyro electric detector are a portion of the ordinarily utilized locator

utilized in flame monitors.

3.4 MOISTURE ANALYZERS:

Moisture analyzers use frequencies which are consumed by the moisture in the IR locale. Articles are illuminated with light having these frequencies (1.1 μm , 1.4 μm , 1.9 μm , and 2.7 μm) and furthermore with reference frequencies. The Lights reflected from the items rely on the dampness content and is recognized by analyzer to quantify dampness (proportion of mirrored light at these frequencies to the mirrored light at reference frequency). In GaAs PIN Pbs photoconductive, photodiodes, detectors are utilized in moisture analyzer circuits.

3.5 IR IMAGING DEVICES:

IR image device is one of the significant utilizations of IR waves, essentially by uprightness of its property that isn't noticeable. It is utilized for thermal images, night vision gadgets, and so forth.



Figure 2.2 IR Imaging Devices

For example, Water, rocks, soil, vegetation, an air, and human tissue all highlights emit IR radiation. The thermal infrared indicators measure these radiations in IR reach and guide the spatial temperature appropriations of the

article/region on a picture. Temperature images generally made out of a Sb (indium antimonite), Gd Hg (mercury-doped germanium), Hg Cd Te (mercury-cadmium-telluride) sensors.

An electronic indicator is cooled to low temperatures utilizing fluid helium or fluid nitrogen. Then the Cooling the locators guarantees that the radiant energy (photons) recorded by the identifiers comes from the landscape and not from the encompassing temperature of items inside the actual scanner an IR imaging electronic gadget.

CHAPTER 4

4.1 LDR- LIGHT DEPENDENT RESISTOR:

What is a Light Dependent Resistor or a Photo Resistor?

A **Light Dependent Resistor** (LDR) or a photo resistor is a device whose resistivity is a component of the incident electromagnetic radiation. Thus, it is light sensitive device. it is additionally called as photograph conductor, photograph conductive cells or essentially photocells. it is comprised of semiconductor material having high opposition. There are various images used to demonstrate a LDR, quite possibly the most ordinarily utilized image is appeared in the figure underneath. The pointer shows light falling on it.

4.1.1 Working Principle of LDR:

A light dependent resistor deals with the principle of photo conductivity. Photo conductivity is an optical illusion where the materials conductivity (Consequently resistivity) reduces when light is devoured by the material. Right when light succumbs to model exactly when the photons fall on the gadget, the electrons in the valence band of the semiconductor material are excites to the conduction band. These photons in the incident light ought to have energy more noteworthy than the band hole of the semiconductor material to take the electrons leap from the valence band to the conduction band. Thus

when light having sufficient energy is episode on the gadget more and more electrons are eager to the conduction band which brings about enormous number of charge transporters. The consequence of this cycle is an ever increasing number of current beginnings streaming and subsequently it is said that the opposition of the gadget has diminished. This is the most widely recognized working rule of LDR.

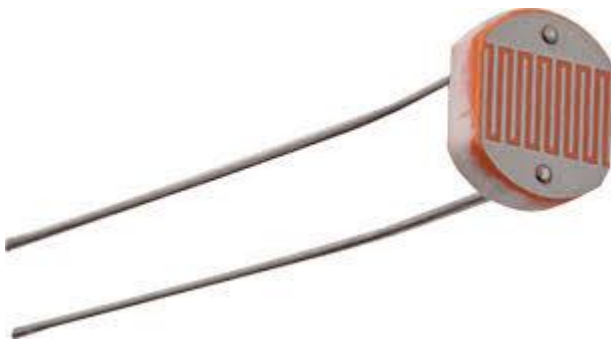


Figure 3.1 Diagram of LDR Sensor

4.1.2 Characteristics of LDR:

LDR is a light dependent device whose obstruction diminishes when light falls on them and increases in the dark. At the point when a light dependent resistor is kept in out of light, its power is high. This power is called as dark resistance. It tends to be just about as high as $10^{12} \Omega$. Also, if the device is permitted to retain light its opposition will diminish radically. In the event that a consistent voltage is applied to it and power of light is expanded the current beginnings expanding. Figure beneath shows opposition versus light bend for a specific LDR. Photocells or LDR's are non-direct gadgets. Their affectability shifts with the frequency of light episode on them. A few photocells may not in the slightest degree reaction to a specific scope of frequencies. In light of the material utilized various cells have distinctive ghostly reaction bends.

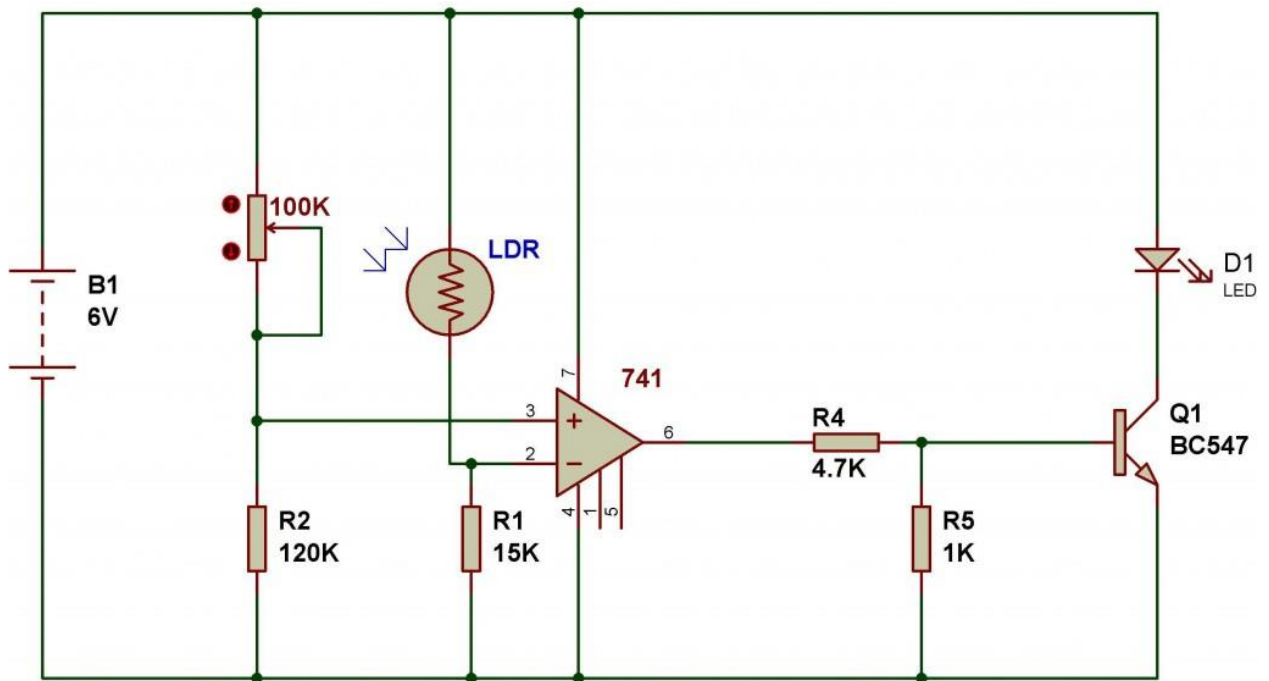


Figure 3.2 Circuit diagram of LDR Sensor

At the point when light is incident on a photocell it typically takes around 8 to 12ms for the adjustment in resistance from happen, while it requires seconds for the resistance from ascend back again to its underlying worth after kept away from light. This phenomenon is called as Resistance Recovery Rate. This property is utilized in Audio Compressors. Additionally, LDR's are less delicate than photo diodes and photo semiconductor. (A photo diode and a photocell (LDR) are not the equivalent, a photograph diode is a p-n junction semiconductor device that converts light to electricity, though a photocell is a uninvolved gadget, there is no p-n intersection in this nor it converts light to electricity).

4.2 TYPES OF LIGHT DEPENDENT RESISTORS:

Based on the materials used they are classified as:

4.2.1 Intrinsic photo resistor (Un doped semiconductor): It is a pure semiconductor material like silicon or germanium. Electrons get energized from valance band to conduction band when photons of enough energy decreases on it and number of charge transporters increases.

4.2.2 Extrinsic photo resistor: It is a semiconductor material doped with

pollutants which are called as dopants. Theories dopants make new energy groups over the valence band which are loaded up with electrons. Henceforth this decreases the band hole and less energy is needed in energizing them. Extraneous photograph resistors are by and large utilized for long frequencies.

4.3 CONSTRUCTION OF A PHOTOCELL:

The construction of a light dependent resistor comprises of a light sensitive material which is deposited on a insulating substrate like ceramic. The material is deposited in crisscross pattern to get the ideal resistance and power rating. This crisscross region isolates the metal deposited areas into two regions. At that point the ohmic contacts are made on the either side of the space. The resistance of these contacts ought to be pretty much as less as conceivable to ensure that the resistance mostly changes because of the impact of light as it were. Materials regularly utilized are cadmium sulfide, cadmium selenide, indium antimonide and cadmium sulphonide. The utilization of lead and cadmium is kept away from as they are destructive to the climate.

4.4 APPLICATIONS OF LDR:

LDR's have minimal cost and basic design. They are frequently utilized as light sensors. They are utilized when there is a need to recognize absences or existences of light like in a camera light meter. Utilized in streetlights, morning timer, criminal alert circuits, light force meters, for tallying the bundles proceeding onward a transport line, and so on.

CHAPTER 5

NODE MCU:

Node MCU IS an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems and equipment which depends on the ESP-12 module. The term "NodeMCU" of course alludes to the firmware instead of the advancement units. The firmware utilizes the Lua scripting language. It depends on the eLua project, and based on the Espressif Non-OS SDK for ESP8266. It utilizes many open-source projects, for example, lua-cjson and SPIFFS.

NodeMCU was made soon after the ESP8266 came out. On December 30, 2013, Espressif Systems began creation of the ESP8266. The ESP8266 is a Wi-Fi SoC coordinated with a Tensilica Xtensa LX106 core,[citation needed] widely utilized in IoT applications (see related projects). NodeMCU began on 13 Oct 2014, when Hong submitted the principal record of nodemcu-firmware to GitHub. Two months after the fact, the venture extended to incorporate an open-equipment stage when engineer Huang R submitted the gerber file of an ESP8266 board, named devkit v0.9. Soon thereafter, Tuan PM ported MQTT client library from Contiki to the ESP8266 SoC platform, and zeroed in on NodeMCU project, by then NodeMCU had the alternative to help the MQTT IoT show, using Lua to get to the MQTT dealer. Another critical update was made on 30 Jan 2015, when Devsaurus ported the u8glib to NodeMCU project, enabling NodeMCU to easily drive LCD, Screen, OLED, even VGA shows.

In summer 2015 the makers deserted the firmware project and a gathering of free supporters dominated. By summer 2016 the NodeMCU included in excess of 40 unique modules. Because of asset imperatives clients need to choose the modules significant for their task and assemble a firmware customized to their necessities.

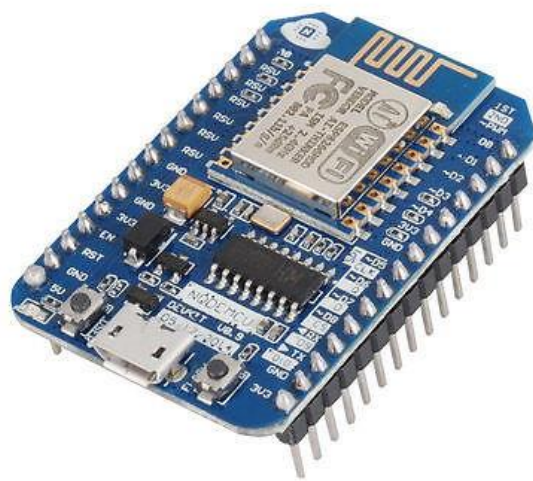
ESP8266 Arduino Core:

As Arduino.cc began growing new MCU boards dependent on non-AVR processors like the ARM/SAM MCU and utilized in the Arduino Duo, they expected to adjust the Arduino IDE's so that it would be moderately simple to change the IDE to help substitute toolchains to permit Arduino C/C++ to be arranged for these new processors. They did this with the presentation of the Board Manager and the SAM Core. A "core" is the assortment of programming parts needed by the Board Manager and the Arduino IDE to assemble an Arduino C/C++ source document for the objective MCU's machine language. Some ESP8266 fans built up an Arduino center for the ESP8266 WiFi SoC, prominently called the "ESP8266 Core for the Arduino IDE".[16] This has become a main programming advancement stage for the different ESP8266-based modules and improvement sheets, including Node MCUs.

5.1 INTRODUCTION:

NodeMCU is an open source LUA based firmware produced for ESP8266 wifi chip. By investigating usefulness with ESP8266 chip, NodeMCU firmware accompanies ESP8266 Development board/unit for example Node MCU development board.

**Figure 4.1 Node
Development
(Version1)**



**MCU
Board/kit v0.9**

Since NodeMCU is open-source platform, their hardware design is open for edit/modify/build.

NodeMCU Dev Kit/board consist of ESP8266 wifi enabled chip. The **ESP8266** is a low-cost [Wi-Fi](#) chip developed by Espressif Systems with TCP/IP protocol. For more information about ESP8266, you can refer ESP8266 WiFi Module.

There is Version2 (V2) available for NodeMCU Dev Kit i.e. **NodeMCU Development Board v1.0 (Version2)**, which usually comes in black colored PCB.



Figure 4.2 NodeMCU Development Board/kit v1.0 (Version2)

NodeMCU Dev Kit has **Arduino like** Analog (i.e. A0) and Digital (D0-D8) pins on its board.

It supports serial communication protocols i.e. UART, SPI, I2C etc. Using such serial protocols we can connect it with serial devices like I2C enabled LCD display, Magnetometer HMC5883, MPU-6050 Gyro meter + Accelerometer, RTC chips, GPS modules, touch screen displays, SD cards etc.

5.2 HOW TO START WITH NODE MCU?

NodeMCU Development board is featured with wifi capability, analog pin, digital pins and serial communication protocols.

To get started with utilizing NodeMCU for IoT applications first we need to think about how to compose/download NodeMCU firmware in NodeMCU Development Boards. Furthermore, before that where this NodeMCU firmware will get according to our prerequisite.

There is online NodeMCU custom forms accessible utilizing which we can undoubtedly get our custom NodeMCU firmware according to our prerequisite.

To find out about how to construct custom NodeMCU firmware on the web and download it.

5.3 HOW TO WRITE CODES FOR NODEMCU?

After setting up ESP8266 with Node-MCU firmware, let's see the IDE (Integrated Development Environment) required for development of NodeMCU.

5.3.1 Node MCU with ESPlorer IDE:

Lua scripts are gradually used to code the Node MCU. Lua is an open source, lightweight, embeddable scripting language based on top of C programming language.

5.3.2 Node MCU with Arduino IDE:

Here is another method of creating Node MCU with a notable IDE for example Arduino IDE. We can likewise create applications on Node MCU utilizing Arduino advancement climate. This makes simple for Arduino engineers than learning new dialect and IDE for Node MCU. For more data about how to write Arduino sketch for Node MCU.

5.4 DIFFERENCE IN USING ESPLORER AND ARDUINO IDE:

All things considered, there is a programming language contrast we can say while creating application for Node MCU utilizing ESPlorer IDE and Arduino IDE.

We need to code in C\C++ programming language in the event that we are utilizing Arduino IDE for creating Node MCU applications and Lua language on the off chance that we are utilizing ESPlorer IDE.

Fundamentally, Node MCU is Lua Interpreter, so it can comprehend Lua content without any problem. At the point when we compose Lua contents for Node MCU and send/transfer it to Node MCU, at that point they will get executes successively. It won't construct parallel firmware document of code for Node MCU to compose. It will send Lua content all things considered to Node MCU to get execute.

In Arduino IDE when we compose and arrange code, ESP8266 toolchain in foundation makes double firmware record of code we composed. Also, when we transfer it to Node MCU then it will streak all Node MCU firmware

with recently produced double firmware code. Truth be told, it composes the total firmware.

That is the motivation behind why Node MCU not acknowledge further Lua contents/code after it is getting streaked by Arduino IDE. In the wake of getting streaked by Arduino sketch/code it will be no more Lua translator and we got mistake on the off chance that we attempt to transfer Lua contents. To again begin with Lua content, we need to streak it with Node MCU firmware.

Since Arduino IDE order and transfer/composes total firmware, it takes additional time than ESPlorer IDE.ch for Node MCU referer.

CHAPTER 6

DC MOTORS:

6.1 GENERAL INFORMATION:

A DC motor is utilized to drive a mechanical load. In this lab, an independently excited DC generator generates the load. The load on the motor is changed by shifting the generator field current. By expanding the field current of the DC generator, the load on the DC motor increments and therefore the armature current increments. in common, DC motors are described by their torque speed curves as

demonstrated in Figure 9.1. Since the estimating hardware for shaft torque isn't accessible in the lab it is important to utilize elective methods for describing the DC motor. One option is to plot shaft speed versus armature current since torque is directly proportion to the armature current with a consistent field current provided to the motor. Shaft speed is likewise a component of the field current in a DC engine while keeping a consistent

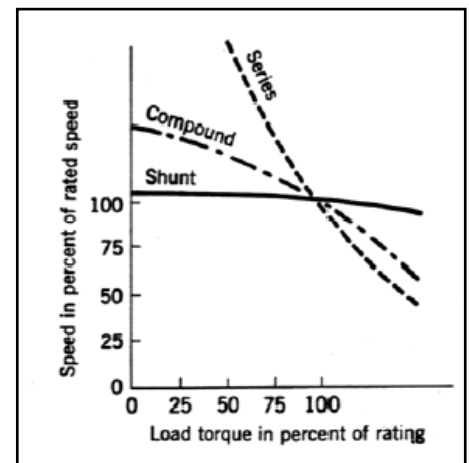


Figure 5.1 Characteristics of DC Motor

armature voltage as field current is proportional to the immediate pivot motion delivered in the machine.

6.2 CONSTRUCTION:

The stator of the dc motor has poles, which are energized by dc current to

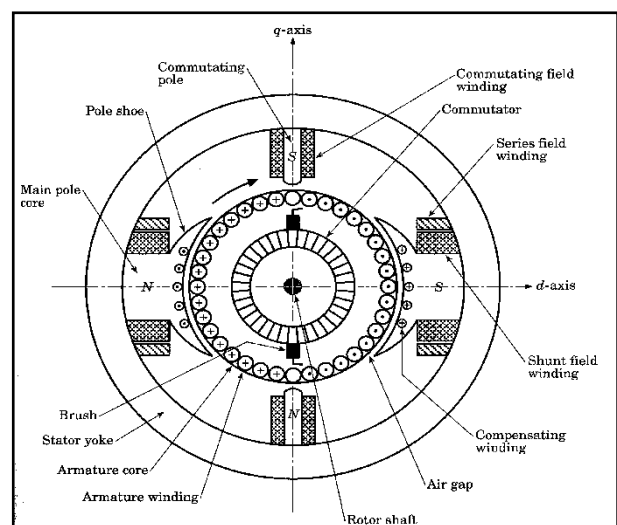
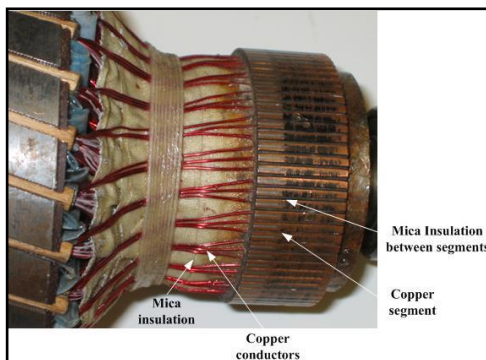


Figure 5.2 Construction Image Of DC Motor

create attractive fields. In the unbiased zone, in the center between the poles, commutating poles are put to lessen starting of the commutator. The commutating poles are provided by dc current. Compensating windings are mounted on the fundamental poles. These short_circuited windings moist rotor motions. The poles are mounted on an iron core that gives a closed magnetic circuit. The motor housing upholds the iron core, the brushes and the barings.

The rotor has a ring-shaped covered iron center with spaces. Curls with a few turns are set in the spaces. The distance between the two legs of the curl is around 180 electric degrees. The loops are associated in arrangement through the commutator sections. The closures of each curl are associated with a commutator fragment. The commutator comprises of protected copper sections mounted on a protected cylinder. Two brushes are squeezed to the commutator to allow current stream. The brushes are set in the nonpartisan zone, where the attractive field is near nothing, to lessen arcing. The rotor has a ring-formed covered iron center with spaces. The commutator comprises of protected copper portions mounted on a protected cylinder. Two brushes are squeezed to the commutator to allow current stream. The brushes are set in the impartial zone, where the attractive field is near nothing, to decrease arcing. The commutator changes the current from one rotor loop to the contiguous curl, the exchanging requires the interference of the loop current. The abrupt interference of an inductive current produces high voltages. The high voltage produces flashover and arcing between the commutator section and the brush.

6.3 DC MOTOR OPERATION:

In a dc motor, the stator poles are provided by dc excitation current, which delivers a dc magnetic field. The rotor is provided by dc current through the brushes, commutator and loops. The cooperation of the magnetic field and rotor current creates a power that drives the motor. The magnetic field

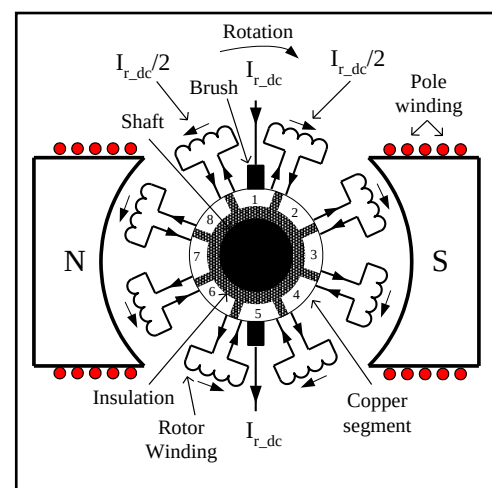
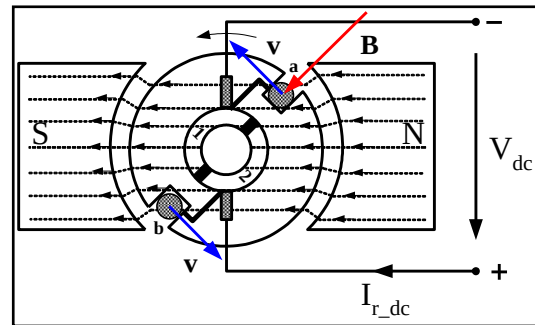
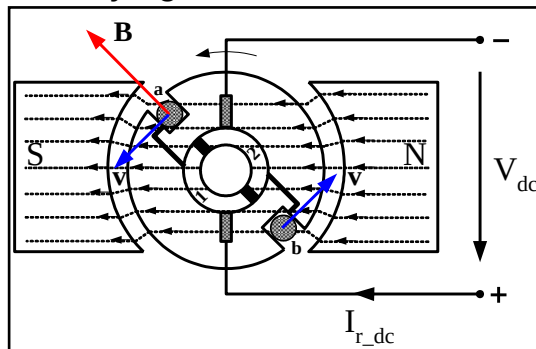


Figure 5.3 Image of Operation of DC Motor

lines go into the rotor from the north pole (N) and exit southward (S).

The shafts produce an attractive field that is opposite to the current conveying conductors. The



communication between the field and the current delivers a Lorentz power; the power is opposite to both the attractive field and conductor.

The produced power turns the rotor until the curl arrives at the nonpartisan point between the shafts. Now, the attractive field turns out to be essentially zero along with the power. Be that as it may, inactivity drives the engine past the impartial zone where the course of the attractive field inverts. To stay away from the inversion of the power bearing, the commutator alters the current course, which keeps up the counterclockwise revolution. Prior to arriving at the unbiased zone, the current enters in portion 1 and ways out from section 2. Along these lines, current enters the curl end at space an and exits from opening b during this stage. Subsequent to passing the nonpartisan zone, the current enters fragment 2 and ways out from section 1, this turns around the current course through the rotor loop, when the curl passes the unbiased zone. The aftereffect of this current inversion is the upkeep of the revolution.

6.4 DC MOTOR EQUIVALENT CIRCUIT:

The following figures show the equivalent circuit of a separately excited dc motor. Equivalent circuit is similar to the generator only the current directions are different.

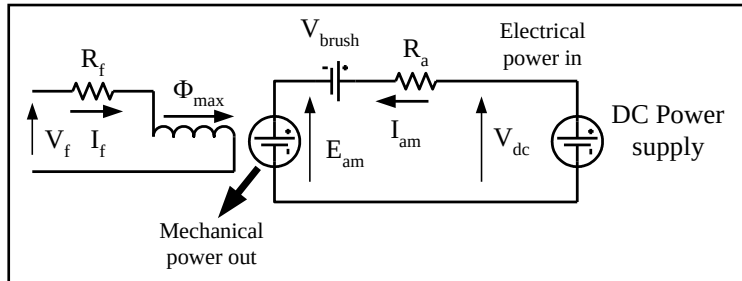


Figure 5.4 DC Motor Equivalent Circuit

The operation equations are:

Armature voltage equation

$$V_{dc} = E_{am} + I_{am} R_a + V_{brush}$$

The induced voltage and motor speed vs angular frequency

$$E_{am} = K_m I_f \omega \quad \omega = 2 \pi n_m$$

The combination of the equations results in

$$K_m I_f \omega = E_{am} = V_{dc} - I_{am} R_m$$

The current is calculated from this equation.

$$P_{out} = E_{am} I_{am} \quad T = \frac{P_{out}}{\omega} = K_m I_{am} I_f$$

Motor Control utilizing NPN Transistor. Generally, even the least complex robot requires an motor to pivot a wheel or to perform specific action. Since motor requires more electricity than the microcontroller pin can ordinarily produce, you need some kind of a switch (Transistors, MOSFET, Relay and so forth,) which can acknowledge a little current, enhance it and create a bigger current, which further drives an motor. This whole cycle is

finished by what is known as a motor driver.

Motor driver is essentially a momentum enhancer which takes a low-ebb and flow signal from the microcontroller and gives out a relatively higher flow signal which can handle and drive an engine. By and large, a semiconductor can go about as a switch and play out this assignment which drives the motor a solitary way.

1. Turning on Switches **A** and **D** makes the motor rotate clockwise
2. Turning on Switches **B** and **C** makes the motor rotate anti-clockwise
3. Turning on Switches **A** and **B** will stop the motor (Brakes)
4. Turning off all the switches gives the motor a free wheel drive
5. Lastly turning on **A & C** at the same time or **B & D** at the same time shorts your entire circuit. So, do not attempt this.

CHAPTER 7

L293D SKELETON:

L293D Skeleton H-extensions can be worked without any preparation utilizing transfers, MOSFET, field impact semiconductors (FET), bi-polar intersection semiconductors (BJT), and so on Be that as it may, if your present prerequisite isn't too high and all you need is a single package which does the work of driving a little DC motor in two ways, at that point all you need is a L293D IC. This single package can interface not one, but rather two DC motors. L293, L293B and few different forms additionally does likewise work, however pick the L293D variant as this one has an inbuilt fly back diode which shields the driving semiconductors from voltage spikes that happen when the engine curl is killed.

7.1 INTRODUCTION TO L293D IC:

L293D IC by and large comes as a standard 16-pin DIP (double in line bundle). This motor driver IC can all the while control two little motors one or the other way; forward and invert with only 4 microcontroller pins (on the off chance that you don't utilize empower pins). A portion of the highlights (and disadvantages) of this IC are:

1. Output current ability is restricted to 600mA per channel with top yield current restricted to 1.2A (non-dull). This implies you can't drive greater motors with this IC. Notwithstanding, most little motors utilized in leisure activity advanced mechanics should work. On the off chance that you are uncertain whether the IC can deal with a specific motor, interface the IC to its circuit and run the motor with your finger on the IC. Assuming it gets truly hot, be careful... Likewise note the words "non-tedious"; if the current yield over and again arrives at 1.2A, it may obliterate the drive semiconductors.
2. Supply voltage can be pretty much as extensive as 36 Volts. This implies you don't need to stress a lot over voltage guideline.
3. L293D has an empower office which assists you with empowering the IC yield pins. In the event that an empower pin is set to rationale high, condition of the sources of info match the condition of the yields. Assuming you pull this low, the yields will be killed paying little heed to the information states.
4. The datasheet likewise specifies an "over temperature security" incorporated into the IC. This implies an inward sensor detects its inner temperature and quits driving the engines if the temperature crosses a set point.
5. Another significant element of L293D is its interior clasp diodes. This

flyback diode shields the driver IC from voltage spikes that happen when the motor loop is turned here and there (generally when killed).

6. The legitimate low in the IC is set to 1.5V. This implies the pin is set high just if the voltage across the pin crosses 1.5V which makes it reasonable for use in high recurrence applications like exchanging applications (upto 5KHz).

7. Ultimately, this coordinated circuit drives DC motors, however can likewise be utilized to drive transfer solenoids, stepper motors and so forth.

7.2 L293D CONNECTIONS:

The circuit appeared to the acceptable is the most essential execution of L293D IC. There are 16 pins standing out of this IC and we need to comprehend the usefulness of each pin prior to executing this in a circuit

Pin1 and Pin9 are "Enable" pins. They ought to be associated with +5V for the drivers to work. Assuming they pulled low (GND), the yields will be killed paying little heed to the information states, halting the engines. On the off chance that you have two extra pins in your microcontroller, interface these pins to the microcontroller, or simply associate them to controlled positive 5 Volts.

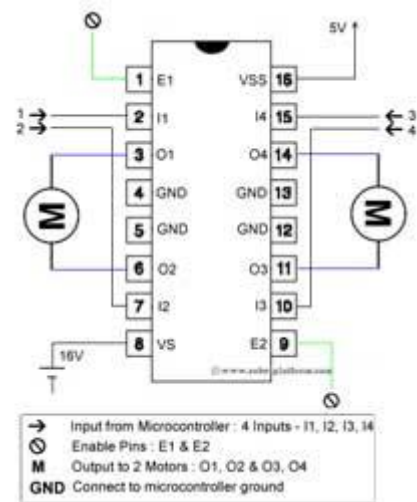
1. Pin4, Pin5, Pin12 and Pin13 are ground pins which ought to in a perfect world be associated with microcontroller's ground.
2. Pin2, Pin7, Pin10 and Pin15 are rationale input pins. These are control pins which ought to be associated with microcontroller pins. Pin2 and Pin7 control the primary engine (left); Pin10 and Pin15 control the second motor(right).

3. Pin3, Pin6, Pin11, and Pin14 are yield pins. Bind Pin3 and Pin6 to the main engine, Pin11 and Pin14 to second engine
4. Pin16 powers the IC and it ought to be associated to regulated +5Volts
5. Pin8 powers the two motors and ought to be associated with positive lead of an secondary battery. According to the datasheet, supply voltage can be just about as high as 36 Volts.

7.3 TRUTH TABLE:

Until now where to connect the motors, battery and the microcontroller have been showed. In any case, how to control the direction of the motor? Allow us to take a model:

Assume you need to control the left motor which is associated with Pin3(O1) and Pin6(O2). As referenced above, we require three pins to control this engine - Pin1 (E1), Pin2 (I1) and Pin7 (I2). Here is reality table addressing the usefulness of this motor driver.



Pin 1	Pin 2	Pin 7	Function
High	High	Low	Turn Anti-clockwise (Reverse)
High	Low	High	Turn clockwise (Forward)
High	High	High	Stop
High	Low	Low	Stop
Low	X	X	Stop

Figure 6.1 Truth Table Of L293D

High $\sim +5V$, Low $\sim 0V$, X=Either high or low (don't care)

In the above truth table you can see that assuming Pin1 (E1) is low when the motor stops, regardless of the states on Pin2 and Pin7. Consequently it is crucial for hold E1 high for the driver to work, or just associate enables pins to positive 5 volts.

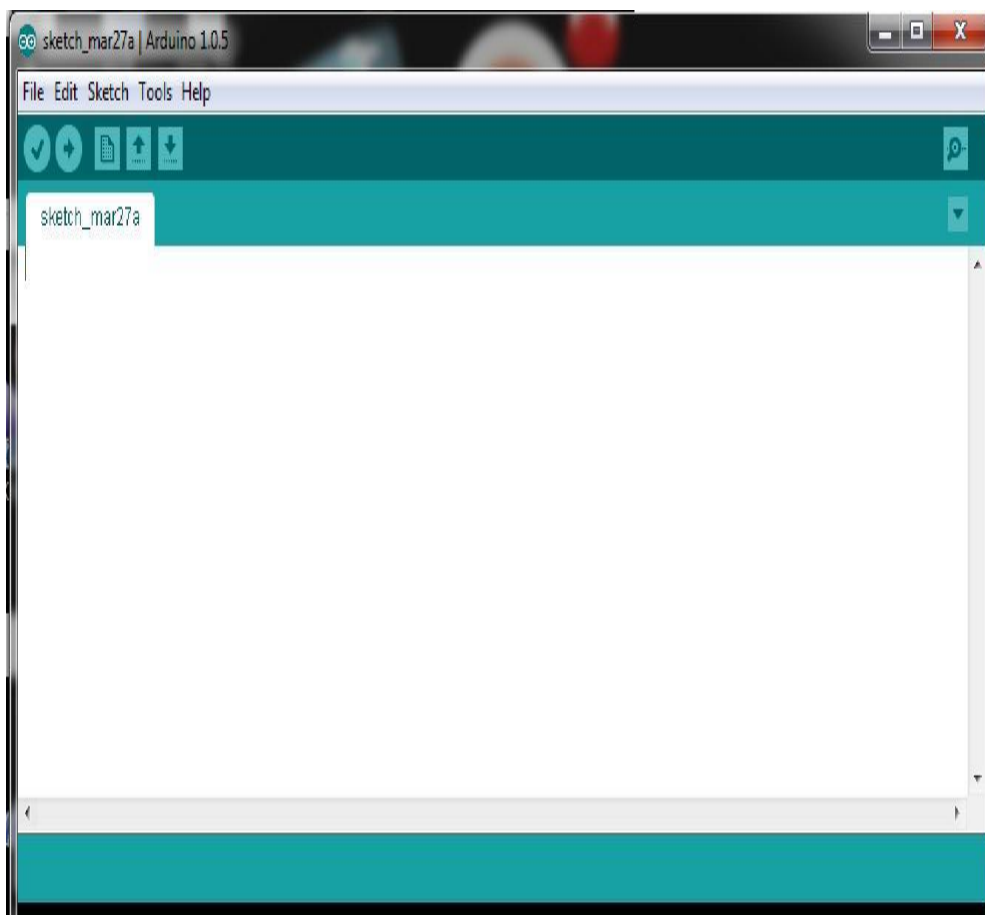
With Pin1 high, in the event that Pin2 is set high and Pin7 is pulled low, current streams from Pin2 to Pin7 driving the motor in enemy of clockwise course. Assuming the territories of Pin2 and Pin7 are flipped, current streams from Pin7 to Pin2 driving the engine clockwise way.

The above idea remains constant for opposite side of the IC as well. Connect your motor to Pin11 and Pin14; Pin10 and Pin15 are input pins, and Pin9 (E2) enables the driver.

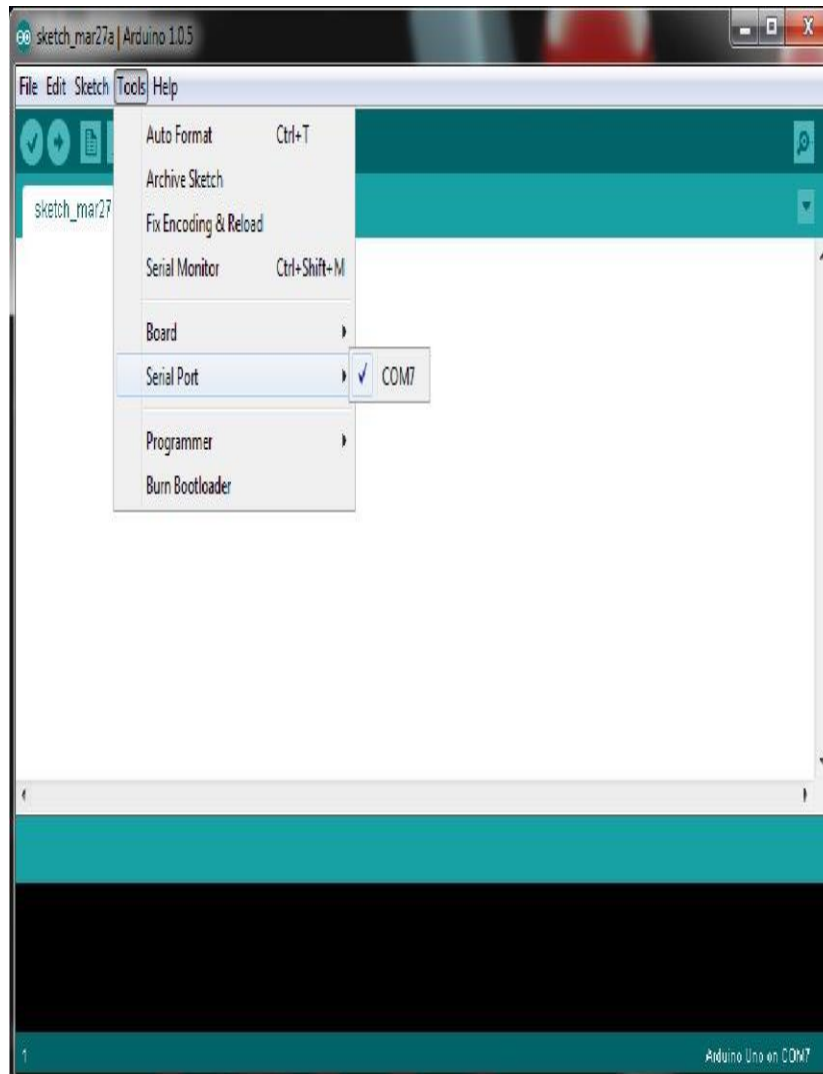
CHAPTER 8

ARDUINO SOFTWARE:

1. Open Arduino IDE as shown below
Open Arduino IDE

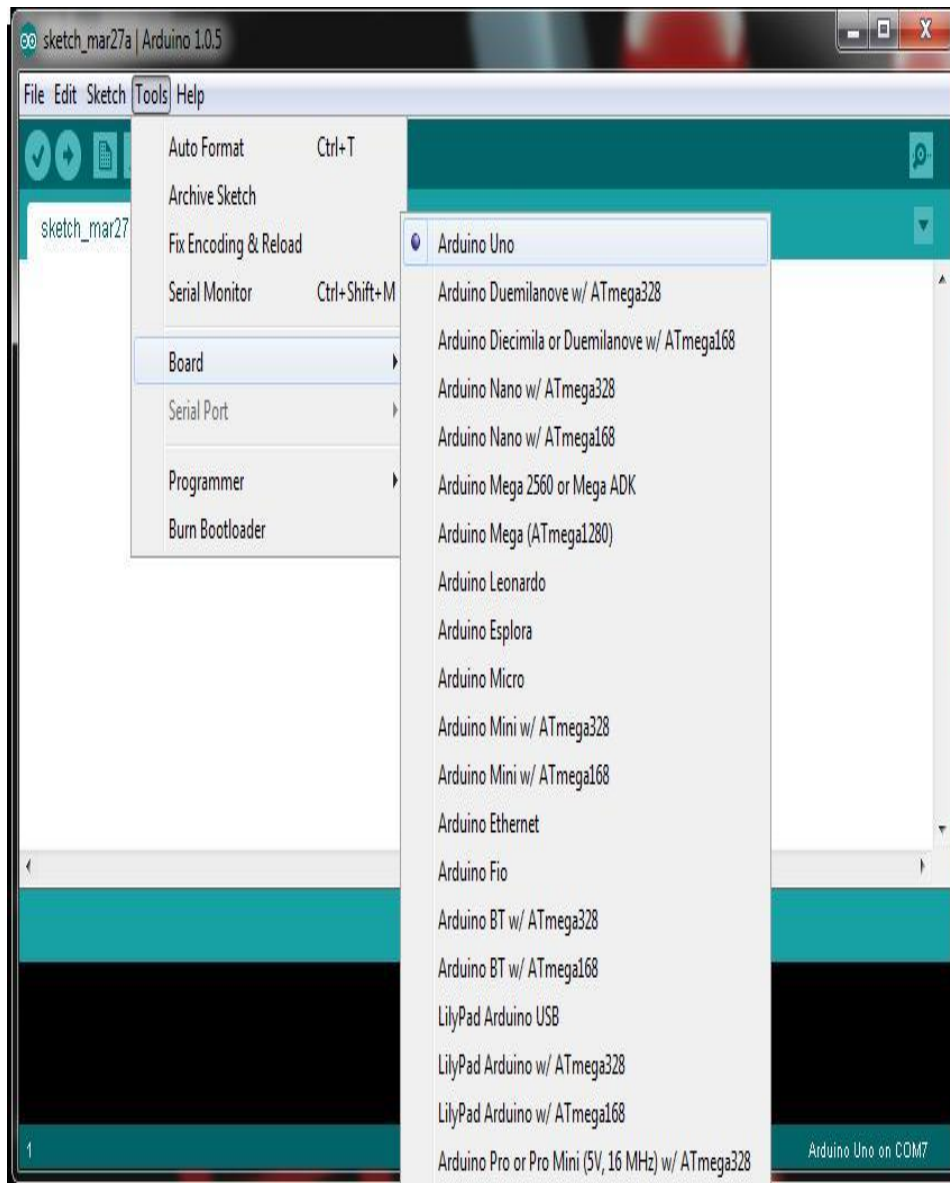


2. Select the COM Port from tool Select the COM Port



3. Select the required Arduino board from Tools as shown below

Select the required Arduino board



4. Write the sketch in Arduino IDE

Sketch in Arduino IDE



```
sketch_mar28a$
#include <Servo.h> //includes the servo library
int motor_pin1 = 4;
int motor_pin2 = 5;
int motor_pin3 = 6;
int motor_pin4 = 7;
int servopin = 8;
int sensorpin = 0;
int dist = 0;
int leftdist = 0;
int righdist = 0;
int object = 500; //distance at which the robot should look for another route
const int RightSensor = 1; // This pin is used to read the value of the Right Sensor.
const int LeftSensor = 2; // This pin is used to read the value of the Left Sensor.
int SensorLeft; // This stores the value of the Left Sensor pin to use later on in the sketch
int SensorRight; // This stores the value of the Right Sensor pin to use later on in the sketch
int SensorDifference; // This value is used to determine the difference between the Left and Right
```

1 Arduino Uno on COM7

5. Compile and upload the Sketch to Arduino board upload the Sketch to Arduino board



CHAPTER 9

CONCLUSION:

This designed Smart Parking System which is basic, monetary and gives compelling answer for diminish carbon footprints in the air. It is very much figured out how to access access the map and travel people to the available parking slots through web. Subsequently it lessens the danger of discovering the parking slots in any area and furthermore it eliminates unnecessary travelling of vehicle through the filled parking areas around there. So it diminishes time and it is economy too.

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Smart Car Parking System using IOT

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Abstract:

- Internet of Things (IOT) plays a vital role in connecting the surrounding environmental things to the network and made easy to access those un-internet things from any remote location.
- And generally people are facing problems on parking vehicles in parking slots in a city. In this study we design a Smart Parking System (SPS) which enables the user to find the nearest parking area and gives availability of parking slots in that respective parking area.
- And it mainly focus on reducing the time in finding the parking lots and also it avoids the unnecessary travelling through filled parking lots in a parking area. Thus it reduces the fuel consumption which in turn reduces carbon footprints in an atmosphere.

LITERATURE SURVEY

Title	Work Done	Limitation
REAL TIME CAR PARKING AND LIGHT CONTROL USING EMBEDDED TECHNOLOGY	<i>The aim of making this project is to overcome the difficulties which we faces usually while parking our vehicles in parking area and also to maintain the efficient use of electricity in parking. Current car parking management systems utilize human personnel to find available parking areas or use a video based system that collects the information in the form of images and tracks available parking slots.</i>	It is not reliable
SMART PARKING SYSTEM BASED ON EMBEDDED SYSTEM AND SENSOR NETWORK	Locating a parking space in central city areas, especially during the peak hours, is cumbersome for drivers. The issue arises from not having the knowledge of where the available spaces may be at the time, even if known, many vehicles may seek very limited parking spaces to cause severe traffic congestion. In this paper the design and implementation with a prototype of Reservation-based Smart Parking System (RSPS) that permits drivers to effectively locate and withhold the vacant parking spaces in mentioned.	Difficult to handle this process
SMART PARKING	Smart Parking systems typically obtains information about available parking spaces in a particular geographic area and process is real-time to place vehicles at available positions .It involves using low-cost sensors, real-time data collection, and mobile-phone-enabled.	high cost

LITERATURE SURVEY:

INTELLIGENT VEHICLE CONTROL USING WIRELESS EMBEDDED SYSTEM IN TRANSPORTATION SYSTEM BASED ON GSM AND GPS TECHNOLOGY	Currently almost of the public having an own vehicle, theft is happening on parking and sometimes driving in security places. The safe of vehicles is extremely essential for public vehicles. Vehicle security and accident prevention is more challenging. So in order to bring a solution for this problem this system can be implemented. Vehicle security enhancement and accident prevention system can be developed through the application of ignition control (tracking and locking), fuel theft, accident detection and prevention, driver fatigue, pollution control and speed limiting with efficient vehicle management system.	Less performance
CAR PARK SYSTEM: A REVIEW OF SMART PARKING SYSTEM AND ITS TECHNOLOGY	Due to the proliferation in the number of vehicles on the road, traffic problems are bound to exist. This is due to the fact that the current transportation infrastructure and car park facility developed are unable to cope with the influx of vehicles on the road. To alleviate the aforementioned problems, the smart parking system has been developed. With the implementation of the smart parking system, patrons can easily locate and secure a vacant parking space at any car park deemed convenient to them.	Short distance usage.

Existing system:

- Public lighting is has the greatest impact on energy consumption of a municipality, and may account for up to 54% of total energy consumption and 61% of electricity consumption of municipal facilities.
- Multiple sections of lights in the same electric cabinet, coupled with the significant loss of tension on power lines, causes serious interference to PLC based systems.
- The technology used here is face recognition and face detection in real time. As the photos are taken in real time, several problems like unequal illumination and changes in the background may affect the system.
- To overcome this problem DCT normalization and background cancellation algorithms are incorporated along with basic face detection and face recognition algorithm. In this paper software and hardware details of the system are discussed. Technologically system is simple, accurate and maintainable.

Proposed system:

The Proposed system consist of the car parking system using the Nodemcu.

The car parking system having the IR sensor to detect the vehicles count and send it to the mail in the entrance of the car parking lot.

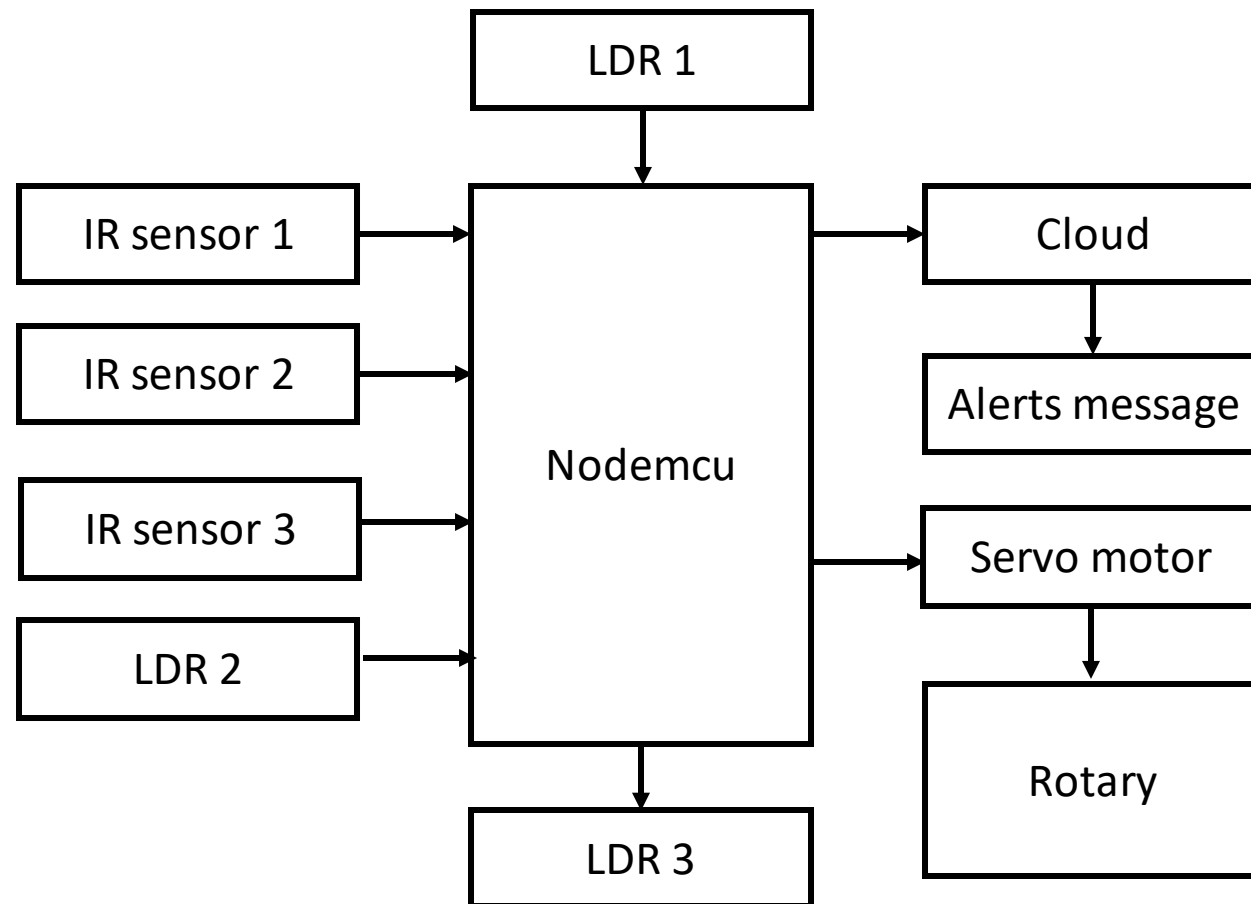
Here we can also added rotary type. It is used to choose the slots automatically, like which slots are available.

Whenever the vehicle is detected, the empty space will be displayed in the mail and The Car parking availability will be shown using LED's intimation.

When the vehicle is moving, we can able to switch on the light automatically then after leaving the vehicle we can switch of the vehicle. At the day time, LDR sensor detect automatically, it will switch of the light, then at the night time, we can able to switch on the light.

When light are having any trouble, we can sent the message to the management of the respective places and also we can able to monitor the distance between backside of the vehicle and parking place.

Block diagram:



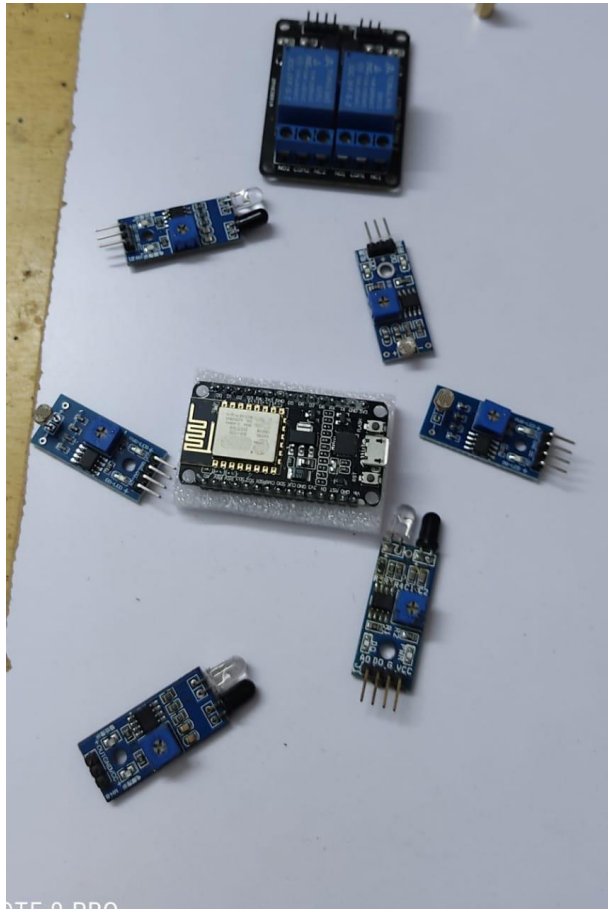
Hardware required:

- Nodemcu
- IR sensor
- LDR
- Servo motor
- Rotary pad

Software required:

- Arduino ide
- Embedded C

Snapshot



```
Blink | Arduino 1.8.13 (Windows Store 1.8.42.0)
File Edit Sketch Tools Help

Blink
by Gaby Newman

This example code is in the public domain.

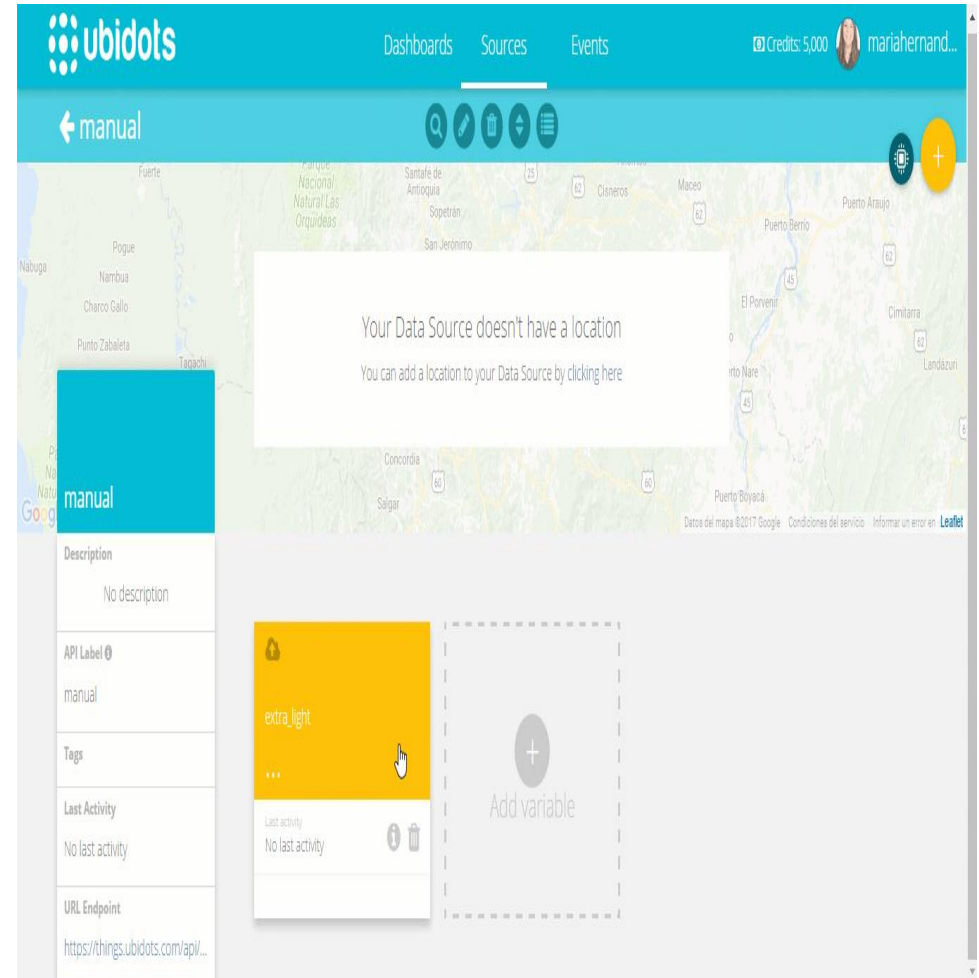
http://www.arduino.cc/en/Tutorial/Blink
*/

// the setup function runs once when you press reset or power the
void setup() {
  // initialize digital pin LED_BUILTIN as an output.
  pinMode(LED_BUILTIN, OUTPUT);
}

// the loop function runs over and over again forever
void loop() {
  digitalWrite(LED_BUILTIN, HIGH);   // turn the LED on (HIGH is the positive voltage)
  delay(1000);                       // wait for a second
  digitalWrite(LED_BUILTIN, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);                       // wait for a second
}

Invalid library found in C:\Users\GTT ECE 02\Documents\Arduino\libraries

1MB (FS:2MB OTA:~1019KB), 2. v2 Lower Memory, Disabled, None, Only Sketch, 115200 on COM4
```



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SMART CAR PARKING SYSTEM USING IOT Submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering By RAYAPUREDDY NAGA SATYA SAI KUMAR (37130346) SEGGAM YOGA AVINASH (37130366) DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING SCHOOL OF ELECTRICAL AND ELECTRONICS ENGINEERING SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY (DEEMED TO BE UNIVERSITY) Accredited with Grade **A** by NAAC JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119 APRIL 2020 DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING BONAFIDE CERTIFICATE This is to certify that this Project Report is the bonafide work of RAYAPUREDDY NAGA SATYA SAI KUMAR (37130346) and SEGGAM YOGA AVINASH(37130366) who have done the Project work as a team who carried out the project entitled **SMART CAR PARKING SYSTEM USING IOT** under my supervision from September 2019 to April 2020. Internal Guide Dr.Z. Mary Livinsa Ph.D Head of the Department Dr. T. RAVI M.E, Ph.D

Submitted for Viva voce Examination held on _ Internal Examiner External Examiner DECLARATION We,RAYAPUREDDY NAGA SATYA SAI KUMAR(37130346) and SEGGAM YOGA AVINASH (37130366) hereby declare that the Project Report entitled **SMART CAR PARKING SYSTEM USING IOT** done by us under the guidance of Dr. Z. Mary Livinsa (Ph.D) at Sathyabama institute of Science and Technology is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering. DATE : PLACE: 1. 2. SIGNATURE OF THE CANDIDATE ACKNOWLEDGEMENT We are pleased to acknowledge our sincere thanks to Board of Management of SATHYABAMA for their kind encouragement in doing this project and for completing it successfully. We are grateful to them.

We convey our thanks to Dr. N. M. Nandhitha, M.E, Ph.D, Dean, School of Electrical and Electronics and Dr. T Ravi, M.E. Ph.D, Head of the Department, Dept. of Electronics and Communication Engineering for providing us necessary support and details at the right time during the progressive reviews. We would like to express our sincere and deep sense of gratitude to our Project Guide Dr. Z. Mary Livinsa Ph.D, for her valuable guidance, suggestions and constant encouragement paved way for the successful completion of our project work. We wish to express our thanks to all Teaching and Non-teaching staff members of the Department of Electronics and Communication Engineering who were helpful in many ways for the completion of the project.

SMART CAR PARKING SYSTEM USING IOT ABSTRACT: Internet of Things (IoT) assumes an imperative part in associating the encompassing natural things to the organization and made simple to get to those un-internet things from any distant area. Furthermore, for the most part, individuals are dealing with issues on

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parking vehicles. In this study we plan a "Smart Parking System" (SPS) which empowers the vehicle owners to discover the closest parking slot and gives accessibility of stopping spaces in that particular region furthermore, it principally centers around lessening the time in discovering the parking slots and furthermore it stays away from the pointless going through filled parking slots in a stopping region. Accordingly, it decreases the fuel utilization which thus reduces the carbon releases in an environment.

Internet of Things (IOT) assumes a crucial part in connecting ecological things to organize and makes it simple to get to these non-internet things from any removed spot. It's inescapable for individuals update with the developing technology and usually, people manage parking problems in city car parks. In this study, we design a Smart Parking System (SPS) allows the user to find the nearest parking area availability of parking spaces in this respective parking area. And he focuses mainly on reducing the time to find the parking and also avoids unnecessary travel thanks to complete parking in a parking lot. So, it reduces fuel consumption which in turn reduces the carbon footprint in an atmosphere.

INTRODUCTION: Road congestion caused by vehicles is alarming problem on a global scale and is growing exponentially. The problem of parking is an important factor and it was still a big problem with confined car parks urban cities. Looking for a parking spot is a routine regularly disappointing tasks for some individuals in the urban areas all throughout the planet. This task consumes around 1,000,000 barrels the oil of the world consistently. These problems will get worse with the world's population continues to urbanize without removed from the car well planned, based on convenience. According to a report, Smart Parking could involve 2, 20,000 gallons of fuel until 2030 and approx. 3, 00,000 gallons fuels by 2050 if implemented properly as stated in Figure. Smart Parking systems get information about availability parking in a particular geographical area. This process is in real time to position the vehicles in the available positions.

Involved Real-time data collection with low-cost sensors automatic payment systems activated on the mobile phone allows people to book early parking. The importance of smart parking is: Detects and accurately preaches the occupation of premises / vehicles by real time. Guide residents and visitors to available parking. Optimize the use of the parking space. Simplify the parking experience and add value parking parties, such as dealers and drivers. Help the free flow of traffic in the city by exploiting the IOT technology. Enables smart decisions using data, including real data temporary status applications and historical analysis reports. Smart parking plays an important role in the creation of urban environment by reducing CO2 emissions and other pollutants.

Smart Parking allows better tracking in real time and manage the resulting free parking space significant revenue generation. Provides tools to optimize the management of the workforce. LITERATURE SURVEY: Smart Car Parking Management System Using Iot Aniket Gupta, Sujata Kulkarni, Vaibhavi Jathar, Ved Sharma, Naman Jain Multiplication in the quantity of vehicles is prompting issues of vehicles parking at a fitting spot particularly in the parking area. This by implication prompts traffic. This is a direct result of the way that current transportation foundation and vehicle parking organisation can't adapt to the appearance of enormous number of vehicles out on the road. To lighten the previously mentioned issue, creators proposed a "Smart Parking Management System" that assists people with consequently tracking down a free parking spot with a more modest sum.

This model includes utilization of Ultrasonic sensor, Arduino Uno, ESP8266-01 Wi-Fi Module, Cloud worker. IOT based new parking method empower to associate, investigate and robotize information assembled from gadgets and execute savvy stopping conceivable. smart parking would empower vehicle inhabitation, observing and overseeing of accessible parking spot continuously that decreasing the natural contamination. Proposed system gives upgrade utilization of parking spot and get significant income age. Smart Parking Management System using Iot Idea Vrushali D. Ichake.1, 2, 3, Priya D. Shitole. 1, 2, 3 and Mohsina Momin.1, 2, 3 Kanchan S. Thakare, Assistant Professor 2, 3 A significant issue in everyday life is leaving of vehicles particularly the vehicle leaving at a parking spot. Furthermore, this issue in a roundabout way prompts traffic.

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This paper presents the fundamental idea of server or cloud based smart parking services in urban areas as a significant utilization of the Internet of Things (Iot). This system will be open through a versatile application or through the page gave and can be utilized to screen or track down the parking slots around there. Survey paper on s Vishwanath , Aishwarya, D Kuchalli, Debarupa Rakshit This paper proposes a Smart Parking system which gives an ideal answer for parking issues in urban communities. Because of fast expansion in vehicles particularly during the pinnacle hours of the day, it is a troublesome undertaking for the drivers to discover a parking spot to leave their vehicles.

The point of the paper is to determine the previously mentioned issue which gives the Smart Parking system. This system utilizes distributed computing and Internet of Things (IOT) technology. An appropriate most limited way calculation is utilized to track down the base distance between the vehicle and every parking slot in the area. Accordingly, the holding up season of the client is limited .The paper likewise presents the use of android application utilizing advanced mobile phone for the communication between the Parking slot and the person. RFID technology is utilized in this system to stay away from the human mediation which limits the expense EXISTING SYSTEM: This document provides a unique algorithm that increases the capacity of the current cloud intelligent parking system and is also developing a network architecture based on the Internet of Things technology. This system helps users find a free parking space with new minimum costs automatic performance measurement. This metric calculates user spaces in each parking space.

To improve parking management, a smart parking system has been developed to reduce purpose of hiring people to maintain the parking system. In this article, we propose a cloud-based Internet-based intelligent parking system. Things. Data including the GPS position of the vehicle and the distance between the car parks and the number free parking in the car parks will be sent to the data center. Here the data server is introduced as cloud server that calculates the expenses of a client parking request and this data is standard refreshed and made accessible to vehicles on the network whenever. In this proposed system, each parking lot is an IOT network and operates independently as a normal parking space. DRAWBACKS: The vehicles may theft by others Man power is needed.

It is not suitable for large no of vehicle car parking Maintenance cost is high Not automated PROPOSED SYSTEM: The Proposed system consist of the car parking system and street light control using the Raspberry pi. The car parking system having the IR sensor to detect the vehicles count and send it to the mail in the entrance of the car parking lot. Whenever the vehicle is detected, the empty space will be displayed in the mail and The Car parking availability will be shown using LED's intimation. When the vehicle is moving, we can able to switch on the light automatically then after leaving the vehicle we can switch of the vehicle.

At the day time, LDR sensor detect automatically, it will switch of the light, then at the night time, we can able to switch on the light. When light are having any trouble, we can sent the message to the management of the respective places and also we can able to monitor the distance between backside of the vehicle and parking place. ADVANTAGES: NO man power Automated More security than existing system Less maintenance More comfortable. BLOCK DIAGRAM: / HARDWARE USED: Nodemcu IR sensor Camera LDR Dc motor SOFTWARE USED: Embedded C Arduino ide IOT: The structure of this chapter is the following: Section 1.1 defines the motivation for this work. Section 1.2

shows the research objectives and questions. Section 1.3 presents the steps required to achieve our objectives. Section 1.4 shows the structure of the report. 1.1 Background The Future Internet goal is to provide an infrastructure to have an immediate access to information about the physical world and its objects. physical objects can be applied to various application areas, for example, e-health, warehouse management, and so on. Every application space may have various kinds of physical devices. Each physical device can have its own specifications, which is required to use in order to interact with it. To achieve the future Internet goal, a layered vision is required that can facilitate data access.

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Internet of Things (IoT) is a vision that aims to integrate the virtual world of information to the real world of devices through a layered architecture. The expression "Internet of Things" comprises of two words, specifically Internet and Things. Internet alludes to the worldwide organization infrastructure with adaptable, configurable capacities dependent on interoperable and standard communication protocols. Things are actual items or devices, or virtual articles, gadgets or data, which have characters, actual credits and virtual characters, and utilize keen interface. For instance, a virtual object can represent an abstract unit of sensor nodes that contains metadata to identify and discover its corresponding sensor nodes.

Therefore, IoT refers to the things that can provide information from the physical environment through the Internet. Middleware is as an interface between the equipment layer and the application layer, which is liable for communicating with devices and data the board. The part of a middleware is to introduce a bound together programming model to collaborate with devices. A middleware is accountable for concealing the heterogeneity and dispersion issues that we face while cooperating with devices. 1.2 Motivation IoT-based system is in charge of providing knowledge from an environment to an non-expert user. IoT-based system can be used in different environments, so it needs to be able to address many heterogeneous devices.

Thus, a major concern within developing an IoT-based system is how to handle the interaction with the heterogeneous devices for non-expert users. This concern can be addressed by a middleware layer between devices and non-expert users. This layer is responsible to hide the diversity of devices from the user perspective, and provides access transparency to the devices for the end users. The idea of creating abstractions of devices been addressed in the literature. The middleware we found in the literature can provide satisfaction by facilitating the interaction with devices, but they do not support low-level device configuration [4]. 2.1. IoT definition In this section, we explain some of the IoT definitions. Also, we explain the layered architecture for IoT. Internet of Things (IoT) has increasingly gained attention in industry to interact with different types of devices.

IoT can have influence on industry and society by integrating physical devices into information networks [8]. IoT impacts can be on different perspectives, namely for private and business users. From the point of view of a private client, IoT has impact on both working and individual fields, like smart homes and workplaces, e-health and helped living. From the aspect of a business user the impacts would be in fields such as automation and industrial manufacturing, logistics, business process management, intelligent transportation of people and goods [9] IoT integrates physical things into information networks. IoT covers the overall infrastructure, including software, hardware and services, which is used to support these information networks.

The integrated physical things can exchange data about the physical properties and information that they sense in their environment. To identify devices, we can use identification technologies like for example RFID, which allow each device be uniquely identified [10]. International Telecommunication Union (ITU)¹ characterizes IoT as "A global foundation for the Information Society, empowering progressed benefits by interconnecting (physical and virtual) things dependent on, existing and developing, interoperable data and correspondence technologies" Internet of Things-Architecture 2 (IoT-A) characterizes it as "The possibility of an all around the world interconnected continuum of devices, articles and things overall arose with the RFID technology, and this idea has extensively been extended to the current vision that envisages a plethora of heterogeneous objects interacting with the physical environment". IoT has a layered architecture designed to answer the demands of various industries, enterprises and society.

Fig. 2.1 shows a generic layered architecture for IoT that consist of five layers, which are discussed, in the following:[13] ♦ Edge Technology layer This is a hardware layer that consists of embedded systems, RFID tags, sensor networks and all of the other sensors in different forms. This hardware layer can perform several functions, such as collecting information from a system or an environment, processing information and supporting communication. ♦ Access Gateway layer This layer is concerned with data handling, and is

responsible for publishing and subscribing the services that are provided by the Things, message routing, and hovelling the communication between platforms.

◆ **Middleware layer** This layer has some critical functionalities, such as aggregating and filtering the received data from the hardware devices, performing information discovery and providing access control to the devices for applications. ◆ **Application layer** This layer is responsible for delivering various application services. These services are provided through the middleware layer to different applications and users in IoT-based systems. The application services can be used in different industries such as, logistics, retail, healthcare, etc. 2.2 Challenges IoT-based systems can be used for different purposes and areas, so that, we have to face different challenges. In this section, we explain some of the challenges that need to be considered in research activities [10]: ◆ **Edgetechnology** At the hardware level, more research efforts are required to develop the technology of embedded devices, sensors, actuators and (passive and active) identification, since an IoT-based system must be able to gather sufficient information about the real world by employing a large variety of devices and environments.

Thus, there more work is still required to connect heterogeneous devices and deploy them in IoT applications, and to provide support for new devices. ◆ **Networking technologies** In IoT, things are connected through different kinds of networks, i.e. mobile, wired and wireless network. These networks support bi-directional communication at different levels among the real world objects, applications and services that are employed by the IoT applications. This highly distributed structure should provide interconnection with low energy consumption, while distributed data can cause privacy issues. ◆ **Middleware system** In IoT, we have heterogeneous devices and networks. Their heterogeneity can potentially increase with new technologies. To facilitate the use of these devices by IoT applications, we should shield their heterogeneity.

Therefore, we need to develop a secure, scalable and semantically enriched service-oriented middleware to cope with the heterogeneity of devices. ◆ **Platform services** They support a superior management of all involved devices in an integrated way, ensuring scalability, high availability, and the safe and secure execution of the requested functionality from devices. In continue, we focus on the middleware challenges, because we are looking for the functionalities that a middleware can provide for the application layer in the IoT-based systems. 2.3 IoT_based Middleware Bandyopadhyay, S. et. al. have studied the middleware systems that have been applied in IoT-based systems [1].

They classify the required functionality of middleware to manage interaction with a variety of devices in four functional components, namely (1) interface protocols, (2) device abstraction, (3) central control, context detection & management, and (4) application abstraction (shown in Fig. 2.2). In the following, we explain these components in details. 2.3.1 Interface protocols This component is in charge of providing technical interoperability. Interoperability with regards to Interface protocols implies: the capacity of two frameworks to interoperate by utilizing similar correspondence protocols. As per ETSI (European Telecommunications Standards Institute) specialized interoperability is characterized as the relationship of equipment or programming parts, frameworks and stages that empower machine-to-machine correspondence to occur.

This sort of interoperability is regularly fixated on (correspondence) protocols and the infrastructure required for those protocols to work. The Interface Protocol component defines protocols for exchanging information among different networks that may work based on different communication protocols, in order to allow technical interoperability. This component is responsible for handling basic connectivity in the physical and data link, network, transport, and sometimes the application layer of the TCP/IP stack. To cope with the heterogeneity of devices, we can use a wrapper for each device to translate the protocol supported by the device to a common protocol. This wrapper can be placed either on the device side or the middleware side.

If we want to have direct interaction with devices, we should place the wrapper in the middleware side. Devices usually have limited capability of computational process, so this would be a reason to implement

wrapper on the middleware side. In contrast, in case of indirect interaction with devices we can develop an intermediary wrapper between the middleware and the devices. The interface protocol component is responsible to allow the middleware to support both direct and indirect interactions. 2.3.2 Device Abstraction (DA): This component is responsible for providing an abstract format to facilitate the interaction of the application components with devices. This abstraction provides syntactic and semantic interoperability, which are defined by ETSI [14] as follows: ♦ Syntactic interoperability is related with information designs.

The messages transferred by correspondence conventions should have a very much characterized language structure and encoding design, which can be addressed by utilizing significant level exchange syntaxes, for example, HTML and XML. ♦ Semantic interoperability is usually associated with the meaning of the content of message which is understandable for human. Consequently, interoperability on this level implies that there is a typical understanding among individuals on the significance of the data being traded among them. However, since DA does not communicate directly with human, semantic interoperability in the context of DA is in charge of providing this common understanding for applications.

Semantic interoperability relies on semantic models which tends to be domain specific. For example, one way to provide semantic interoperability in Service Oriented (SOA) [15] based middleware is by using Devices Profile for Web Services (DPWS) [16] . In this context, each device type refers to a distinguished service type DA component provide two general functionalities: (1) to ask devices to perform some functionality and (2) to define and configure devices DPWS uses the XML format that is shown in Code 2.1. 2.3.3 Central control, Context detection & Management (CCM) Context characterizes the situation of an entity, which can be a place, a person or an object that is relevant to the user, applications and their interactions [1]. The CCM functional component is responsible to support context-aware computation that is a computational style that take to account the context of the entities that interact with the system.

A middleware for IoT-based systems must be context-aware to work in smart environments. Smart environments allude to an physical world that is lavishly and imperceptibly joined with sensors, actuators, displays, and computational elements, inserted flawlessly in the regular objects of our lives, and associated through a consistent network. Context-awareness includes two functionalities: 1) Context detection, which consists of collecting data from resources, and selecting the information that can have an impact on the computation. 2) Context processing, to use the gathered information to perform a task or make a decision. 2.3.4 Application Abstraction This functional component provides an interface for both high-level applications and end-users to interact with devices.

For instance, this interface can be a RESTful interface or can be implemented with some query-based language. A. Malatras. et. al. propose a SOA-based middleware to perform data management and data monitoring services [18]. This middleware uses a RESTful interface to facilitate the interaction of high-level applications with sensors, which can communicate with Wireless Sensor Network (WSN) through the HTTP operations: (1) GET to issue a query on an existing resource, (2) DELETE to remove an existing resource, (3) POST to create a new resource, and (4) PUT to update an existing resource. For instance, a client application gets the result of a domain task by sending a GET request through the URL: ♦http :/{ hostname}/REST/{version}/DomaintaskResult/id♦. In this URI that reference to an ♦id" leads to a unique result.

In the TinyDB middleware [19], an end-user can use a query language to interact with devices. For instance, a user can send the following query to get the id of a sensor (nodeid) nearby and temperatures that are sensed by this sensor during the past 10 seconds before executing the query: SELECT nodeid, temp FROM sensors SAMPLE PERIOD 1s FOR 10s 2.4 Conclusion In this chapter, we defined IoT and identified common IoT layers. Furthermore, we discussed a reference middleware architecture for IoT-based systems. This architecture has been proposed by Bandyopadhyay, S. et. al based on a study on the existing middleware frameworks for IoT-based systems .

Chapter 3 Review of IoT-based Middleware The term Internet of Things (IoT) refers to a wide set of applications and research areas such as, distributed computing and knowledge management. Much of the IoT research we found in the literature is related to the field of pervasive computing. World Wide Web Consortium defines pervasive computing as a vision about our future computing life style. In this vision, computer systems will be consistently coordinated into our regular daily existence, expecting our requirements and offering significant types of services and data for us in a whenever and-anyplace style. Pervasive Computing is all about making the human's life easier by exploiting the available computing technologies. This motivates scientists to develop new technologies for the everyday people's lives.

Since the vision of IoT is almost similar to Pervasive computing, we reviewed the literatures that address both IoT and Pervasive systems. To select the middleware to discuss we had the following approaches: 1) We looked at typical IoT middleware such as ISMP, ASPIRE GSN. We selected HYDRA to review, because it is the most popular and well-documented middleware in comparer to the mentioned middleware. Also, based on the study of Bandyopadhyay, S. et. al, those middleware does not support the discussed functional components in Chapter 3, while HYDRA supports them. 2) We looked at typical Pervasive system middleware such as [25], [26], [27].

We selected the following middleware to review: ◆ AURA [28] because this middleware focus on elaboration and manipulation of the gathered data from devices. we aim to provide ease of configuration and deployment for end user and developer. Since to meet this goal, we require to facilitate the gathered data manipulation, we reviewed AURA that was the only middleware among the reviewed paper that considered the data manipulation. ◆ TinyDB [19] focus on gathering data from devices. Since in an IoT-based system we need to gather data from environment through different devices, we reviewed TinyDB that is a popular middleware. ◆ WiseMID [29] is the only middleware among the reviewed middleware that is specific for energy saving purpose. As saving the energy of devices is important issue, we reviewed this middleware. In this chapter, we the mentioned middleware in more detail. Also, we analyze the discussed middleware with respect to the functional components mentioned in Chapter 2.

IR (Infrared) Sensor An ◆infrared sensor ◆is an electronic gadget that transmits to detect a few parts of the environmental factors. An IR sensor can quantify the warmth of an article just as identifies the movement. These sorts of sensors estimates just infrared radiation, as opposed to producing it that is called as a ◆passive IR sensor. Typically in the infrared range, every one of the items emanate some type of warm radiations. These kinds of radiations are ◆invisible to our eyes that can be distinguished by an infrared sensor. The producer is essentially an IR Driven (Light Radiating Diode) and the identifier is basically an IR photodiode which is touchy to IR light of the very frequency as that discharged by the IR Drove.

At the point when IR light falls on the photodiode, the protections and these yield voltages, change in relation to the greatness of the IR light got. IR Sensor Circuit Diagram and Working Principle An infrared ◆sensor circuit is one of the fundamental and famous sensor module in an ◆electronic gadget. This sensor is closely resembling human's visionary detects, which can be utilized to recognize snags and it is one of the regular applications continuously. This circuit contains the accompanying segments LM358 IC ◆2 IR transmitter and receiver pair Resistors of the range of kilo ohms. Variable resistors. LED (Light Emitting Diode).

In this undertaking, the transmitter segment incorporates an IR sensor, which sends persistent IR beams to be gotten by an IR collector module. An IR yield terminal of the beneficiary changes relying on its getting of IR beams. Since this variety can't be examined thusly, accordingly this yield can be taken care of to a comparator circuit. Here an operational amplifier ◆(op-amp) of LM 339 is utilized as comparator circuit. At the point when the IR recipient doesn't get a sign, the potential at the reversing input goes higher than that non-modifying contribution of the comparator IC (LM339). Accordingly the yield of the comparator goes low, yet the LED doesn't glow. At the point when the IR recipient module gets sign to the potential at the altering input goes low. In this way the yield of the comparator (LM 339) goes high and the LED starts glowing. IR Sensor circuit / Fig.

IR Sensor Circuit diagram Resistor R1 (100 Ω), R2 (10k Ω) and R3 (330 Ω) are utilized to guarantee that base 10 mA current goes through the IR LED Devices like Photodiode and typical LEDs individually. Resistor VR2 (preset=5k) is utilized to change the output terminals. Resistor VR1 (preset=10k) is utilized to set the affectability of the circuit Diagram. Peruse more about IR sensors. Different Types of IR Sensors and Their Applications IR sensors are requested into different sorts depending upon the applications. The speed sensor is used for synchronizing the speed of different motors. The $\diamond$ temperature sensor $\diamond$ is used for mechanical temperature control. $\diamond$ PIR sensor $\diamond$ is utilized for programmed entryway opening framework and $\diamond\diamond$ Ultrasonic sensor $\diamond$ are utilized for distance estimation.

IR Sensor Applications IR sensors are utilized in various $\diamond$ Sensor based projects $\diamond$ and likewise in different electronic gadgets which estimates the temperature that are talked about in the below. Radiation Thermometers IR sensors are utilized in radiation thermometers to quantify the temperature rely on the temperature and the material of the item and these thermometers have a portion of the accompanying highlights Measurement without direct contact with the object Faster response Easy pattern measurements Flame Monitors These kinds of gadgets are utilized for identifying the light discharged from the flares and to screen how the blazes are copying. The Light discharged from blazes reach out from UV to IR area types. PbS, PbSe, Two-colour detector, pyro electric detector are a portion of the ordinarily utilized locator utilized in flame monitors.

Moisture Analyzers Moisture analyzers use frequencies which are consumed by the moisture in the IR locale. Articles are illuminated with light having these frequencies (1.1 $\diamond$ m, 1.4 $\diamond$ m, 1.9 $\diamond$ m, and 2.7 $\diamond$ m) and furthermore with reference frequencies. The Lights reflected from the items rely on the dampness content and is recognized by analyzer to quantify dampness (proportion of mirrored light at these frequencies to the mirrored light at reference frequency). In GaAs PIN Pbs photoconductive, photodiodes, detectors are utilized in moisture analyzer circuits. IR Imaging Devices IR image device is one of the significant utilizations of IR waves, essentially by uprightness of its property that isn't noticeable. It is utilized for thermal images, night vision gadgets, and so forth. / For example, Water, rocks, soil, vegetation, an air, and human tissue all highlights emit IR radiation.

The thermal infrared indicators measure these radiations in IR reach and guide the spatial temperature appropriations of the article/region on a picture. Temperature images generally made out of a Sb (indium antimonite), Gd Hg (mercury-doped germanium), Hg Cd Te (mercury-cadmium-telluride) sensors. An electronic indicator is cooled to low temperatures utilizing fluid helium or fluid nitrogen. $\diamond$ Then the Cooling the locators guarantees that the radiant energy (photons) recorded by the identifiers comes from the landscape and not from the encompassing temperature of items inside the actual scanner an IR imaging electronic gadget. LDR- LIGHT DEPENDENT RESISTOR What is a Light Dependent Resistor or a Photo Resistor? A Light Dependent Resistor (LDR) or a photo resistor is a device whose resistivity is a component of the incident electromagnetic radiation.

Thus, it is light sensitive device. it is additionally called as photograph conductor, photograph conductive cells or essentially photocells. it is comprised of semiconductor material having high opposition. There are various images used to demonstrate a LDR, quite possibly the most ordinarily utilized image is appeared in the figure underneath. The pointer shows light falling on it. Working Principle of LDR A light dependent resistor deals with the principle of photo conductivity. Photo conductivity is an optical illusion where the materials conductivity (Consequently resistivity) reduces when light is devoured by the material. Right when light succumbs to model exactly when the photons fall on the gadget, the electrons in the valence band of the semiconductor material are excites to the conduction band.

These photons in the incident light ought to have energy more noteworthy than the band hole of the semiconductor material to take the electrons leap from the valence band to the conduction band. Thus when

light having sufficient energy is episode on the gadget more and more electrons are eager to the conduction band which brings about enormous number of charge transporters. The consequence of this cycle is an ever increasing number of current beginnings streaming and subsequently it is said that the opposition of the gadget has diminished. This is the most widely recognized working rule of LDR. //□ Diagram of LDR Sensor Characteristics of LDR LDR is a light dependent device whose obstruction diminishes when light falls on them and increases in the dark. At the point when a light dependent resistor is kept in out of light, its power is high.

This power is called as dark resistance. It tends to be just about as high as 1012 Ω. Also, if the device is permitted to retain light its opposition will diminish radically. In the event that a consistent voltage is applied to it and power of light is expanded the current beginnings expanding. Figure beneath shows opposition versus light bend for a specific LDR. Photocells or LDR's are non-direct gadgets. Their affectability shifts with the frequency of light episode on them. A few photocells may not in the slightest degree reaction to a specific scope of frequencies. In light of the material utilized various cells have distinctive reaction bends. //□ Circuit diagram of LDR Sensor At the point when light is incident on a photocell it typically takes around 8 to 12ms for the adjustment in resistance from happen, while it requires seconds for the resistance from ascend back again to its underlying worth after kept away from light. This phenomenon is called as Resistance Recovery Rate. This property is utilized in Audio Compressors. Additionally, LDR's are less delicate than photo diodes and photo semiconductor.

(A photo diode and a photocell (LDR) are not the equivalent, a photocell is a p-n junction semiconductor device that converts light to electricity, though a photo diode is a uninvolved gadget, there is no p-n intersection in this nor it converts light to electricity). Types of Light Dependent Resistors: Based on the materials used they are classified as: i) Intrinsic photo resistor (Un doped semiconductor): It is a pure semiconductor material like silicon or germanium. Electrons get energized from valence band to conduction band when photons of enough energy decreases on it and number of charge transporters increases. ii) Extrinsic photo resistor: It is a semiconductor material doped with pollutants which are called as dopants. Theories dopants make new energy groups over the valence band which are loaded up with electrons.

Henceforth this decreases the band hole and less energy is needed in energizing them. Extraneous photocell resistors are by and large utilized for long frequencies. Construction of a Photocell The construction of a light dependent resistor comprises of a light sensitive material which is deposited on a insulating substrate like ceramic. The material is deposited in crisscross pattern to get the ideal resistance and power rating. This crisscross region isolates the metal deposited areas into two regions. At that point the ohmic contacts are made on the either side of the space. The resistance of these contacts ought to be pretty much as less as conceivable to ensure that the resistance mostly changes because of the impact of light as it were.

Materials regularly utilized are cadmium sulfide, cadmium selenide, indium antimonide and cadmium sulphide. The utilization of lead and cadmium is kept away from as they are destructive to the climate. Applications of LDR LDR's have minimal cost and basic design. They are frequently utilized as light sensors. They are utilized when there is a need to recognize absences or existences of light like in a camera light meter. Utilized in streetlights, morning timer, criminal alert circuits, light force meters, for tallying the bundles proceeding onward a transport line, and so on. NODE MCU Node MCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems and equipment which depends on the ESP-12 module. The term "NodeMCU" of course alludes to the firmware instead of the advancement units.

The firmware utilizes the Lua scripting language. It depends on the eLua project, and based on the Espressif Non-OS SDK for ESP8266. It utilizes many open-source projects, for example, lua-cjson and SPIFFS. NodeMCU was made soon after the ESP8266 came out. On December 30, 2013, Espressif Systems began creation of the ESP8266. The ESP8266 is a Wi-Fi SoC coordinated with

a Tensilica Xtensa LX106 core,[citation needed] widely utilized in IoT applications (see related projects). NodeMCU began on 13 Oct 2014, when Hong submitted the principal record of nodemcu-firmware to GitHub. Two months after the fact, the venture extended to incorporate an open-equipment stage when engineer Huang R submitted the gerber file of an ESP8266 board, named devkit v0.9.

Soon thereafter, Tuan PM ported MQTT client library from Contiki to the ESP8266 SoC platform, and zeroed in on NodeMCU project, by then NodeMCU had the alternative to help the MQTT IoT show, using Lua to get to the MQTT dealer. Another critical update was made on 30 Jan 2015, when Devsaurus ported the u8glib to NodeMCU project, enabling NodeMCU to easily drive LCD, Screen, OLED, even VGA shows. In summer 2015 the makers deserted the firmware project and a gathering of free supporters dominated. By summer 2016 the NodeMCU included in excess of 40 unique modules. Because of asset imperatives clients need to choose the modules significant for their task and assemble a firmware customized to their necessities. ESP8266 Arduino Coreb; As Arduino.cc began growing new MCU boards dependent on non-AVR processors like the ARM/SAM MCU and utilized in the Arduino Duo, they expected to adjust the Arduino IDE's so that it would be moderately simple to change the IDE to help substitute toolchains to permit Arduino C/C++ to be arranged for these new processors. They did this with the presentation of the Board Manager and the SAM Core.

A "core" is the assortment of programming parts needed by the Board Manager and the Arduino IDE to assemble an Arduino C/C++ source document for the objective MCU's machine language. Some ESP8266 fans built up an Arduino center for the ESP8266 WiFi SoC, prominently called the "ESP8266 Core for the Arduino IDE".[16] This has become a main programming advancement stage for the different ESP8266-based modules and improvement sheets, including Node MCUs. Introduction NodeMCU is an open source LUA based firmware produced for ESP8266 wifi chip. By investigating usefulness with ESP8266 chip, NodeMCU firmware accompanies ESP8266 Development board/unit for example NodeMCU Development board. / NodeMCU Development Board/kit v0.9

(Version1) Since NodeMCU is open source platform, their hardware design is open for edit/modify/build. NodeMCU Dev Kit/board consist of ESP8266 wifi enabled chip. The ESP8266 is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol. For more information about ESP8266, you can refer ESP8266 WiFi Module. There is Version2 (V2) available for NodeMCU Dev Kit i.e. NodeMCU Development Board v1.0 (Version2), which usually comes in black colored PCB. / NodeMCU Development Board/kit v1.0 (Version2) For more information about NodeMCU Boards available in market refer NodeMCU Development Boards NodeMCU Dev Kit has Arduino like Analog (i.e. A0) and Digital (D0-D8) pins on its board. It supports serial communication protocols i.e. UART, SPI, I2C etc. Using such serial protocols we can connect it with serial devices like I2C enabled LCD display, Magnetometer HMC5883, MPU-6050 Gyro meter + Accelerometer, RTC chips, GPS modules, touch screen displays, SD cards etc.

How to start with NodeMCU? NodeMCU Development board is featured with wifi capability, analog pin, digital pins and serial communication protocols. To get started with utilizing NodeMCU for IoT applications first we need to think about how to compose/download NodeMCU firmware in NodeMCU Development Boards. Furthermore, before that where this NodeMCU firmware will get according to our prerequisite. There is online NodeMCU custom forms accessible utilizing which we can undoubtedly get our custom NodeMCU firmware according to our prerequisite. To find out about how to construct custom NodeMCU firmware on the web and download it to refer Getting started with NodeMCU How to write codes for NodeMCU? After setting up ESP8266 with Node-MCU firmware, let's see the IDE (Integrated Development Environment) required for development of NodeMCU. NodeMCU with ESPlorer IDE Lua scripts are gradually used to code the NodeMCU. Lua is an open source, lightweight, embeddable scripting language based on top of C programming language.

For more data about how to compose Lua script for NodeMCU refer [◆Getting started with NodeMCU using ESPlorerIDE NodeMCU with Arduino IDE](#) Here is another method of creating NodeMCU with a notable IDE for example Arduino IDE. We can likewise create applications on NodeMCU utilizing Arduino advancement climate. This makes simple for Arduino engineers than learning new dialect and IDE for NodeMCU. For more data about how to write Arduino sketch for NodeMCU refer [◆Getting started with NodeMCU using ArduinoIDE](#) [◆Difference in using ESPlorer and Arduino IDE](#) All things considered, there is a programming language contrast we can say while creating application for NodeMCU utilizing ESPlorer IDE and Arduino IDE. We need to code in C/C++ programming language in the event that we are utilizing Arduino IDE for creating NodeMCU applications and Lua language on the off chance that we are utilizing ESPlorer IDE.

Fundamentally, NodeMCU is Lua Interpreter, so it can comprehend Lua content without any problem. At the point when we compose Lua contents for NodeMCU and send/transfer it to NodeMCU, at that point they will get executes successively. It won't construct parallel firmware document of code for NodeMCU to compose. It will send Lua content all things considered to NodeMCU to get execute. In Arduino IDE when we compose and arrange code, ESP8266 toolchain in foundation makes double firmware record of code we composed. Also, when we transfer it to NodeMCU then it will streak all NodeMCU firmware with recently produced double firmware code. Truth be told, it composes the total firmware. That is the motivation behind why NodeMCU not acknowledge further Lua contents/code after it is getting streaked by Arduino IDE.

In the wake of getting streaked by Arduino sketch/code it will be no more Lua translator and we got mistake on the off chance that we attempt to transfer Lua contents. To again begin with Lua content, we need to streak it with NodeMCU firmware. Since Arduino IDE order and transfer/composes total firmware, it takes additional time than ESPlorer IDE.ch for NodeMCU referer. DC MOTORS A. General Information A DC motor is utilized to drive a mechanical load. In this lab, an independently excited DC generator generates the load. The load on the motor is changed by shifting the generator field current. By expanding the field current of the DC generator, the load on the DC motor increments and therefore the armature current increments. In common, DC motors are described by their torque speed curves as demonstrated in Figure 9.1.

Since the estimating hardware for shaft torque isn't accessible in the lab it is important to utilize elective methods for describing the DC motor. One option is to plot shaft speed versus armature current since torque is directly proportion to the armature current with a consistent field current provided to the motor. Shaft speed is likewise a component of the field current in a DC engine while keeping a consistent armature voltage as field current is proportional to the immediate pivot motion delivered in the machine. B. Construction The stator of the dc motor has poles, which are energized by dc current to create attractive fields. In the unbiased zone, in the center between the poles, commutating poles are put to lessen starting of the commutator.

The commutating poles are provided by dc current. Compensating windings are mounted on the fundamental poles. These short_circuited windings moist rotor motions. The poles are mounted on an iron core that gives a closed magnetic circuit. The motor housing upholds the iron core, the brushes and the barings. The rotor has a ring-shaped covered iron center with spaces. Curls with a few turns are set in the spaces. The distance between the two legs of the curl is around 180 electric degrees. The loops are associated in arrangement through the commutator sections. The closures of each curl are associated with a commutator fragment. The commutator comprises of protected copper sections mounted on a protected cylinder. Two brushes are squeezed to the commutator to allow current stream. The brushes are set in the nonpartisan zone, where the attractive field is near nothing, to lessen arcing. The rotor has a ring-formed covered iron center with spaces.

The commutator comprises of protected copper portions mounted on a protected cylinder. Two brushes are squeezed to the commutator to allow current stream. The brushes are set in the impartial zone, where the attractive field is near nothing, to decrease arcing. The commutator changes the current from one rotor loop to the contiguous curl, the exchanging requires the interference of the loop current. The abrupt interference of an inductive current produces high voltages. The high voltage produces flashover and arcing between the

commutator section and the brush. C. DC Motor Operation In a dc motor, the stator poles are provided by dc excitation current, which delivers a dc magnetic field. The rotor is provided by dc current through the brushes, commutator and loops.

The cooperation of the magnetic field and rotor current creates a power that drives the motor. The magnetic field lines go into the rotor from the north pole (N) and exit southward (S). The shafts produce an attractive field that is opposite to the current conveying conductors. The communication between the field and the current delivers a Lorentz power; the power is opposite to both the attractive field and conductor. The produced power turns the rotor until the curl arrives at the nonpartisan point between the shafts. Now, the attractive field turns out to be essentially zero along with the power. Be that as it may, inactivity drives the engine past the impartial zone where the course of the attractive field inverts.

To stay away from the inversion of the power bearing, the commutator alters the current course, which keeps up the counterclockwise revolution. Prior to arriving at the unbiased zone, the current enters in portion 1 and ways out from section 2. Along these lines, current enters the curl end at space an and exits from opening b during this stage. Subsequent to passing the nonpartisan zone, the current enters fragment 2 and ways out from section 1, this turns around the current course through the rotor loop, when the curl passes the unbiased zone. The aftereffect of this current inversion is the upkeep of the revolution. D. DC Motor Equivalent circuit The following figures show the equivalent circuit of a separately excited dc motor.

Equivalent circuit is similar to the generator only the current directions are different. The operation equations are: Armature voltage equation The induced voltage and motor speed vs angular frequency The combination of the equations results in The current is calculated from this equation. Motor Control utilizing NPN Transistor. Generally, even the least complex robot requires an motor to pivot a wheel or to perform specific action. Since motor requires more electricity than the microcontroller pin can ordinarily produce, you need some kind of a switch (Transistors, MOSFET, Relay and so forth,) which can acknowledge a little current, enhance it and create a bigger current, which further drives an motor. This whole cycle is finished by what is known as a motor driver.

Motor driver is essentially a momentum enhancer which takes a low-ebb and flow signal from the microcontroller and gives out a relatively higher flow signal which can handle and drive an engine. By and large, a semiconductor can go about as a switch and play out this assignment which drives the motor a solitary way. Turning on Switches A and D makes the motor rotate clockwise Turning on Switches B and C makes the motor rotate anti-clockwise Turning on Switches A and B will stop the motor (Brakes) Turning off all the switches gives the motor a free wheel drive Lastly turning on A & C at the same time or B & D at the same time shorts your entire circuit. So, do not attempt this.

L293D Skeleton H-extensions can be worked without any preparation utilizing transfers, MOSFET, field impact semiconductors (FET), bi-polar intersection semiconductors (BJT), and so on Be that as it may, if your present prerequisite isn't too high and all you need is a single package which does the work of driving a little DC motor in two ways, at that point all you need is a L293D IC. This single package can interface not one, but rather two DC motors. L293, L293B and few different forms additionally does likewise work, however pick the L293D variant as this one has an inbuilt fly back diode which shields the driving semiconductors from voltage spikes that happen when the engine curl is killed. Introduction to L293D IC L293D IC by and large comes as a standard 16-pin DIP (double in line bundle).

This motor driver IC can all the while control two little motors one or the other way; forward and invert with only 4 microcontroller pins (on the off chance that you don't utilize empower pins). A portion of the highlights (and disadvantages) of this IC are: 1. Output current ability is restricted to 600mA per channel with top yield current restricted to 1.2A (non-dull). This implies you can't drive greater motors with this IC. Notwithstanding, most

little motors utilized in leisure activity advanced mechanics should work. On the off chance that you are uncertain whether the IC can deal with a specific motor, interface the IC to its circuit and run the motor with your finger on the IC. Assuming it gets truly hot, be careful...

Likewise note the words "non-tedious"; if the current yield over and again arrives at 1.2A, it may obliterate the drive semiconductors. 2. Supply voltage can be pretty much as extensive as 36 Volts. This implies you don't need to stress a lot over voltage guideline. 3. L293D has an empower office which assists you with empowering the IC yield pins. In the event that an empower pin is set to rationale high, condition of the sources of info match the condition of the yields. Assuming you pull this low, the yields will be killed paying little heed to the information states 4. The datasheet likewise specifies an "over temperature security" incorporated into the IC. This implies an inward sensor detects its inner temperature and quits driving the engines if the temperature crosses a set point 5.

Another significant element of L293D is its interior clasp diodes. This flyback diode shields the driver IC from voltage spikes that happen when the motor loop is turned here and there (generally when killed) 6. The legitimate low in the IC is set to 1.5V. This implies the pin is set high just if the voltage across the pin crosses 1.5V which makes it reasonable for use in high recurrence applications like exchanging applications (upto 5KHz) 7. Ultimately, this coordinated circuit drives DC motors, however can likewise be utilized to drive transfer solenoids, stepper motors and so forth L293D Connections The circuit appeared to the acceptable is the most essential execution of L293D IC. There are 16 pins standing out of this IC and we need to comprehend the usefulness of each pin prior to executing this in a circuit Pin1 and Pin9 are "Enable" pins. They ought to be associated with +5V for the drivers to work.

Assuming they pulled low (GND), the yields will be killed paying little heed to the information states, halting the engines. On the off chance that you have two extra pins in your microcontroller, interface these pins to the microcontroller, or simply associate them to controlled positive 5 Volts. Pin4, Pin5, Pin12 and Pin13 are ground pins which ought to in a perfect world be associated with microcontroller's ground. Pin2, Pin7, Pin10 and Pin15 are rationale input pins. These are control pins which ought to be associated with microcontroller pins. Pin2 and Pin7 control the primary engine (left); Pin10 and Pin15 control the second motor(right). Pin3, Pin6, Pin11, and Pin14 are yield pins.

Bind Pin3 and Pin6 to the main engine, Pin11 and Pin14 to second engine Pin16 powers the IC and it ought to be associated to regulated +5Volts Pin8 powers the two motors and ought to be associated with positive lead of an secondary battery. According to the datasheet, supply voltage can be just about as high as 36 Volts. Truth table Until now where to connect the motors, battery and the microcontroller have been showed. In any case, how to control the direction of the motor? Allow us to take a model: Assume you need to control the left motor which is associated with Pin3(O1) and Pin6(O2). As referenced above, we require three pins to control this engine - Pin1 (E1), Pin2 (I1) and Pin7 (I2). Here is reality table addressing the usefulness of this motor driver.

Pin 1 Pin 2 Pin 7 Function High High Low Turn Anti-clockwise (Reverse) High Low High Turn clockwise (Forward) High High High Stop High Low Low Stop Low X X Stop High ~+5V, Low ~0V, X=Either high or low (don't care) In the above truth table you can see that assuming Pin1 (E1) is low when the motor stops, regardless of the states on Pin2 and Pin7. Consequently it is crucial for hold E1 high for the driver to work, or just associate enables pins to positive 5 volts. With Pin1 high, in the event that Pin2 is set high and Pin7 is pulled low, current streams from Pin2 to Pin7 driving the motor in enemy of clockwise course. Assuming the territories of Pin2 and Pin7 are flipped, current streams from Pin7 to Pin2 driving the engine clockwise way. The above idea remains constant for opposite side of the IC as well.

Connect your motor to Pin11 and Pin14; Pin10 and Pin15 are input pins, and Pin9 (E2) enables the driver.

ARDUINO SOFTWARE: Open Arduino IDE as shown below Open Arduino IDE Arduino IDE Select the COM

Port from tool Select the COM Port Select the required Arduino board from Tools as shown below Select the required Arduino board Write the sketch in Arduino IDE Sketch in Arduino IDE Compile and upload the Sketch to Arduino board upload the Sketch to Arduino board CONCLUSION: This designed Smart Parking System which is basic, monetary and gives compelling answer for diminish carbon footprints in the air. It is very much figured out how to access access the map and travel people to the available parking slots through web.

Subsequently it lessens the danger of discovering the parking slots in any area and furthermore it eliminates unnecessary travelling of vehicle through the filled parking areas around there. So it diminishes time and it is economy too. References: [1] <http://www.mdpi.com/journal/sensors> Sensors 2014, 14, 22372-22393; doi:10.3390/s141222372 [2] Bilodeau, V.P. Intelligent Parking Technology Adoption. Ph.D. Thesis, University of Southern Queensland: Queensland, Australia, 2010. [3] Li, T.S.; Ying- Chieh, Y.; Jyun-Da, W.; Ming-Ying, H.; Chih-Yang, C. Multifunctional intelligent autonomous parking controllers for carlike mobile robots. IEEE Trans. Ind. Electron. 2010, 57, 1687-1700. [4] Faheem1, S.A. Mahmud, G.M. Khan, M. Rahman and H. Zafar, 'A Survey of Intelligent Car Parking System?', October 2013 [5] S. Alam, M. M. R. Chowdhury, and J.

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