

IOT BASED E-VEHICLE AUTOMATIC CHARGING AND PARKING SYSTEM

Submitted in partial fulfillment of the requirements for the award of

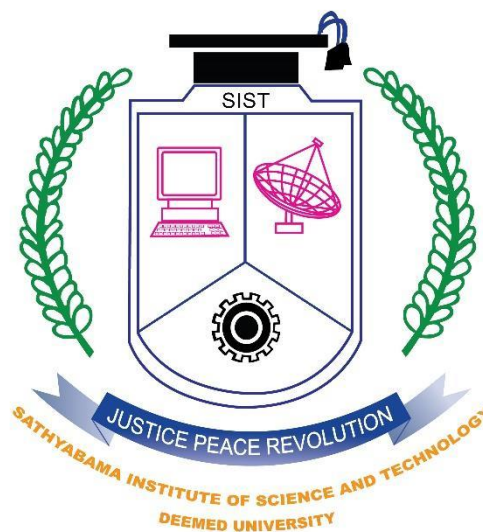
Bachelor of Engineering Degree in

Electronics and Instrumentation Engineering

by

Bala Varun Chowdary (38180701)

Sarish S Wadkar(38180007)



**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION
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

MAY 2022



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**DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION
ENGINEERING**

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **Bala Varun Chowdary (38180701), Sarish S Wadkar (38180007)** who carried out the project entitled **"IOT BASED E-VEHICLE AUTOMATIC CHARGING AND PARKING SYSTEM"** under my supervision from June 2021 to May 2022.

Ms. G. RAJALAKSHMI, M.E., (Ph.D.)
Internal Guide

Dr. Lalithakumari.S, M.E., Ph.D.
Head of the Department

Submitted for Viva voice Examination held on _____

Name:

Signature:

Internal Examiner

External Examiner

DECLARATION

I **Bala Varun Chowdary (38180701)**, **Sarish S Wadkar (38180007)** hereby declare that the Project Report entitled “**IOT BASED E-VEHICLE AUTOMATIC CHARGING AND PARKING SYSTEM**” done by me under the guidance of **Ms. G. RAJALAKSHMI, M.E., (Ph.D.)** is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Instrumentation Engineering.

Date:

Place:

Signature of the candidate

1.

2.

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Abstract

We are currently experiencing difficulties due to a lack of fuel. As a result, we are heading towards electric vehicles. However, many are still hesitant to choose electric vehicles over present vehicles. It's due to a combination of high prices and a scarcity of charging outlets. Even if there are only a few charging stations accessible, extra time is required to charge the vehicle. Furthermore, in today's cities, car parking has become a serious concern. As a result, by considering these challenges, we can give smart parking with charging options to the majority of business buildings. This will reduce the time spent looking for a parking spot. Furthermore, there is no need to spend additional time looking for a charging station or charging at home. The wireless power transfer technology for EVs and charging systems with IoT is described in this study. In this study, reviews of IoT-based smart parking systems that have been implemented are examined, and a comparison between a combined parking and charging system and a separate parking and charging system is made.

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CHAPTER 1

INTRODUCTION

Introduction

We are all aware that the world is moving toward automation as new technologies emerge, and that the world is becoming smarter. As a result, the requirements of this modern, or smart, world are also smart. Result of all these new technologies is coming up like IoT, Industry 4.0, artificial intelligence, M2M etc. Now-a-days the electric vehicle is a hot topic right now, and it's also an important part of the smart world. We all know that we have a limited supply of fuel on our planet, so it is past time to switch to another method, and electricity is the best option for it, as electric vehicles are an example. Developing countries, such as India, are embracing new technologies. The Indian government has set a realistic target of 30 percent electric vehicles by 2030, down from a previous target of 100 percent. As a result, parking and charging of electric vehicles are taken into consideration. As a result, we are introducing an IoT-based car parking and EV (Electrical Vehicle) charging system. Electrical vehicles, like current fuel cars, require a charging station, and obviously charging takes time, so it is preferable to charge the car while it is parked. It is therefore efficient to combine both the charging and parking system, which is based on IoT technology, which makes the system user friendly. Data can be uploaded to the cloud and smart phones at the same time. It is simple to monitor car parking as well as charging of vehicles when they are parked at the same time with the use of IoT, which aids in synchronized parking. Another key aspect of using IoT is that we can store data on the cloud, which we can access at any time and from any location, making life easier and simpler.

CHAPTER 2

LITERATURE SURVEY

- [1] **Pampa Sadhukhan** proposed E-parking system using an integrated component called parking meter to address the issues as well as to provide smart parking management throughout the city. The increasing number of vehicles on the road along with the mismanagement of available parking space leads to the parking related problems as well as increased traffic congestion in urban areas. Thus, it is highly required to develop an automated smart parking management system that would help the driver to find out some suitable parking space for his/her vehicle very quickly. Although ample research works on the development of smart parking systems exist in literature, most of them have not addressed the problem of real-time detection of improper parking and automatic collection of parking charges. In this paper, a prototype of an internet-of-thing based E-parking system is proposed.
- [2] **Julian Timpner, Lars Wolf** discussed that the V-Charge project has the vision to provide a solution by combining autonomous valet parking with e-mobility, introducing improved parking and charging comfort to increase customer acceptance of electric vehicles. V-Charge proposes a solution for charging autonomous electric vehicles in parking places and efficiently using scarce charging resources.
- [3] **Kriti Chopra, Kunal Gupta** focused that the IoT enabled smart cards make use of some sensor devices that are used to carry the device-related information to the Internet. Further, this existing Smart Card will be extended to store the information regarding the vehicle registration, vehicle type, vehicle owner's license details, vehicle pollution details, vehicle challan details and vehicle insurance details
- [4] **Erhuwvu Ayisire, Adel Sharaf** discussed that the Wireless power transfer (WPT) for Electric Vehicles by magnetic resonance coupling is of high priority due to its efficiency, high power transmission and larger charging distance. Also, we demonstrated with simulations how energy can be transferred efficiently between two magnetically coupled resonating coils. Also, the effect of parameters such as the inductor, capacitor, load, and coupling coefficient on efficiency are also discussed.

- [5] **Supapong Nutwong, et.al** focussed that the retroreflective photoelectric sensor is adopted, which can enhance the accuracy and reliability of the conventional position detection system. With the presented method, the system is operated at the maximum efficiency throughout the operation. Furthermore, the IoT technology is also introduced in the proposed system where remote monitoring and controlling can be achieved
- [6] **Michel Ferreira,et.al** performed a complete evaluation of different strategies of vehicle coordination based on large-scale datasets of parking sessions in distinct scenarios and under varying demand patterns. Our results on the key metrics, namely area per vehicle, travel distance while parked, and removal time - clearly highlight the relevance and efficiency of this novel approach to parking.
- [7] **K. Vijayakumar** discussed that the market for electric vehicles has been growing enormously over the last two years and should continue to expand exponentially. This requires a large domestic and commercial charging network. The EV charging infrastructure that enables electric vehicle adoption relies heavily on partnerships between the private and public sectors, including utilities, government agencies, automakers, and the general public. Electric vehicles are shifting energy paradigms for mobility around the world. Many factors contribute to a consideration of fueling with electricity: When to charge, where to charge, how fast can the vehicle charge, and who will charging affect? As more electric vehicles pull power from the grid, utilities will need to address the increasing demand drivers will place on the grid. Energy storage and source from solar PV systems provides an eloquent solution to power providers and drivers alike.
- [8] **Deeksha Devendra, et.al** focussed that the Electric Vehicle (EV) charger, also called Electric Vehicle Charging Station (EVCS) is an infrastructure element that supplies electrical energy for recharging EVs. The paper focuses on the design and fabrication of two-wheeler (escooter) electric vehicle charging equipment. Considering the future scenario of mass privatization of EV two-wheelers on Indian roads, the outline discusses the product design based on fabricability, affordability, and ability to mass manufacture. The proposed architecture follows the Level 2 charging standards (240 Volts), and is based on the open charge

point protocol (OCPP). The suggested EVCS is constructed considering the safety prerequisites of system administrators, installers, consumers, government agencies and others. The design of EVCS links to three industries: equipment manufacturers, software industry and electric power networks. This paper presents design considerations by elaborating the hardware, software, and protocols followed to design the Level 2 charging standard EVCS.

- [9] **Markus Henke; Tim-Hendrik Dietrich** focused on the conceptual design and the required measurements to charge electric taxis on the proprietary emil charging stations. One of the main targets is the development of a system that can be applied into a variety of different vehicles, being charged on the primary charging systems of the emil buses. It is presented how to implement the high-power charging system in series production electric vehicles. This means that beside electromagnetic coil design and power electronic converter design a charging procedure is emulated on the prototype vehicle control unit to operate the inductive charging process.
- [10] **K. Aravindhan, et.al** discussed on a simple vehicle-2-vehicle (V2V) charging system provided electric vehicles with a versatile and fast power sharing method without the use of battery packs. Some of the key technical problems in cooperative V2V charging include successful charging navigation structure designs with lower processing demands and high computational decision-making expertise for the selection of halting locations to operate V2V charging facilities, and the necessary matching problem between charging and discharging electric vehicles. To address the aforementioned issues, we suggest a smart V2V charging course-plotting approach for growing the integer of distributed electric vehicles. Specifically, a networking model focused on hybrid based vehicular ad-hoc networks guarantees effective message and efficient charging coordination. The functionality and efficacy of the proposed concept on V2V charging course-plotting strategy was demonstrated through a series of simulated data with respect to packet delivery ratio and offloading time.

CHAPTER 3

AIM AND SCOPE OF THE PRESENT INVESTIGATION

3.1 SCOPE OF THE PROJECT

Future of the world is moving towards smartness i.e., IoT systems and in that wireless system will be preferable one. As this system is IoT and cloud based, it is already wireless. So, it will be easy to adopt in future also. As per today's circumstances this system consists of both parking and charging availability as per vehicle type. As we are witnessing how the world is moving towards EV's, so if all vehicles get replaced by EVs, the system can be modified as all slots will provide charging facility standardization of EV charging system will make it more convenient. This system also can be utilized by using or creating applications (mobile) for it including GPS systems like book, pay and park or charge. This will add more smartness in the system.

3.2 EXISTING SYSTEM

Existing systems for parking and charging of vehicles are two different systems. In proposed work both systems are combined with convenient solutions for some particular problems about both systems.

In the existing parking system, there is a problem of finding an empty slot to park vehicles. Also, it can cause inconvenient traffic conditions in parking areas. In the proposed system this problem is solved by providing a display outside the parking area to show information about slot availability, i.e., it will show which slot is available to park vehicles and which one is unavailable. In the condition of all slots unavailable, the system is provided with smart gate control which will lock the gate and refuse entry of any extra vehicle.

Now-a-days most used charging method is plug in charging; this method consists of a plug which needs to be connected to the vehicle to start charging. Connection of plug to vehicle requires human interaction. It may be risky to start charging or while removing the plug since the charging cable contains high power supply. Wireless charging offers more advantages and user friendliness over plug in charging. It requires no or less human interaction, so it is a better option.

In electric vehicle charging, there is another problem about timing required to charge a vehicle, that it takes some hours to get charged. Vehicles need to be parked in a charging station until it gets charged up to certain necessity. The problem can be covered up by charging vehicles at any commercial building's parking lot while working in that building, like in office buildings, school or college, malls etc.

3.3 DRAWBACKS

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

3.4 PROPOSED SYSTEM

The proposed system is automatically operated and data obtained from the system is stored on the cloud. This data can be only accessed by the owner. Other than this, the owner can access data from anywhere and anytime which makes the system flexible and secure.

This system also includes wireless charging. In that there is no need to ON-OFF the plug. As a result, there will be less human interaction, and the risk of electric shock from connected connections will be reduced.

The proposed system can be installed in any commercial building's parking or paid parking; it will save time searching for a charging station as we can charge our vehicle in nearby commercial parking. Proposed system also contains a display outside the parking area or at the entrance of parking to show information regarding availability of particular slots in parking.

3.5 ADVANTAGES

- a) No man power
- b) Automated

- c) More security than existing system
- d) Less maintenance

3.6 PARKING SYSTEM

With the developing ubiquity of Keen Cities, there's continuously a request for shrewd arrangements for every domain. Keen Stopping is one of the foremost embraced and quickest developing savvy city arrangements across the world. In common, keen stopping can be characterized as a framework which gives data about availability of stopping spaces in a specific zone. Air terminals, Universities, Shopping centers and City garages are a number of substances that have started to realize the noteworthy benefits of automated parking innovation. Shrewd stopping is a mechanized and remote framework which can be completely based on an IoT innovation.

Savvy Stopping makes a difference to illuminate numerous issues like activity blockage, restricted stopping offices, and road security which makes it one of the foremost well-known portions of shrewd city. It includes a savvy parking management framework, shrewd entryway control, savvy cameras which are able to identify gadgets, ANPR (Automatic Number Plate Acknowledgement), shrewd installment framework, savvy section framework, data uploading and numerous more things.

In the proposed framework each opening given for stopping the composition of an IR sensor interfaces with particle photon board through molecule web IDE. These IR sensors distinguish in the event that any vehicle is displayed in a specific space and grant obtained data to show as well the same information getting transferred to the cloud through molecule photons. The LCD show is given at the entrance of the stop. LCD display is utilized to appear data with respect to accessibility of stopping opening in stopping zone i.e., it keeps information around each and each opening in the event that it is free to stop or not because it is nourished by yield of IR sensors of each opening.

As the proposed framework is shrewd, door control of the framework ought to be shrewd. So here the framework is getting given with a shrewd or programmed door control. Opening and closing motion of the entryway is controlled by servo engine which is nourished with yield of

IR sensors settled at entrance and exit gates of stopping. Shrewd control of entryways works as, in case a vehicle shows up at the entrance of stopping it is detected by IR sensor display at entrance, yield of this IR sensor is given to servo engine through particle photon and entryway opens. There's a condition for keen control of the entryway that on the off chance that all spaces in parking are full at that point the entrance entryway will get bolted and will not open until any space gets free to stop.

OVERALL WORKING OF PROPOSED PARKING SYSTEM

As all data about accessibility of openings in stopping is displayed at the entrance of parking, according to that, the client can select the opening to stop the vehicle. Too, as entryways are savvy controlled, in case opening is available in stopping at that point as it were the entrance door will open something else it gets bolted and no vehicle can enter within the stopping. As long as the vehicle gets stopped in an opening, an IR sensor identifies it and accordingly information on show at entrance will alter that the specific space is full. And this information will be uploaded on cloud which can be seen and gotten to anytime anyplace by proprietor.

3.7 CHARGING SYSTEM

The basic block diagram of the static WCS for EVs is illustrated Firstly, AC mains supply from the grid is converted into high frequency AC using AC/DC and DC/AC converters, to enable power transfer from transmission coil to receiving coil. On both transmitting and receiving sides, include series and parallel combination-based compensation networks in order to improve system efficiency. High frequency AC goes to the transmitting coil which is mounted on ground or concrete through a compensation network. The receiving coil, mounted underneath the vehicle, converts oscillating magnetic flux fields into high frequency AC then high frequency AC is converted to stable DC supply. This DC supply is used by on board batteries. To avoid health and safety issues and ensure stable operation, this system also includes battery management system (BMS), power control and communication.

Wireless Power Transfer Methods: Since the introduction of wireless charging systems for EVs, four methods for the design of WEVCS have been utilized traditional inductive power transfer (IPT), capacitive wireless power transfer (CWPT), magnetic gear wireless power

transfer (MGWPT) and resonant inductive power transfer (RIPT). presents the summary of available wireless power transfer technologies for battery operated electric vehicles (BEVs).

Inductive Power Transfer: Traditional IPT was developed by Nikola Tesla in 1914 to transfer power wirelessly. It is based on several EV charging structures. IPT has been tested and utilized in a wide variety of areas ranging from milliwatts to kilowatts to transfer contactless power from the source to the receiver.

CHAPTER 4

EXPERIMENTAL OR MATERIAL AND METHODS

4.1 EMBEDDED SYSTEM

An embedded system is a special-purpose computer system designed to perform one or a few dedicated functions, often with real-time computing constraints. It is usually embedded as part of a bigger device that also has hardware and mechanical components. In contrast, a general-purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems have grown in importance in recent years since they govern many of the ordinary gadgets we use.

Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Physically, embedded systems range from small portable gadgets like digital watches and MP3 players to massive fixed installations like traffic lights, industrial controls, and nuclear power plant control systems. The level of complexity varies from modest (a single microcontroller chip) to extremely high (many units, peripherals, and networks installed inside a huge chassis or enclosure).

Embedded systems perform a variety of purposes:

- a) Keep an eye on the surroundings; embedded systems collect data from input sensors. This data is subsequently processed, and the findings are provided to a user or users in some manner.
- b) Environment control; embedded systems produce and deliver commands to actuators.
- c) Transform the data; embedded systems transform the gathered data in some useful way, such as data compression/decompression.

Although sensor and actuator contact with the outside world is a key feature of embedded systems, these systems also provide capabilities exclusive to their applications. Control rules, finite state machines, and signal processing algorithms are examples of applications that are typically executed by embedded systems. In addition, these systems

must identify and respond to defects in both the internal computer environment and the surrounding electromechanical systems.

There are many categories of embedded systems, from communication devices to home appliances to control systems. Examples include;

- a) •Communication devices
eg: modems, cellular phones
- b) •Home Appliances
eg: CD player, VCR, microwave oven

4.2 BLOCK DIAGRAM OF AN EMBEDDED SYSTEM

An embedded system is often found in an embedded device. Many digitally interfaced devices, such as microwaves, VCRs, and automobiles, make use of embedded systems. An operating system is included in certain embedded systems. Others are very specialized; therefore, the entire logic is implemented as a single program. These systems are embedded in a device for a specialized function other than general-purpose computing.

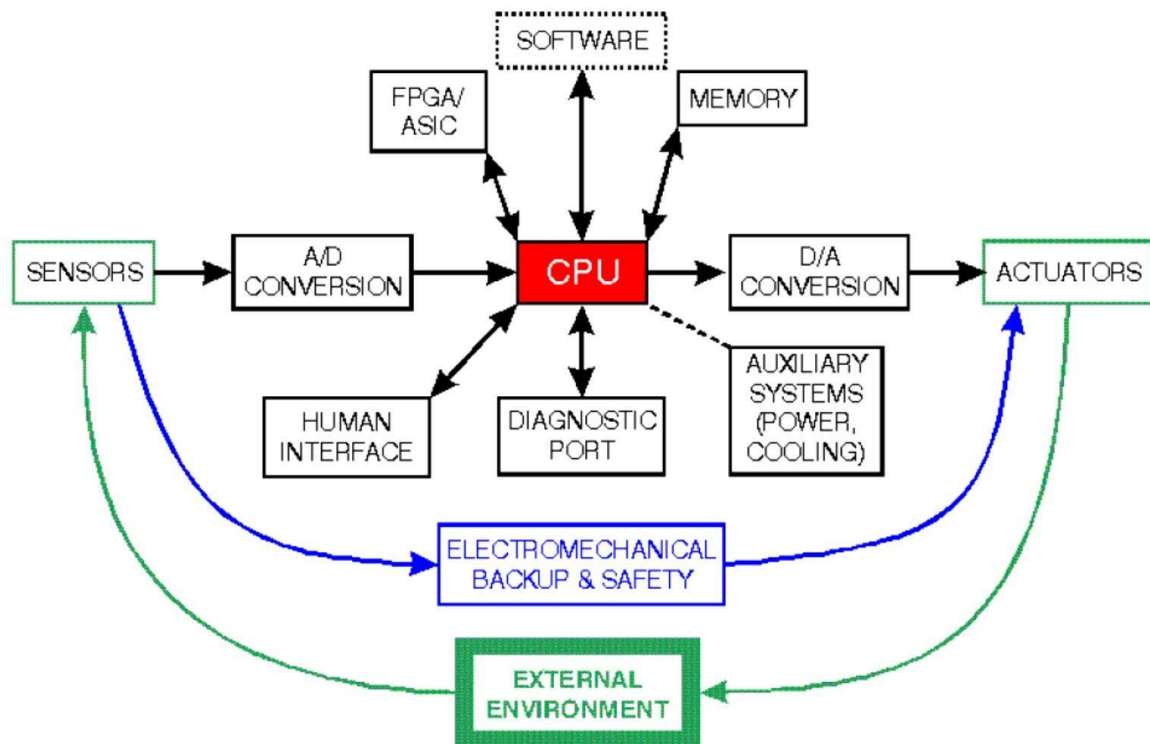


Fig: 4.1: Block diagram of an Embedded system

4.3 CHARACTERISTICS OF EMBEDDED SYSTEMS:

Embedded systems are distinguished by a discrete set of properties. Each of these features put a unique set of design limitations on embedded system designers. The difficulty in building embedded systems is adhering to the application's unique set of limitations.

4.4 APPLICATION SPECIFIC SYSTEMS:

Embedded systems aren't like ordinary computers. Embedded system designs are adapted to a particular application. Many of the job characteristics are known prior to the creation of the gear. This frees up the designer's time to concentrate on the precise design restrictions of a well-defined application. As a result, user reprogrammability is limited. Some embedded systems, on the other hand, need the capacity to reprogram. For such applications, programmable DSPs are widespread.

REACTIVE SYSTEMS:

A typical embedded systems paradigm, as previously stated, responds to the environment via sensors and controls the environment via actuators. This necessitates those embedded systems operate at the speed of the environment. This feature of an embedded system is known as "reactive." The term "reactive computation" refers to how the system (mainly the software component) responds to external stimuli. External events might be periodic or aperiodic in nature. Periodic events make it easy to plan processing to ensure performance. Aperiodic occurrences are more difficult to plan. In order to handle worst-case scenarios, the maximum event arrival rate must be predicted. The majority of embedded systems have a large reactive component. One of the most difficult tasks for embedded system designers is to do an accurate worst-case design analysis on systems with statistical performance characteristics (e.g., cache memory on a DSP or other embedded processor). The operation of a real-time system implies that the accuracy of a calculation is determined in part by the time at which it is provided. Systems with this criterion must frequently be designed to achieve the worst-case performance. On sophisticated designs, however, precisely predicting the worst-case scenario may be difficult. This frequently results in unduly gloomy projections that err on the side of

caution. Many embedded systems rely heavily on real-time operation to fulfill external I/O and control stability requirements. Many real-time systems are reactive systems as well.

SYSTEM SAFETY AND RELIABILITY:

As embedded system complexity and processing power increase, they begin to regulate more and more of the entire system's safety features. These safety precautions may take the shape of both software and hardware control. Mechanical backups are often initiated when a computer system loses control in order to securely shut down system activity. The issue of software safety and dependability is more serious. In most cases, software does not "break" in the same way that hardware does. However, software can be so complicated that a series of unanticipated events might induce software failures, resulting in dangerous scenarios. This topic is outside the scope of this book, but the problems for embedded designers include developing dependable software and creating low-cost, high-availability systems. The major difficulty for embedded system designers is to achieve low-cost dependability while using as little redundancy as possible.

CONTROL OF PHYSICAL SYSTEMS

The ability to interact with the environment is one of the primary motivations for embedding a computer. This is frequently accomplished by monitoring and controlling external machines. Embedded computers convert analogue signals from sensors to digital signals for processing. The outputs must be converted to analogue signal levels. Large current loads may need to be switched while operating physical equipment in order to run motors and other actuators. To achieve these requirements, embedded systems may require massive computer circuit boards with a significant number of non-digital components. Designers of embedded systems must carefully balance system tradeoffs between analogue components, power, mechanical, network, and digital hardware, as well as matching software.

SMALL AND LOW WEIGHT

A significant number of embedded computers are physically located within a bigger system. Aesthetics may determine the form factor of the embedded system. For example, the form factor of a missile may need to fit inside the missile's nose. Developing non-

rectangular shapes for particular solutions is one of the hurdles for embedded system designers. Weight might sometimes be a limiting factor. Embedded car control systems, for example, must be lightweight in order to save gasoline. Portable CD players must be low in weight in order to be portable.

POWER MANAGEMENT

Embedded systems have strict constraints on power. Given the portability requirements of many embedded systems, the need to conserve power is important to maintain battery life as long as possible. Minimization of heat production is another obvious concern for embedded systems.

4.5 INTERNET OF THINGS(IoT)

IoT stands for Internet of Things, which means accessing and controlling daily usable equipment and devices using Internet

IoT is a modern automation and analytics system that uses artificial intelligence, sensor, networking, electrical, cloud messaging, and other technologies to provide entire systems for products or services. IoT-created systems have increased transparency, control, and performance.

As we have a platform, such as the cloud, that stores all of the data, we can link all of the items around us. For example, consider a house where we can link our home appliances such as air conditioners, lights, and so on, and all of these items are handled on the same platform. Because we have a platform, we can link our automobile, track its fuel meter, speed level, and position.

4.6 FEATURES OF IoT

The most important features of IoT on which it works are connectivity, analyzing, integrating, active engagement, and many more. Some of them are

CONNECTIVITY

Connectivity refers to the establishment of a relevant link between all IoT components and an IoT platform, which might be a server or a cloud. After connecting

the IoT devices, dependable, secure, and bi-directional communication requires high-speed messaging between the devices and the cloud.

ANALYZING

After connecting all of the important objects, it is time to analyze the data obtained in real-time and apply it to develop efficient business intelligence. If we have a thorough understanding of the data obtained from all of these sources, we refer to our system as a smart system.

INTEGRATING

IoT is also combining multiple models to improve the user experience.

ARTIFICIAL INTELLIGENCE:

IoT makes things smart and enhances life through the use of data. For example, if we have a coffee machine whose beans are going to end, then the coffee machine itself orders the coffee beans of your choice from the retailer.

SENSING:

The sensor devices used in IoT technologies detect and measure any change in the environment and report on their status. IoT technology brings passive networks to active networks. Without sensors, there could not hold an effective or true IoT environment.

ACTIVE ENGAGEMENT

IoT allows related technology, products, or services to actively engage with one another.

4.7 IoT ARCHITECTURE

There is no widely known unique or conventional agreement on Internet of Things (IoT) architecture. The IoT architecture differs in terms of functional area and solutions. The IoT architectural technology, on the other hand, is primarily composed of four essential components.

COMPONENTS OF IoT ARCHITECTURE

- Sensors/Devices
- Gateways and Networks
- Cloud/Management Service Layer
- Application Layer

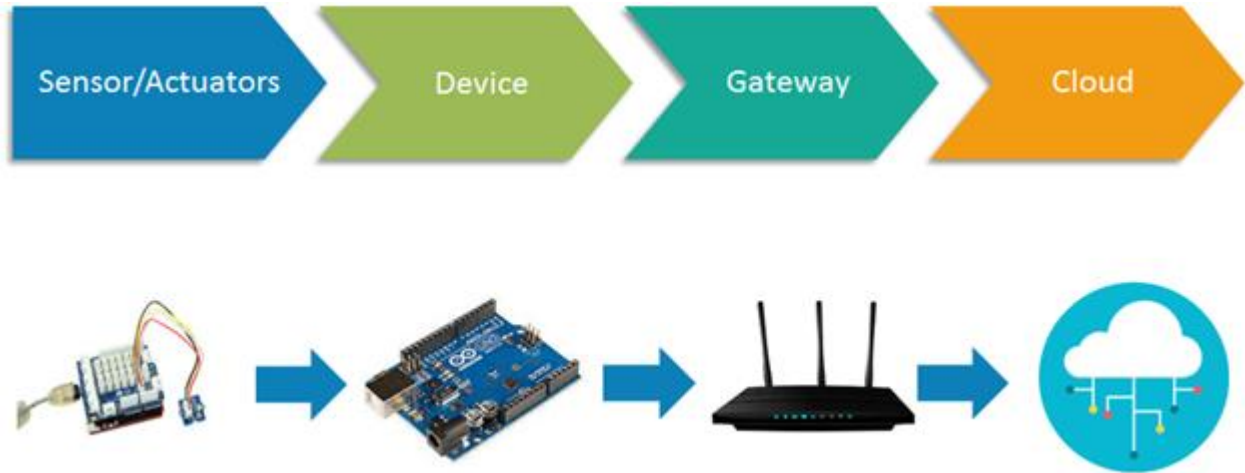


Fig:4.2: Block diagram of IoT Architecture

Sensors/Actuators: Sensors or Actuators are the devices that are able to emit, accept and process data over the network. These sensors or actuators can be linked via cable or wireless connections. This contains GPS, Electrochemical, Gyroscope, RFID, etc. Most of the sensors need connectivity through sensor gateways. The connection of sensors or actuators can be through a Local Area Network (LAN) or Personal Area Network.

Gateways and Data Acquisition: As the large numbers of data are produced by these sensors and actuator need the high-speed Gateways and Networks to transfer the data. This network can be of type Local Area Network (LAN such as WIFI, Ethernet, etc.), Wide Area Network (WAN such as GSM, 5G, etc.).

Edge IT: Edge in the IoT Architecture is the hardware and software gateways that analyze and pre-process the data before transferring it to the cloud. If the data read

from the sensors and gateways are not changed from its previous reading value then it does not transfer over the cloud, this saves the data used.

Data center/ Cloud: The Data Center or Cloud comes under the Management Services which process the information through analytics, management of device and security controls. Beside this security controls and device management the cloud transfers the data to the end user's application such as Retail, Healthcare, Emergency, Environment, and Energy, etc.

4.8 ADVANTAGES OF IoT:

The Internet of things facilitates several advantages in day-to-day life in the business sector.

Efficient resource utilization: Knowing the functionality and how each instrument works will undoubtedly boost the efficient resource utilization as well as the monitoring of natural resources.

Reduce human effort: Because IoT devices interact and communicate with one another and perform a variety of tasks for us, they reduce human effort.

Save time: As it eliminates human effort, it undoubtedly saves time. The fundamental aspect that an IoT platform can save is time.

Improve security: Now, if we have a system that all these things are interconnected then we can make the system more secure and efficient.

4.9 DISADVANTAGES OF IoT:

BREACH OF DATA:

It's great to have access to data. Unfortunately, our personal information is becoming increasingly at risk. The most compromised information is a credit card number, followed by a debit card number.

Data breaches are upsetting. Companies are likewise concerned about them and may lose confidence if their clients' personal information is stolen. Off-brand IoT devices, used smart devices, and questionable software are believed to be the worst.

LESSER EMPLOYMENT OF MENIAL STAFF:

As a result of the automation of daily operations, non-educated workers and assistance may lose their employment. This can result in societal unemployment.

This is an issue with overexposure to any technology, but it is one that can be solved with knowledge. Naturally, as everyday tasks become more automated, there will be fewer need for human labour, particularly employees and less educated personnel.

4.10 EMBEDDED DEVICES (SYSTEM) IN (IOT):

It is crucial to understand embedded devices while learning about IoT or developing IoT initiatives. The embedded devices are the things that make up the one-of-a-kind computer system. These systems may or may not have Internet access.

In most cases, an embedded device system operates as a single application. These gadgets, on the other hand, can connect to the internet and communicate with other network devices.

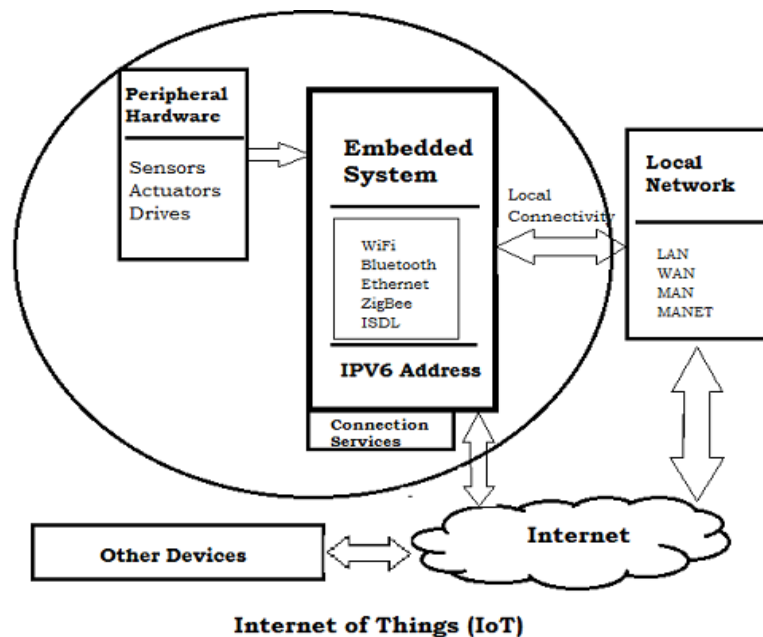


Fig:4.3: Basic Embedded System

IoT device embedded systems are a mix of hardware and firmware, as well as internet connectivity, that enable specified activities to be performed. These devices provide real-time data via the internet for a variety of purposes including as monitoring, tracking, analyzing, and even automatic interference.

The embedded system that employs devices able to operate the system is built on the language platform, which is mostly where real-time operations are executed. Manufacturers create embedded software for electrical equipment such as automobiles, telephones, modems, appliances, and so on. Lighting controls operated on an 8-bit microcontroller can be used as embedded system software. It may also be complex software for missiles, process control systems, and airplanes, among other things.

4.11 Block diagram of project:

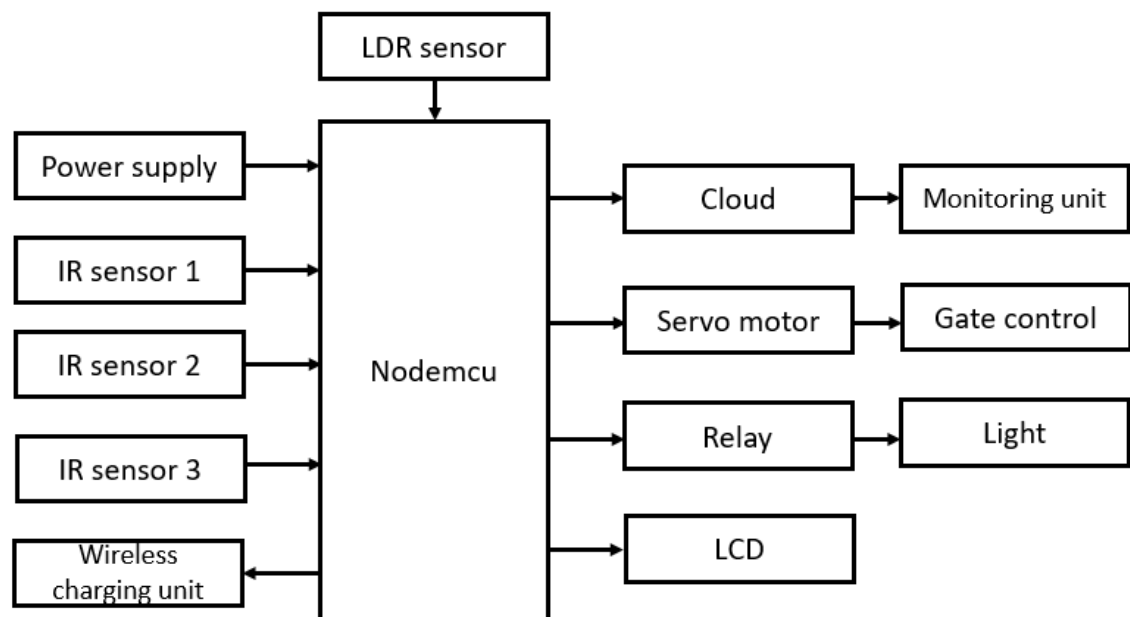


Fig:4.4:Block diagram of project

4.12 HARDWARE USED:

- Nodemcu.
- IR sensor.
- LDR.

- Servo motor.
- Wireless charging unit.
- LCD.
- Relay.

4.13 SOFTWARE USED:

- Embedded C
- Arduino ide

NodeMCU:

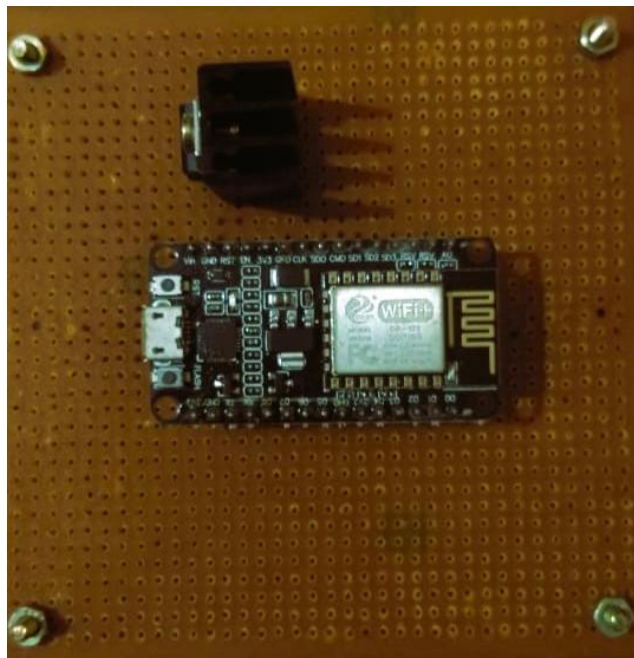


Fig:4.5:ESP8266 Wi-Fi chip.

NodeMCU is a free and open-source LUA-based firmware for the ESP8266 Wi-Fi chip. AS NodeMCU is an open-source platform, its hardware design is available for editing, modification, and building. The ESP8266 Wi-Fi enabled chip is used in the NodeMCU Development Kit/board.

The ESP8266 is a low-cost Wi-Fi microchip with 32-bit microcontroller capability, standard digital peripheral interfaces. There are different types of ESP8266 boards available for different needs. The primary goal of this board is to deal with the built-in Wi-Fi through AT commands if used as device modules, but you can 'program' using the Arduino board; however, it also reads and controls input/output, digital and analog.

IR (INFRARED) SENSOR:

An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detect the motion. These types of sensors measure only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes that can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED. When IR light falls on the photodiode, the resistances and these output voltages change in proportion to the magnitude of the IR light received.

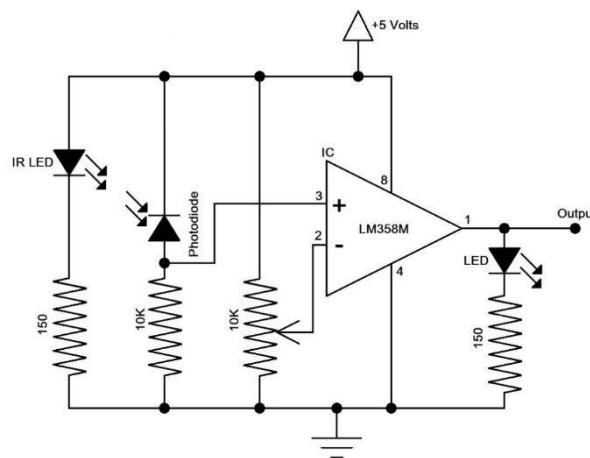


Fig:4.6:IR Sensor Circuit diagram

Resistors R1 (100), R2 (10k) and R3 (330) are used to ensure that minimum 10 mA current passes through the IR LED Devices like Photodiode and normal LEDs respectively.

Resistor VR2 (pre-set=5k) is used to adjust the output terminals. Resistor VR1 (preset=10k) is used to set the sensitivity of the circuit Diagram. Read more about IR sensors.

LDR (LIGHT DEPENDENT RESISTOR):

A Light Dependent Resistor (LDR) or photoresistor is a device whose resistance varies with the amount of incoming electromagnetic radiation. As a result, they are light sensitive gadgets. Photo conductors, photo conducting cells, and simply photocells are some names for them. They are made of high-resistance semiconductor materials.

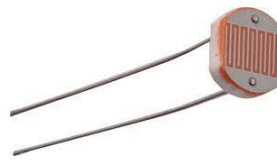


Fig:4.7:LDR SENSOR

Working Principle of LDR:

A light dependent resistor operates on the photo conductivity concept. Photo conductivity is an optical phenomenon in which the conductivity (and hence resistivity) of a substance decreases as light is absorbed by it. When light, or photons, strike the device, electrons in the semiconductor material's valence band are stimulated to the conduction band. To cause electrons to jump from the valence band to the conduction band, the incoming light photons must have an energy larger than the band gap of the semiconductor material. As a result, when sufficient energy is impacted on the device, more and more electrons are stimulated to the conduction band, resulting in a huge number of charge carriers. The result of this process is more and more current starts flowing and hence it is said that the resistance of the device has decreased. This is the most common working principle of LDR.

ARDUINO:

Arduino is a free and open-source electronics platform with simple hardware and software. Arduino boards can read inputs such as a light on a sensor, a finger on a button,

or a Twitter tweet and convert them into outputs such as operating a motor, turning on an LED, or posting anything online. You may direct your board by delivering a series of instructions to the board's microcontroller. You utilise the Arduino programming language (based on Wiring) and the Arduino Software (IDE) (based on Processing) to do this.

ARDUINO IDE:

The Arduino Integrated Development Environment (IDE), often known as the Arduino Software (IDE), has a text editor for writing code, a message box, a text terminal, a toolbar with buttons for common tasks, and a set of functions.

Chapter 5

RESULT AND DISCUSSIONS, PERFORMANCE ANALYSIS

The proposed system has both hardware and software uploaded results, which are given below.

5.1 HARDWARE RESULTS

Proposed system is provided with LCD display at entrance which displays information regarding slots availability. Numbers show empty slots and 'B' shows booked slots.

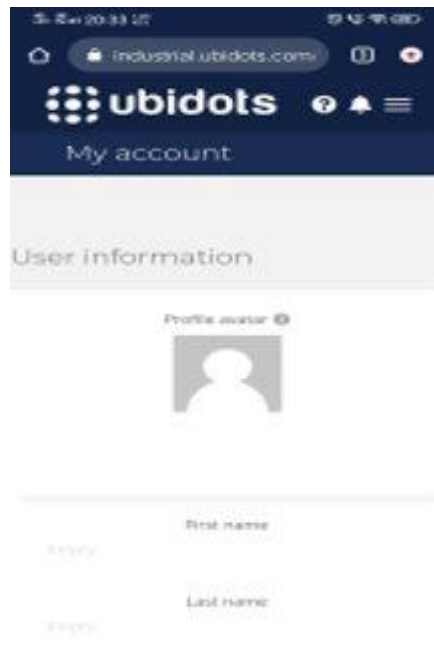


As the sensor detects the vehicle in the charging slot, with some delay charging starts automatically. Charging is started and is indicated by LED, as it glows.

5.2 SOFTWARE RESULTS

All data obtained in the hardware is updated on cloud. Then in devices we can see which system is connected and at what time, which location we have connected. After entering the device we can see all the actions going on. Which slot is asking access, at what time. The working can be understood by following method –

Step 1 - Initially, we have to make an account on cloud for IOT, here we are using ubidots.



The screenshot shows the 'My account' page on the Ubidots website. The 'User Information' section is highlighted. It includes a 'Profile picture' placeholder, a 'First name' input field with the text 'Smart', and a 'Last name' input field with the text 'Parking'.

Step 2 -This is username and Password I have used for ubidots

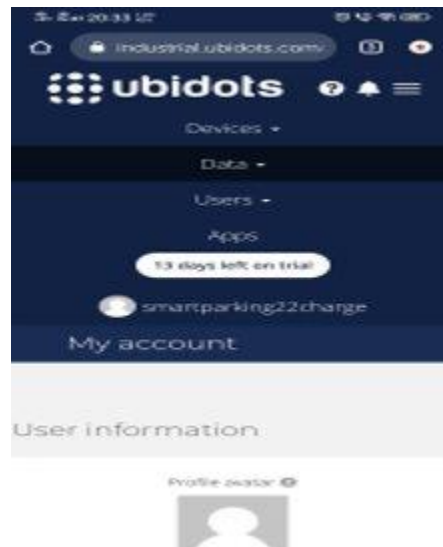


The screenshot shows the 'Account details' page on the Ubidots website. It displays the following information:

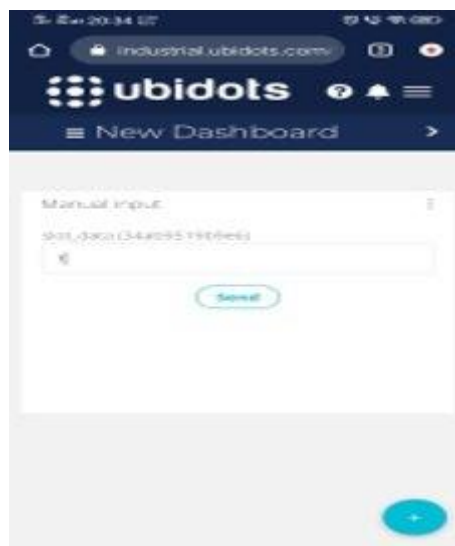
- Username: smartparking22charge
- Email: smartparking22charge@gmail.com
- Password: PASSWORD (masked)
- Data Export: EXPORT (button)
- Account deletion: PAUSE DELETE (buttons)

At the bottom, there is a sidebar with 'My account' and 'API Credentials' options.

Step 3 - Now we can see we have multiple options available. Initially to give input we have to click on data, we can get access to the dashboard.



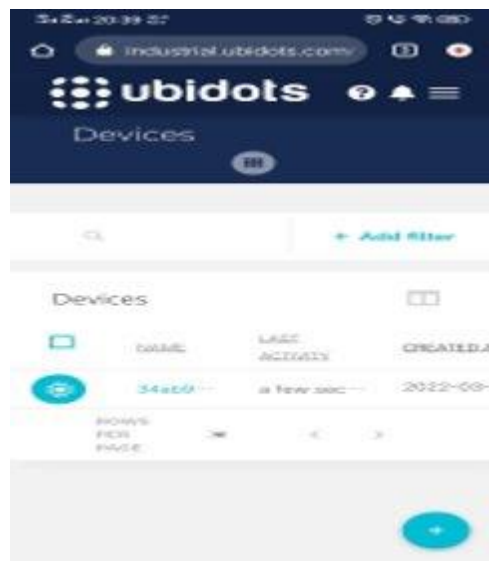
Step 4 - After entering the dashboard here we have to give input. So here input will be in which slot we want to park we have to add that slot number as 1,2 and 3.



Step 5 - After giving input as 1, on the display it will show as slot 1 is booked.



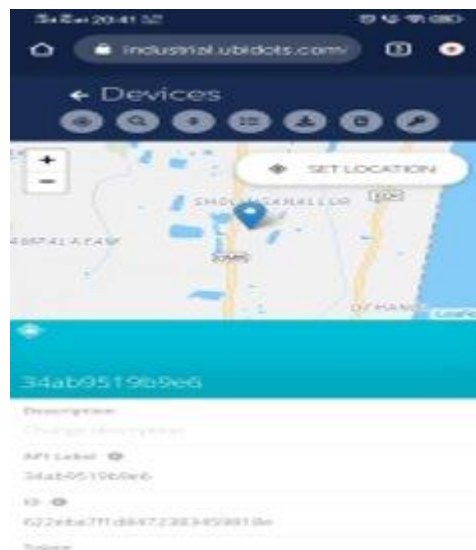
Step 6-Then in devices we can see which system is connected and at what time, which location we have connected.



Step 7- After entering the device we can see all the actions going on. Which slot is asking access, at what time.



Step 8- Also we can see the location on which the access is been asked.



CHAPTER 6

CONCLUSION

The proposed work has been developed in order to provide a conceptual system to assist and manage electrical vehicles charging process and parking facilities for cars. With the implementation of smart charging and parking systems, it enables better and real time observation and data collection of parking slots which develop an effective platform. This system provides real time information regarding availability of parking slots in a parking area. The main benefits are fuel and time saving. This system provides sustainable parking management in an eco-friendly manner.

6.1 APPLICATIONS:

- 1) Provides a parking slot with a facility of charging for electrical vehicles.
- 2) It can be implemented in commercial buildings like shopping malls, theaters etc.
- 3) Provides tools to optimize workspace management.
- 4) Simplifies the charging and parking experience of stakeholders.
- 5) Optimize parking space uses.

6.2 FUTURE SCOPE:

Future of world is moving towards smartness i.e., IoT systems and wireless systems will be preferable. As this system is IoT and cloud based, it is already wireless. So, it will be easy to adopt in future also. As per today's circumstances this system consists of both parking and charging availability as per vehicle type. If in future, all vehicles get replaced by EVs, the system can be modified as all slots will provide charging facility standardization of EV charging system will make more convenience. This system also can be utilized by using or creating applications (mobile) for it including GPS systems like book, pay and park or charge. This will add more smartness in the system.

CHAPTER 7

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