Industrial Engineering Journal
ISSN: 0970-2555
Volume : 53, Issue 4, April : 2024

# IOT BASED WIRELESS EV CHARGING STATION USING RFID

**Abstract:** As the automobile industry enters a new era, it is transitioning quickly from IC engine vehicles to electric vehicles. The demand for electric vehicles is rising, which also causes a rise in the number of charging stations. In this concept, the automobile is wirelessly charged by inductive coupling using a wireless charging system. The automobile only needs to be parked on the charging location. One of the technologies that may be one step ahead of us is wireless power transmission. This technology may lead to new wireless charging applications that we can utilize on a regular basis.

## INTRODUCTION

We live in a technologically advanced world. Every day, new technologies are developed to simplify our lives. Despite this, we continue to utilize the traditional wire system to charge low- and mid-power electronics like laptops and everyday low-power gadgets like mobile phones and digital cameras. When multiple gadgets need to be charged at once, the traditional wire method is a mess. Additionally, it consumes a lot of electrical outlets, not to mention that each device has a charging connector with a unique design. There might be a question at this moment What if these gadgets could be charged simultaneously by a single device without the need for cords and without making a mess? We thought about it and developed a concept. All of these problems can be resolved using inductive coupling, a quick and efficient method of wireless power transfer. Without the use of wire or any other material, wireless power transmission (WPT) is the effective transfer of electric power from one location to another across a vacuum or an environment. This can be applied in situations when instantaneous or continuous energy transfer is required but conventional cables are prohibitively expensive, cumbersome, risky, undesirable, or impossible. Inductive coupling, resonant induction, and electromagnetic wave power transfer are all viable options for transferring power over short, medium, and long distances. WPT is a technology that makes it possible to deliver power to places that would otherwise be difficult or impractical to reach. The next big thing could be using inductive coupling to charge electric vehicle batteries. In order to

wirelessly transmit electricity through space and charge an electric vehicle's battery, the goal of this article is to develop an electric vehicle wireless charging station and charging platform. To transmit electricity from a transmitter to a resistive load or batteries of an electric vehicle, the system will use inductive coupling. If successful, it would make charging the battery of an electric car simpler and easier by eliminating the need for cords.

## OBJECTIVES

1. To build a Prototype of a wireless Charging Station for EV. 2. To Use RFID sensor for payment purpose. 3. To use a cloud-based technology to store the data from the sensor

## METHODOLOGY

Wireless charging systems for electric vehicles can be categorized into four types based on their operating techniques. These include the Capacitive Wireless Charging `System, Permanent Magnetic Gear Wireless Charging System, Inductive Wireless Charging System, and Resonant Inductive Wireless Charging System. The Inductive Wireless Charging System operates based on Faraday's law of induction. It uses the mutual induction of magnetic field or flux between the transmission and reception coil to transmit power wirelessly. When an AC supply is applied to the transmitter coil, it creates an AC magnetic field that passes through the receiver coil. This magnetic field moves electrons in the receiver coil, causing AC power output that is then rectified and filtered to charge the battery of an electric vehicle. The amount of power transferred depends on the frequency, mutual inductance, and distance between the transmission and reception coil. The operating frequency of the Inductive Wireless Charging System ranges from 19 to 50 kHz. However, there are some limitations to the Inductive Wireless Charging System. The harmonic current can cause heating in a conductor, leading to an increase in current value higher than expected. This

mechanism leads to losses in the distribution of current in the conductor, including the skin effect and proximity effect. The skin effect is caused by the surface current that does not penetrate far into the conductor's body but travels along its surface. Therefore, in a large diameter conducting wire, most of the cross-sectional area of the wire is not used to conduct the current. This effect increases the wire's resistance in the coil, which may already have a high resistance due to its length and small diameter. The proximity effect is caused by the conductor's magnetic field, which disrupts the current distribution in adjacent carriers.

**EXISTING SYSTEM**

Electric vehicle wireless charging is an emerging technology that aims to provide a convenient and efficient way to charge electric vehicles without the need for physical cables. There are several existing systems of electric vehicle wireless charging that use different technologies, such as inductive charging, magnetic resonance, and conductive charging. Inductive charging is the most commonly used technology, where a wireless charging pad is installed in the ground, and a receiver coil is installed on the vehicle. The charging pad creates a magnetic field, which induces an electrical current in the receiver coil, charging the vehicle's battery. Magnetic resonance charging uses a similar approach, but with the addition of resonant coils that increase the efficiency of the charging process. Conductive charging, on the other hand, uses a conductive plate installed on the ground and a conductive connector on the vehicle to transfer the electrical charge. The technology is being tested in various applications, including public transportation and personal vehicles. Companies such as BMW, Mercedes-Benz, and Audi are working on developing wireless charging infrastructure for their vehicles. While the technology is still in the early stages of development, it has the potential to significantly improve the convenience and accessibility of electric vehicle charging.

**DRAWBACKS**

• Higher cost of installation and maintenance compared to traditional plug-in charging systems • Lower charging efficiency and slower charging times compared to plug-in systems • Limited availability of wireless charging infrastructure • Limitations in the range and alignment of the charging pad and the receiver coil on the vehicle • Higher risk of damage to the charging pad and the vehicle's undercarriage due to physical contact with the ground.

**PROPOSED SYSTEM**

The system of electric vehicle wireless charging using RFID (Radio-Frequency Identification) is a technology that allows electric vehicles to be charged wirelessly through a magnetic field generated by a charging pad. The system uses RFID technology to authenticate the vehicle and initiate the charging process, making it convenient and easy for EV owners to charge their vehicles without having to physically connect a charging cable to the car. The system consists of twomain components: the charging pad and the RFID tag. The charging pad is installed on the ground and generates a magnetic field that transfers energy wirelessly to the vehicle's battery through an induction coil. The RFID tag is placed on the vehicle and contains information about the vehicle, such as its identification number, battery capacity, and charging requirements. When an EV with an RFID tag enters the charging pad's range, the system reads the tag and identifies the vehicle. The charging pad then generates a magnetic field that transfers energy wirelessly to the vehicle's battery. The RFID tag also allows the system to monitor the charging process and adjust it to optimize the charging time and battery life. Once the battery is fully charged, the system stops the charging process and releases the vehicle from the charging pad. In conclusion, the system of electric vehicle wireless charging using RFID is a promising technology that offers numerous benefits for EV owners. With the continuous advancement of technology, the system has the potential to

revolutionize the EV industry and provide a more convenient and efficient way of charging electric vehicles.

## LITERATURE SURVEY

Due to their numerous benefits, in the transportation sector, internal combustion (IC) engine-powered cars are regarded as being replaced by electric vehicles (EV). Modern electric car batteries should be charged wirelessly whenever possible. This study performs a thorough review of the various wireless EV battery charging methods. There are two alternative ways to wirelessly distribute power to charge an electric vehicle's battery: static EV charging and dynamic EV charging [1]. For power transfer in static wireless EV battery charging techniques, both capacitive and inductive methods are employed; however, in dynamic wireless EV battery charging techniques, only inductive methods are used. This study provides a comprehensive evaluation of these approaches with an emphasis on compensating circuit topologies, magnetic linked inductor core types, and various converters and controllers for wireless power transfer (WPT) systems. In addition, design considerations for a static wireless EV battery charging system are discussed in this work, along with an analysis of its equivalent circuit. This report also explains the difficulties and potential future developments in wireless charging of EV batteries. Due to improvements in battery life and their low emission levels, electric vehicles (EVs) have attracted a lot of attention recently. Similar to how more devices can now be connected because to the growth of the Internet of Things (IoT) [4][13]. The current restricted battery range and the dearth of outlets for charging or battery changing are two main issues for EVs. Building the required infrastructure and having a reliable battery management system (BMS) that can accurately estimate the amount of power left over are two solutions. Battery switching may potentially be an option for some EVs, either at authorized charging stations or even directly from other EV users. In order to provide drivers with information on

a successful battery charge or exchange, a network of EV information is necessary[3]. This study presents two blockchain implementations for an EV BMS that use blockchain as the network and data layer of the application. The first solution builds smart contracts on top of the Ethereum blockchain, whereas the second builds them on top of the IOTA tangle and a directed acyclic graph (DAG). The two strategies are put into practice and contrasted to show that both systems can offer a workable solution for an effective, partially decentralized, data-driven BMS [4]. Customers accept electrical vehicles because they are simple to use. It has a lot of requirements, one of which is a pleasant charging and parking area. The suggested model combines these two systems to provide an effective solution. The design of a system that can manage free parking spaces and charge schedules is discussed in this article. The parking systems in place today are not capable of handling all kinds of automobiles. There must be parking and a charging station for electric vehicles. The suggested model offers the option to reserve a charging area using a smartphone[5][14].

# 4. DESIGN OF HARDWARE

## 4.1 ARDUINO:

The most common version of Arduino is the Arduino Uno. This board is what most people are talking about when they refer to an Arduino. The Uno is one of the more popular boards in the Arduino family and a great choice for beginners. There are different revisions of Arduino Uno, below detail is the most recent revision (Rev3 or R3).

The Arduino Uno is a microcontroller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

Industrial Engineering Journal
ISSN: 0970-2555
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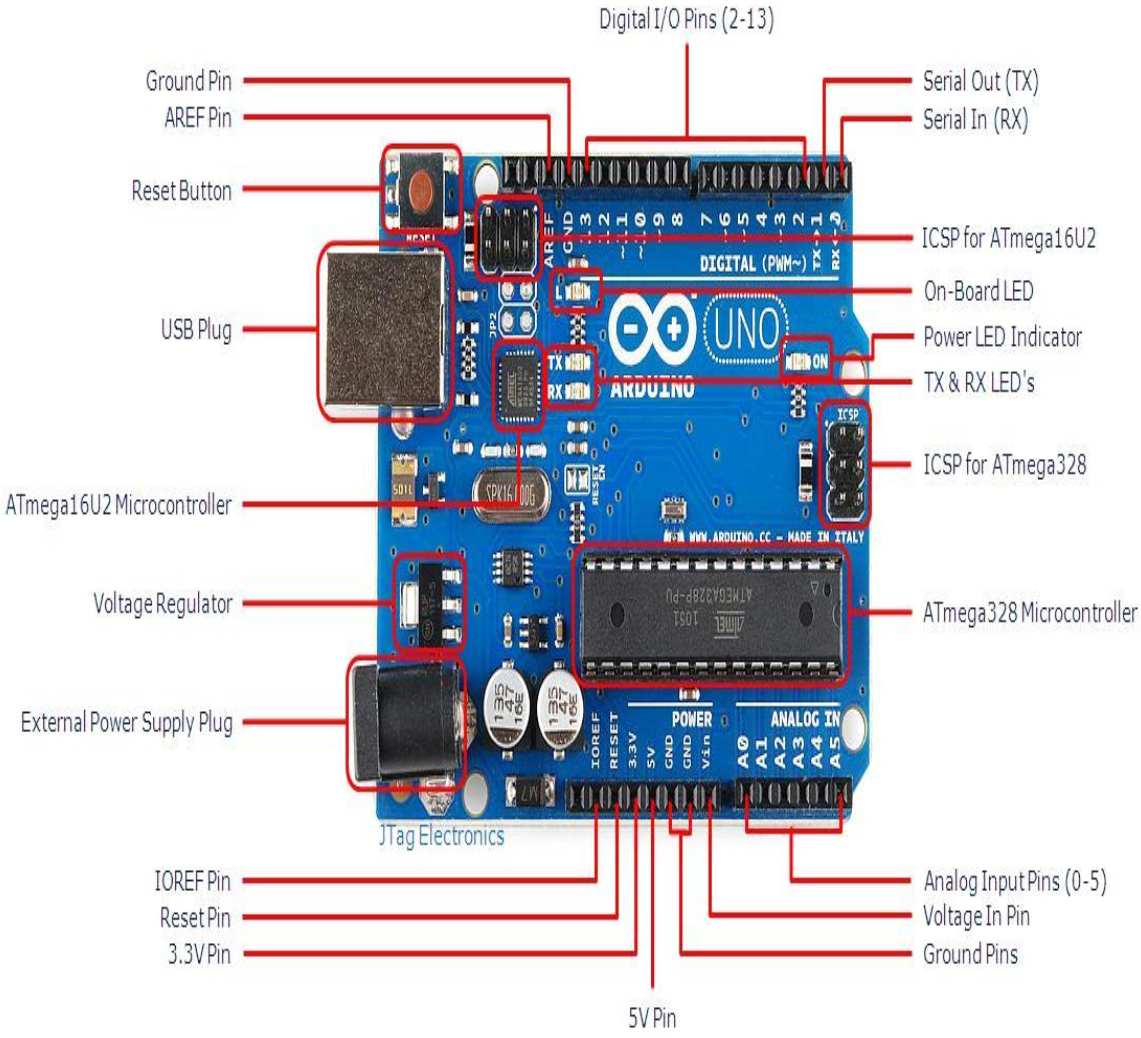


fig 3.1 ArduinoUno R3 Board

## 4.9. POWER SUPPLY:

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is known as "Regulated D.C Power Supply".

Industrial Engineering Journal
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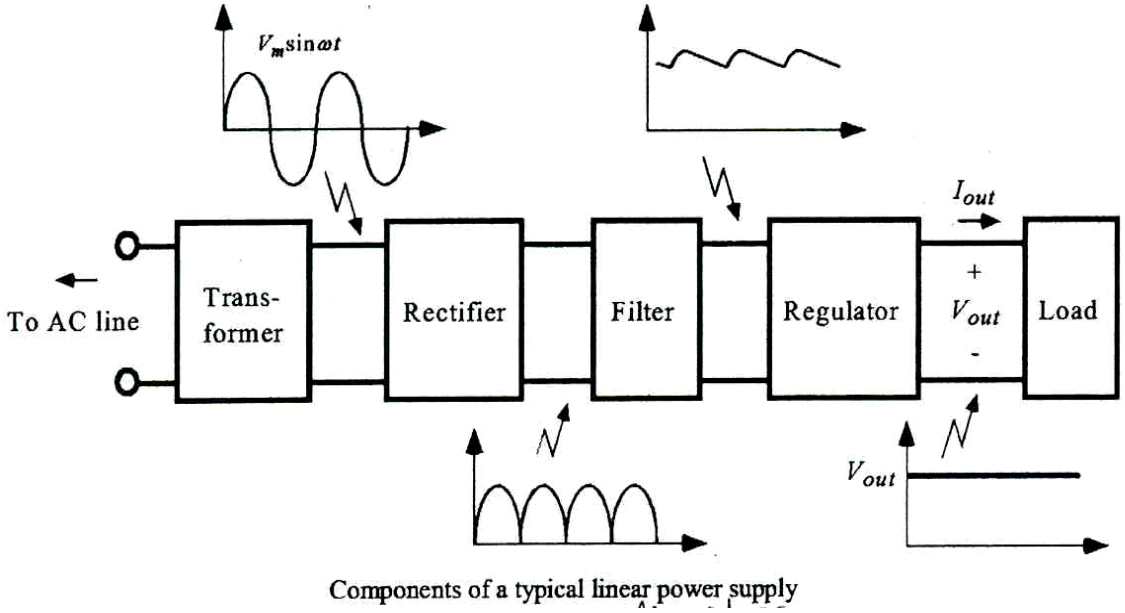


Fig:4.4. Block Diagram of Power Supply

## 4.13. LCD:

A model described here is for its low price and great possibilities most frequently used in practice. It is based on the HD44780 microcontroller (Hitachi) and can display messages in two lines with 16 characters each. It displays all the alphabets, Greek letters, punctuation marks, mathematical symbols etc. In addition, it is possible to display symbols that user makes up on its own. Automatic shifting message on display (shift left and right), appearance of the pointer, backlight etc. are considered as useful characteristics.

Industrial Engineering Journal
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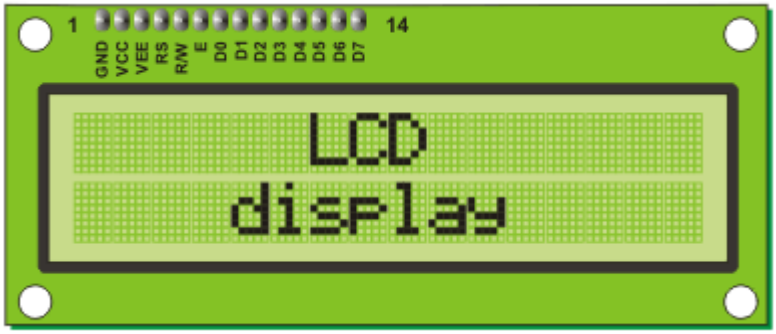
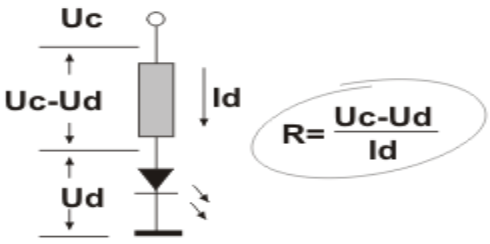


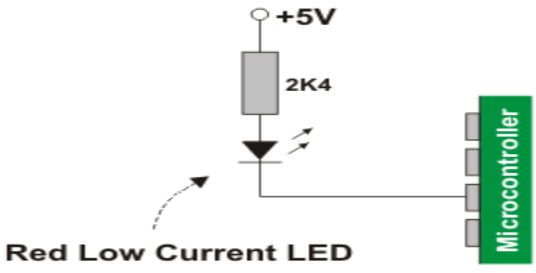

Fig: 4.10. LCD

## Light-emitting diode (LED)

Light-emitting diodes are elements for light signalization in electronics. They are manufactured in different shapes, colors and sizes. For their low price, low consumption and simple use, they have almost completely pushed aside other light sources- bulbs at first place. They perform similar to common diodes with the difference that they emit light when current flows through them.




It is important to know that each diode will be immediately destroyed unless its current is limited. This means that a conductor must be connected in parallel to a diode. In order to correctly determine value of this conductor, it is necessary to know diode's voltage drop in forward direction, which depends on what material a diode is made of and what colour it



is. Values typical for the most frequently used diodes are shown in table below: As seen, there are three main types of LEDs. *Standard* ones get ful brightness at current of 20mA. *Low Current* diodes get ful brightness at ten times lower current while *Super Bright* diodes produce more intensive light than Standard ones.

## RFID (Radio-frequency identification)

**Radio-frequency identification** (**RFID**) uses electromagnetic fields to automatically identify and track tags attached to objects. The tags contain electronically-stored information. Passive tags collect energy from a nearby RFID reader's interrogating radio waves. Active tags have a local power source (such as a battery) and may operate hundreds of meters from the RFID reader. Unlike a barcode, the tag need not be within the line of sight of the reader, so it may be embedded in the tracked object. RFID is one method of automatic identification and data capture (AIDC).[1]

RFID tags are used in many industries. For example, an RFID tag attached to an automobile during production can be used to track its progress through the assembly line; RFID-tagged pharmaceuticals can be tracked through warehouses; and implanting RFID microchips in livestock and pets enables positive identification of animals.

Since RFID tags can be attached to cash, clothing, and possessions, or implanted in animals and people, the possibility of reading personally-linked information without consent has raised serious privacy concerns.[2] These concerns resulted in standard specifications development addressing privacy and security issues. ISO/IEC 18000 and ISO/IEC 29167 use on-chip cryptography methods for untraceability, tag and reader authentication, and over-the-air privacy. ISO/IEC 20248 specifies a digital signature data structure for RFID and barcodes providing data, source and read method authenticity. This work is done within ISO/IEC JTC 1/SC 31 Automatic identification and data capture techniques. Tags can also be used in shops to expedite checkout, and to prevent theft by customers and employees.

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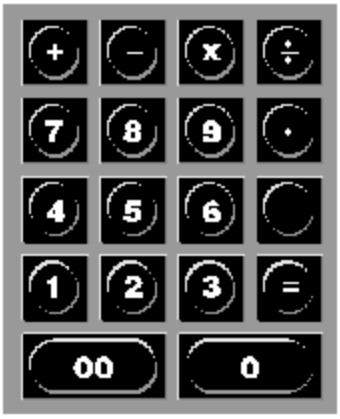
**KEYPAD:**

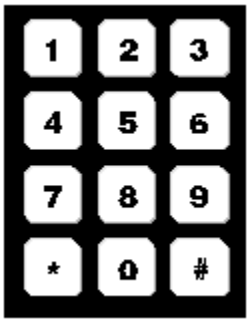
Keypads and LCDs are the most widely used input/output devices of the 8051 and a basic understanding of them is essential. The keypads are mainly three types:

1. 4*3 keypad
2. 4*4 keypad
3. 4*8 keypad.

The keypad used in this project is 4*3 keypad.




**Calculator keypad**




**Telephone keypad**

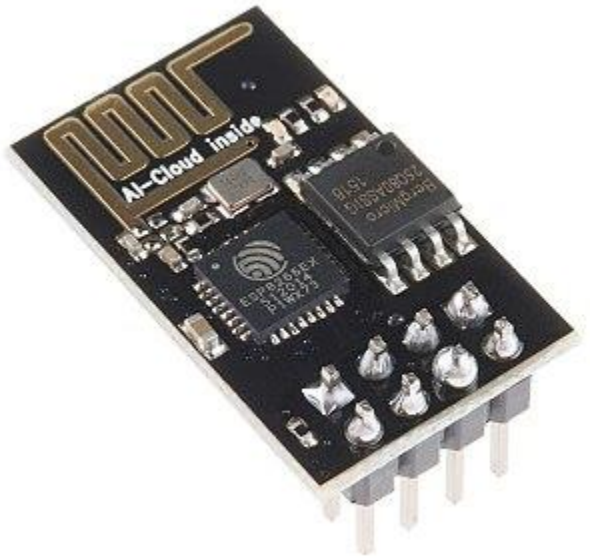
## ESP8266 WIFI

The **ESP8266** is a low-cost Wi-Fi microchip with full TCP/IP stack and microcontroller capability produced by Shanghai-based Chinese manufacturer, Espressif Systems.[1]

The chip first came to the attention of western makers in August 2014 with the **ESP-01** module, made by a third-party manufacturer, Ai-Thinker. This small

module allows microcontrollers to connect to a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. However, at the time there was almost no English-language documentation on the chip and the commands it accepted.[2] The very low price and the fact that there were very few external components on the module which suggested that it could eventually be very inexpensive in volume, attracted many hackers to explore the module, chip, and the software on it, as well as to translate the Chinese documentation.[3]

The **ESP8285** is an ESP8266 with 1 MiB of built-in flash, allowing for single-chip devices capable of connecting to Wi-Fi.[4]




## RELAYS

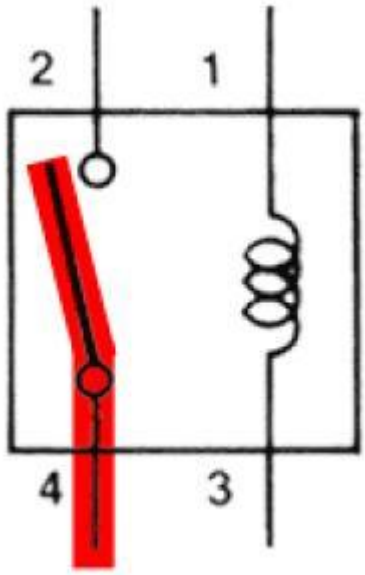
### What is a relay?

We know that most of the high end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays consist of a n electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they

differ according to their applications. Most of the devices have the application of relays.

**Why is a relay used?**

The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. The application of relays started during the invention of telephones. They played an important role in switching calls in telephone exchanges. They were also used in long distance telegraphy. They were used to switch the signal coming from one source to another destination.




# 6. PROJECT DESCRIPTION

This chapter deals with working and circuits of "". It can be simply understood by its block diagram &circuit diagram.

**BLOCK DIAGRAM:**

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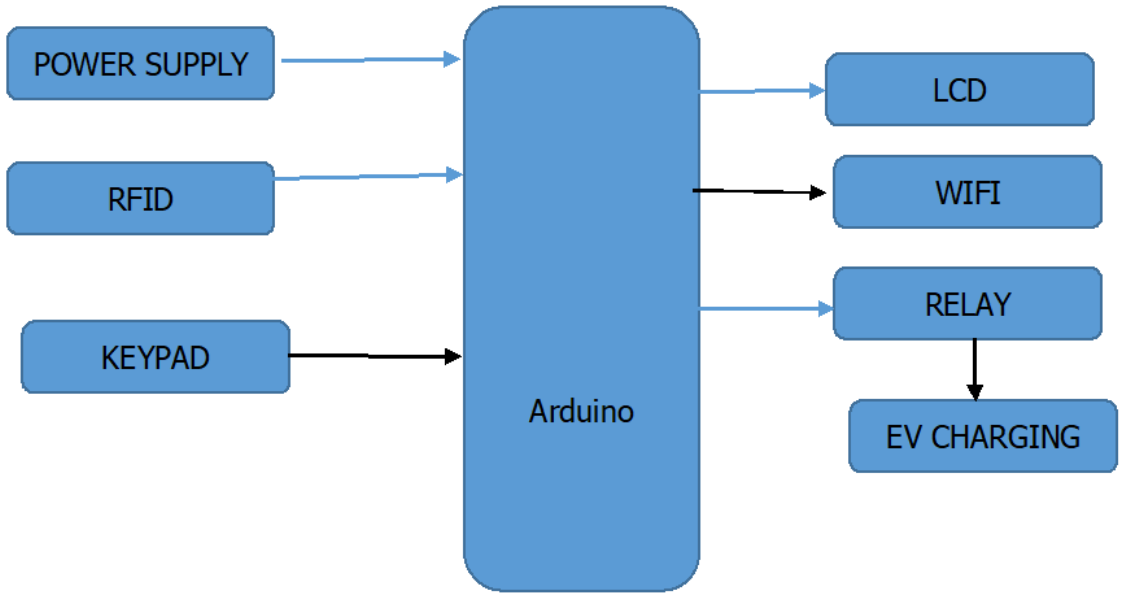


**Working :**

Electric vehicle wireless charging using RFID (Radio Frequency Identification) is a promising technology that offers convenience and efficiency to EV owners. RFID technology allows for wireless communication between the EV and the charging station, eliminating the need for cables and connectors. The EV is fitted with an RFID tag that communicates with the charging station to initiate and monitor the charging process. This technology is also beneficial for fleet management, as it enables remote monitoring and control of charging activities. Additionally, RFID charging systems can be integrated with renewable energy sources, further reducing carbon emissions. However, challenges still exist with the technology, such as the limited range of RFID communication and the high cost of implementation. Nonetheless, continued research and development of this technology could lead to widespread adoption and improved sustainability in the

# CONCLUSION AND FUTURE SCOPE

In conclusion, electric vehicle wireless charging using RFID has the potential to revolutionize the way we charge our electric vehicles, providing greater convenience, efficiency, and sustainability. The technology offers benefits such as eliminating the need for cables and connectors, remote monitoring and control of charging activities, and integration with renewable energy sources. However, further research and development are necessary to address challenges such as the limited range of RFID communication and the high cost of implementation. With continued innovation and investment, the use of RFID technology in electric vehicle charging systems cancontribute to the transition to a cleaner and more sustainable transportation system.

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