WIRELESS ELECTRIC VEHICLE CHARGING USING SOLAR ENERGY

A PROJECT REPORT

submitted by

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In partial fulfilment for the award of the degree of

BACHELOR OF TECHNOLOGY IN ELECTRONICS AND COMMUNICATION ENGINEERING

Under the guidance of

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Submitted to

AMRITA VISHWA VIDYAPEETHAM

AMRITA SCHOOL OF ENGINEERING

CHENNAI – 601103

APRIL 2024

BONAFIDE CERTIFICATE

This is to Certify that this project report entitled **“WIRELESS EV CHARGING SYSTEM USING SOLAR ENERGY”** is the bonfire work of **“KESAVARDHANBABU (Reg. No. CH.EN. U4ECE20022), JAMPANA JASWANTH KUMAR (Reg. No. CH.EN. U4ECE20015)”,** who carried out the project work under my supervision.

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I declare that the report entitled **"WIRELESS EV CHARGING SOLAR ENERGY"** submitted by me for the degree of Bachelor technology is the record of the project work carried out by me under the guidance of **'B. DEVANANDHAN'** and this work is not formed for basis for the award of degree, diploma, associate ship, fellowship, titled in this or any other university or other similar institute for higher learning.

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ABSTRACT

The automobile industry is rapidly transitioning from internal combustion engine cars to electric vehicles, ushering in a new era of mobility. This transition is accompanied by increased demand for electric cars, resulting in a rise in the number of charging stations. The vehicles are wirelessly charged in this revolutionary design by inductive coupling, which is accomplished by a wireless charging technology. All that is necessary is that the car be driven into the charging station. It is the technique that transmits energy from one source to a device or vehicle over a distance without the need of traditional cables or conducting wires. The notion of wireless power transfer was one of Nikola Tesla's most revolutionary inventions. Most importantly, this technique does not require Wireless power transfer (WPT) based on magnetic resonance (MR) has the potential to free people from the limits of bulky cables. WPT, in essence, employs the same underlying idea of inductive power transfer that has been studied for decades. However, the fast advancement of WPT technology in recent years has been astounding. It has achieved a phenomenal load efficiency of more than 90%, greatly expanding the power transmission distance from mm to several hundred mm and power outputs ranging from milliwatts to kilowatts. WPT technology developments are particularly appealing to electric vehicle (EV) charging applications since it can be used efficiently in both stationary and dynamic charging conditions. This talk focuses on the WPT technologies that are relevant.

Keywords: Automobile industry, Electric vehicles (EVs), Charging stations, Inductive coupling, Wireless power transfer (WPT), Stationary charging, Dynamic charging, Load efficiency

ACKNOWLEDGEMENT

This project work would not have been possible without the contribution of many people. It gives me immense pleasure to express my profound gratitude to our honourable Chancellor **Sri Mata Amritanandamayi Devi**, for her blessings and for being a source of inspiration. I am indebted to extend my gratitude to our Director, **Mr. I B Manikandan** Amrita School of Computing and Engineering, for facilitating us with all the facilities and extended support to gain valuable education and learning experience.

I register my special thanks to **Dr. V. Jayakumar**, Principal, Amrita School of Computing and Engineering for the support given to me in the successful conduct of this project. I wish to express my sincere gratitude to my supervisor **'B. DEVANANDHAN'** ASE, Department of Electronics and Communication Engineering, for his inspiring guidance, personal involvement, and constant encouragement during the entire course of this work.

I am grateful to the Project Coordinator, Review Panel Members, and the entire faculty of the Department of Electronic and Communication & Engineering, for their constructive criticisms and valuable suggestions which have been a rich source to improve the quality of this work.

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TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 PREFACE

Electric vehicles are rapidly becoming popular as a viable mode of transportation in today's culture. Unlike typical vehicles with internal combustion engines, EVs run on electric motors driven by rechargeable batteries. Their environmental benefits include lower greenhouse gas emissions and less dependence on fossil fuels, have received extensive attention An electric vehicle relies heavily on its battery pack, which serves as an energy storage unit. This battery pack stores electrical energy and powers the electric motor that moves the vehicle ahead. Compared to traditional vehicles, EVs have various advantages, including cheaper operating costs, quieter operation, which results in less noise pollution, and increased energy efficiency. Charging an electric car is a simple operation that usually involves connecting it to a power source, such as a house outlet or a public charging station. This allows the battery pack to recharge, ensuring that the car has sufficient power for the next excursion. As charging infrastructure expands, it becomes easier for EV owners to charge their vehicles at home and on the go.

Electric vehicle (EV) customers now have more convenient charging alternatives because to the ongoing global expansion of charging infrastructure. Early concerns regarding EV adoption have been alleviated by developments in battery technology, which have resulted in longer driving ranges and faster charging. There are two types of electric vehicles: all-electric vehicles, which run solely on battery power, and plug-in hybrid electric vehicles, which combine a battery pack and an internal combustion engine. continual advancement in electric vehicle technology has resulted in a broad range of models and designs that appeal to a variety of consumer tastes and needs. This continual innovation ensures that EVs can suit drivers' different needs while also contributing to a more sustainable transportation environment.

The EV charging system comprises essential components such as the charging station and the connection cable. The charging station acts as the bridge between the electrical grid and the EV, delivering the necessary electricity for charging.

The development of battery-powered electric vehicles (EVs) has been in high demand since a century ago as a means of reducing air pollution and replacing fossil fuels. The battery charger is necessary for the advancement of electric vehicles (EVs). Because of the addition for cutting down on charging time, high-quality, high-efficiency, and power-density chargers are essential for preserving and increasing battery lifetime. Electric vehicles can be charged without the use of physical wires or grid connections by combining solar energy with wireless power transfer.

Power transfer in wireless technology is where idea for an EV's wireless charging system originated. The first person to successfully experiment with energy transmission via capacitive and inductive coupling with spark radio frequency resonant transformers. Wireless power transmission techniques are classified into four categories: inductive coupling, wireless power transmission systems, Magnetic, Resonant Inductive, and Capacitive Wireless charging is also necessary for electric vehicles in today's environment when wireless technology is preferred over cable technology everywhere. The car must rely on the charging stations if the wired charging system is the only one in use.

An initial analysis of (EVs) delves into a variety of technological solutions and their feasibility in light of financial, power electronics technology, and energy consumption constraints. The study excludes Dynamic Wireless Charging Systems (DWCS) and Capacitive Power Transfer (CPT). The report also looks at solutions supplied by universities and research organizations working on the subject, as well as an overview of technology companies that have developed wireless charging solutions for EVs. It also addresses regulatory and safety concerns about wireless charging systems, as well as firms interested in implementing wireless charging infrastructure for EVs. This study focuses mostly on practicality and acceptance, ignoring critical issues such as invoicing techniques and Inductive Power Transfer (IPT).

Wireless charging is easy to install and doesn't require a charging station. It also costs less. It is possible to use wireless charging for both autonomous vehicles and electric vehicles in motion. When the car pulls into the charging line, it will begin an automated charging process. The car could charge even while it is operating if it has dynamic charging capacity.

At the moment, depletion of mineral resources and pollution are two major issues. The transportation has undergone electrical installation for various reasons, including energy and environmental concerns. The linked kind of electric charger that is used nowadays can be found at central charging stations, at work, or at home. However, there are frequent disruptions and simple electrical leakage with the attached charger.

In light of environmental and energy concerns, governments and automakers worldwide have recently been pushing the adoption of electric vehicles (EVs), which don't release any hazardous emissions during operation, such as carbon dioxide. Although large-capacity batteries allow long-distance driving on a single charge, they are nonetheless one of the solutions to the longstanding criticism that EVs have a short cruising range. It has, however, also brought to light fresh problems, such increased car costs and protracted charging times.

Modern technologies of wireless power transmission and solar energy harvesting are combined in a wireless electric vehicle (EV) charging system that runs on solar power. Through the use of solar energy, this cutting-edge system provides EV users with an easy and sustainable way to power their vehicles all without the need for physical wires.

Additionally, wireless charging technology, coupled with solar energy harvesting, is emerging as a promising solution for powering EVs sustainably. This innovative system allows EV users to charge their vehicles without the need for physical wires, utilizing solar power for a convenient and eco-friendly charging experience.

Overall, the widespread adoption of electric vehicles represents a significant step towards addressing environmental and energy concerns, with governments and automakers worldwide actively promoting their use. Despite challenges such as initial costs and charging infrastructure development, the continued advancement of EV technology promises a cleaner and more sustainable future for transportation.

1.2 WIRELESS POWER TRANSFER

Throughout the 19th century, numerous ideas and counter-theories on the potential transmission of electrical energy were developed. André-Marie Ampère found that current and magnets are related in 1826. The electromotive force that drives a current in a conductor loop Numerous researchers and inventors have seen the transfer of electrical energy without the need for wires; yet, the lack of a well-developed theory has led some to tentatively attribute these phenomena to electromagnetic induction. The 1860s Maxwell equations, developed by James Clerk Maxwell, provide a succinct explanation of these phenomena. They developed a theory that linked magnetism and electricity to produce electromagnetism and predicted the advent of electromagnetic waves as the "wireless" carrier of electromagnetic energy.

This technology has the ability to completely transform a number of industries, including consumer electronics, healthcare, and more. In the late 19th century, the idea of wireless power transfer was first introduced. Wireless power transmission is a result of Tesla's research with high-frequency alternating currents. He showed how electrical energy might be sent over short distances without the need for wires in 1891, raising the prospect of a wireless power system. This method effectively transfers energy across short distances by using coils set to the same frequency. Resonant inductive coupling for wireless charging was shown to be feasible by MIT researchers in 2007, which sparked a resurgence of interest in the technology.

Radio Frequency (RF)-based Wireless Power Transfer (WPT) systems have witnessed significant advancements in recent years, offering promising solutions for various applications. This paper provides a comprehensive review of recent developments in RF-based WPT systems, focusing on modulation techniques, antenna designs, transmission protocols, efficiency optimization, and challenges such as interference and regulatory compliance. Recent Advancements in RF-based WPT Systems: The paper begins by discussing recent advancements in RF-based WPT systems, highlighting innovations in modulation techniques and transmission protocols. These advancements aim to improve the efficiency and reliability of wireless power transfer over radio frequencies.

Modulation Techniques and Antenna Designs: Various modulation techniques are explored for RF energy harvesting, including Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), and Phase Shift Keying (PSK). These techniques enable efficient transfer of power over RF channels while minimizing interference and maximizing energy capture. Antenna designs play a crucial role in RF-based WPT systems, influencing factors such as efficiency, range, and directional control. The paper reviews different antenna configurations 13 optimized for wireless power transfer applications, including dipole antennas, patch antennas, and phased array antennas. Transmission Protocols and Efficiency Optimization: Transmission protocols govern the communication and synchronization between transmitter and receiver in RF-based WPT systems. The paper discusses various protocols, such as Time Division Multiple Access (TDMA) and Carrier Sense Multiple Access (CSMA), highlighting their strengths and limitations. Efficiency optimization techniques are also examined, including power control algorithms, beamforming strategies, and adaptive modulation schemes. These techniques aim to maximize power transfer efficiency while minimizing energy losses and interference.

Challenges and Regulatory Compliance: Despite the advancements in RF-based WPT systems, challenges such as interference and regulatory compliance remain significant considerations. The paper addresses these challenges, discussing strategies for mitigating interference through frequency coordination, spatial filtering, and signal processing techniques. Regulatory compliance is crucial for ensuring the safe and legal operation of RF-based WPT systems. The paper provides an overview of regulatory requirements and standards, emphasizing the importance of adhering to established guidelines to avoid interference with other wireless devices and comply with electromagnetic emission limits. In conclusion, this paper offers valuable insights into recent developments in RF-based Wireless Power Transfer systems, covering modulation techniques, antenna designs, transmission protocols, efficiency optimization, and regulatory compliance. By reviewing the latest advancements and addressing key challenges, the paper contributes to the ongoing progress and adoption of RF-based WPT technology in various applications.

Optimization of Coil Design: Inductive coupling stands as a fundamental method in Wireless Power Transfer (WPT) systems, particularly for short-range applications. This paper concentrates on optimizing coil design parameters within inductive coupling WPT systems, aiming to enhance power transfer efficiency. The primary focus lies on exploring methods to optimize parameters such as the number of turns, coil geometry, and mutual inductance, which significantly influence the performance of the system. Through analytical models and simulation results, the paper illustrates the impact of coil design on power transfer efficiency.

Modern Applications Wireless power transfer has gained popularity recently in a number of Applications include electric vehicles, medical equipment, and consumer gadgets. A future free of wires is now possible technologies by businesses like WiTricity and Energies, which are based on resonant inductive coupling and radio frequency (RF) energy transmission. Principles of Wireless Power Transmission in Action In order to send to a receiver without the need for physical connections, wireless power transmission a number important concepts and technologies.

1.3 Components:

Transmitter Coil: Also referred to as the primary coil, this device creates an oscillating magnetic field when it is powered on.

Receiver Coil: Also referred to as the secondary coil, it transforms the magnetic field into electrical energy.

Inductive Coupling: A wireless method of exchanging electrical energy, the oscillating through mutual inductance. Electromagnetic waves are released by the transmitter antenna and travel throughout space. Until they reach the receiving antenna, electromagnetic waves travel through the atmosphere.

After the electromagnetic waves are picked up by the reception antenna, they are rectified and transformed into DC power by the RF energy harvesting circuit.

Either the load is powered by the converted DC power, or it is stored in a battery for later use.

A Comprehensive Description of Wireless Power Transmission Efficiency Factors In wireless power transmission systems, efficiency is crucial since any energy lost during transmission lowers the overall performance of the system. A number of variables, such as operating frequency, coil spacing, and coil design, affect how efficient wireless power transfer is.

Coil Design: Transmission of energy of lost less when coils have a lower resistance and a greater quality factor.

The separation between coils:

The effectiveness of energy transfer is influenced by the separation between the coils of the transmitter and receiver. Reduced efficiency results from the magnetic field's strength decreasing with increasing distance. In order to save energy, resonant inductive coupling systems are usually made for short-range applications.

Operating Frequency: The wireless power transmission system's efficiency and range are influenced by its operating frequency. Higher frequencies provide more effective energy transfer, although they may be constrained by electromagnetic interference and legal limitations.

Safety Points to Remember in wireless power transmission systems, safety is crucial to preventing damage to users and electronic devices. It is necessary to take into account a number of safety factors, such as electromagnetic interference, thermal impacts, and foreign object identification.

In order to avoid charging unwanted objects like metal or magnetic materials, wireless charging systems need to have foreign object identification features.

Electric cars (EVs): The process of charging an EV is made easier for owners by wireless charging systems, which make it possible to charge an EV conveniently and effectively without the need for physical connections.

As research and development efforts to improve efficiency, range, and safety continue, the field of wireless power transfer is ever evolving. The potential for further improving wireless power transmission systems and opening up new applications lies in emerging technologies like beamforming, metamaterials, and sophisticated power electronics.

There are two main types of wireless power techniques: near field and far field. Power is transmitted over short distances using near field or non-radiative means. Magnetic field transfer is achieved through inductive coupling between wire coils, whereas electric field transfer occurs through capacitive coupling between metal electrodes.

WPT technology, which can remove any difficulties with charging, is appealing to EV owners. When energy is transmitted wirelessly to the EV, charging becomes the most straightforward process. If the WPT system is stationary, drivers only need to park their vehicles at the charging station. This implies that an EV with a dynamic WPT system can be powered while in motion and can continue running continuously. Furthermore, when comparing EVs using wireless charging to those that employ conductive charging.

The two coils needed for the charging system are the primary coil. For the EV side coil to function properly, it must be small and lightweight. Since the compensating approach improves power transfer capability and facilitates smooth power electronics equipment switching, it is an essential component of building an inductive base WCS. For electric vehicle (EV) applications, great efficiency, small size, and high reliability are essential requirements for a battery charger.

The search for more sensible and dependable ways to employ electrical vehicles has also increased awareness of them. In order to include Electric car (EV) technology without taking into account any drawbacks associated with plug-in systems, wireless electric car charging systems are now available alternative.

Wireless power transfer technology is where the idea for an EV's wireless charging system originated. The first person to successfully experiment with energy transmission through capacitive and inductive coupling using spark radio frequency resonant transformers was inventor Nikola Tesla. The four primary categories of wireless power transmission techniques are Magnetic, Resonant Inductive, and Capacitive Wireless charging is also necessary for electric vehicles in today's environment when wireless technology is preferred over cable technology everywhere. The car must rely on the charging stations if the wired charging system is the only one in use.

Vehicles equipped with wireless charging systems will be able to refuel from any location, even a distance away, provided that a charging station is nearby. Wireless charging is easy to install and doesn't require a charging station. It also costs less.It is possible to use wireless charging for both autonomous vehicles and electric vehicles in motion. As the car moves into the charging line, an automatic mechanism will begin to charge it. The car could charge even while it is operating if it has dynamic charging capacity. This will facilitate the use of electric vehicles more comfortably.

CHAPTER 2

LITERATURE REVIEW

2.1 Wireless Power Transmission of Electric Vehicle Literature Survey:

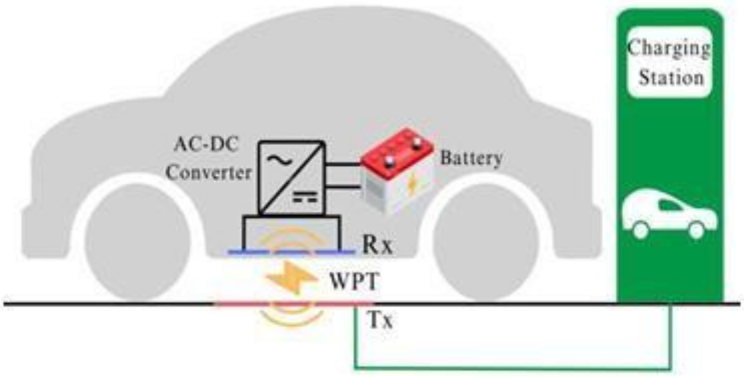


FIG 1: WIRELESS ELECTRIC VEHICLE CHARGING

Electric vehicles (EVs) represent an emerging and promising mode of mobility. Unlike traditional internal combustion engines, electric vehicles (EVs) propel themselves with electric motors and rechargeable batteries. Electric vehicles are powered by a battery pack that stores electricity. The vehicle is propelled forward by the electric motor, which uses kinetic energy. Electric vehicles have various advantages over conventional vehicles, including lower costs, lesser noise pollution, and increased energy efficiency. Charging an electric car usually entails connecting it to a power source, either at home or at a public charging station [1]. The global increase of charging infrastructure has given EV users convenient charging options. Despite initial reservations about EV adoption, advances in battery technology have resulted in better driving ranges and faster charging times. Electric vehicles are classified into two types: allelectric (AEV) and plug-in hybrid (PHEV), both of which combine a battery pack with an internal combustion engine. Electric vehicle technology is constantly evolving, resulting in a wide range of models and designs to meet a variety of consumer needs. Government subsidies, environmental legislation, and growing public awareness of sustainable transportation are all significant factors.

2.2 Solar Powered Wireless Power Transmission System for Electric Vehicles

Literature survey:

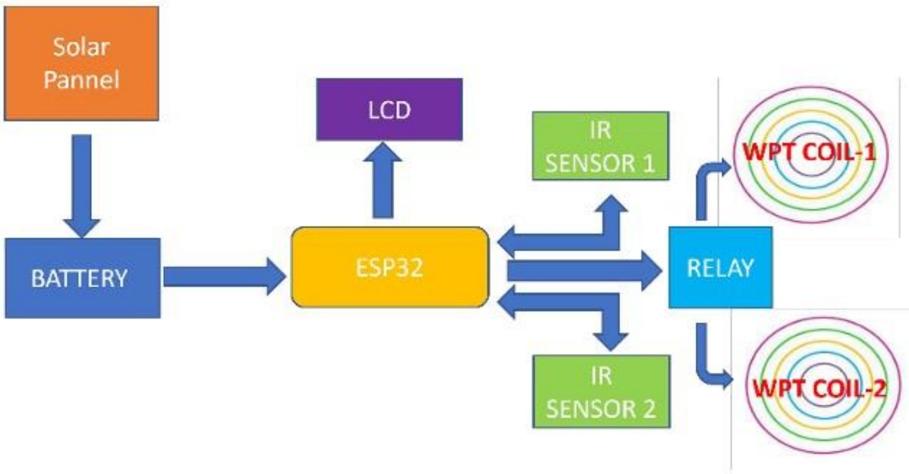


FIG 2: BLOCK DIAGRAM OF THE TRASMITTER SECTION

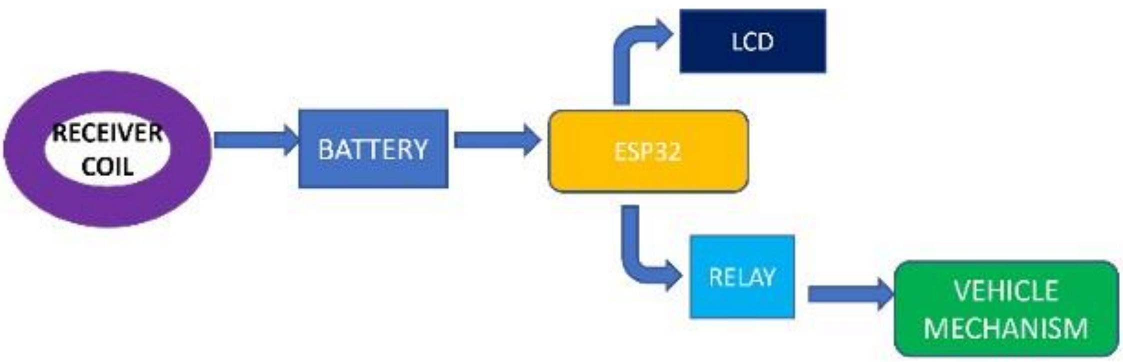


FIG 3: BLOCK DIAGRAM OF THE RECEIVER SECTION

The transportation sector has seen substantial modifications as a result of technical advancement, progressing from steam-powered to fossil fuel-powered cars and now to Electric cars (EVs). As transportation demands have grown, technological breakthroughs have propelled the industry forward [2]. In the early stages of vehicle development, reliance on non-renewable resources was the norm, meeting the needs of the time. However, as car usage increased, so did our reliance on these limited resources, putting them at risk of depletion. Given that these resources must renew over millions of years, this poses a huge threat to both the transportation industry and civilization as a whole [3]. Electric vehicles have developed as an alternate answer to the environmental issues raised by greenhouse gasses due to their zeroemission and non-polluting nature. Despite developments in charging technology, this technology confronts its own set of obstacles, namely the frequent need for battery recharging and the length of time required for this process. Even with the fastest charging methods available today, which take several hours to complete, recharging an electric vehicle battery is still a time-consuming task when contrasted to the speedy refilling process of traditional automobiles. Addressing the issues around electric cars (EVs) is critical, especially as demand for larger batteries and longer charging periods develops. Furthermore, the scarcity of charging stations in comparison to typical petrol stations creates challenges, especially when time is of the essence.

Furthermore, charging stations' reliance on non-renewable resources, such as coal, raises worries about environmental damage. While current energy resources include thermal, hydro, and nuclear power, there is a visible shift toward renewable resources as a means of achieving sustainability. These stations can be very useful in distant places where installing power cables is prohibitive.

These stand-alone power transfer systems, when combined with charging stations, not only serve remote places but also help to construct a network of power transmission systems. This strategy shows potential for improving the accessibility and sustainability of electric vehicle charging infrastructure.

2.3 Wireless Charging of Electric Vehicles Using Solar Road Literature survey:

In today's technology age, it is commonly acknowledged that the advent of electric vehicles (EVs) will have a significant impact on the future of automobiles. This understanding has fuelled the search for suitable alternatives, with electric vehicles emerging as a particularly attractive option. However, one ongoing concern about electric vehicles is the significant time necessary for charging. When combined with the shortage of charging stations and the difficulty of locating ideal spots along roadways, this creates a substantial barrier to mainstream adoption.

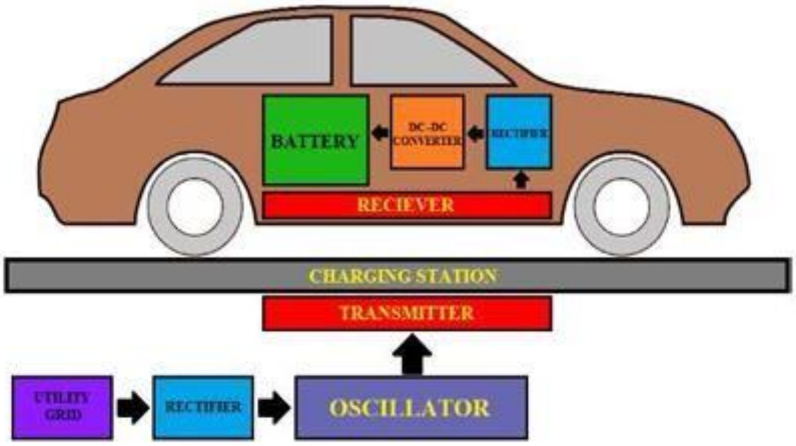


FIG 4: BLOCK DIAGRAM OF EXISTING SYSTEM

A new technique to charge electric vehicles (EVs) while in motion, based on the concept of a solar road. Our idea builds on the existing wireless charging technology for stationary EVs. The core premise is the wireless transmission of power from a transmitter beneath the charging station platform to a receiver on the vehicle platform Rectifier [4]. This DC power is then routed into an oscillator circuit, which generates a signal that is transmitted via the platform's inbuilt transmitter coil. On the vehicle side, the receiver coil receives the sent signal, which is initially a sinusoidal AC pulse. This received signal is rectified back to DC with a rectifier and then adjusted to the desired voltage for battery charging with a DC-DC converter. This breakthrough method enables seamless charging of EVs while in motion, paving the door for more efficient and convenient electric car infrastructure.

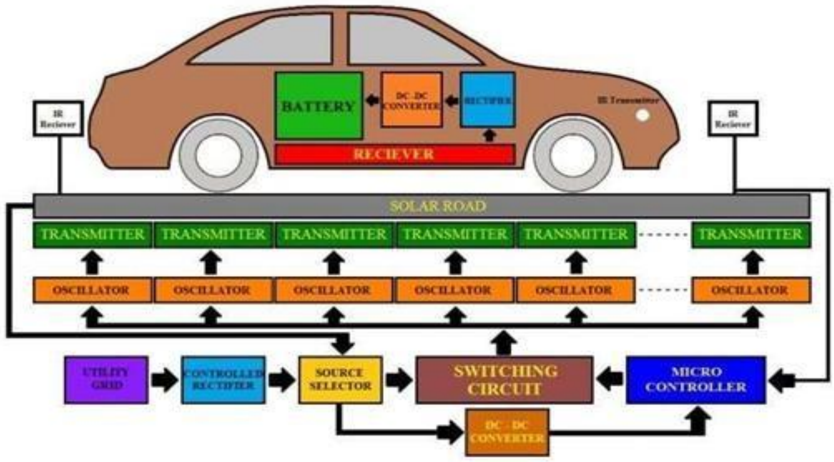


FIG 5: BLOCK DIAGRAM OF PROPOSED SYSTEM

In this design, we leverage power from both the solar road and the utility grid to ensure continuous charging independent of solar energy availability [5]. A source selector determines the power source based on the current and voltage levels of the solar panels. If solar energy is insufficient, the selector will switch to utility grid power. If the utility grid is chosen as the source, power is rectified by a controlled rectifier before being sent into the source selector. As an automobile approaches the solar road, an infrared sensor detects it and sends a signal to the microcontroller. When the vehicle travels over the solar road, the switching circuit activates the oscillator circuit located beneath it.

2.4 Solar Based Parking Cum Charging Station for Electric Vehicles Literature Survey:

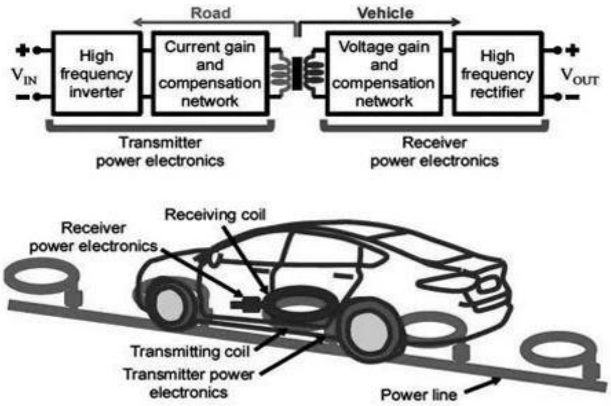


FIG 6: WIRELESS CHARGING FOR AUTOMOTIVE

In today's quickly changing technology landscape, new technologies are always emerging to improve many aspects of our life. Despite these developments, many people continue to charge their electronic gadgets using old wired networks, resulting in congested and difficult charging arrangements, particularly when multiple electric vehicles need to be charged at the same time. This begs the question: What if there was a way to charge electric vehicles without using cables and without causing a mess. This research describes a pioneering innovation represented in Figure [6], which provides instantaneous or continuous energy transmission in situations where wires are unsuitable. This technique works by sending an electrical current through two coils of wire with magnetic fields, allowing power to be transferred between devices. Inductive coupling, the underlying principle behind this breakthrough, provides a cost-effective, userfriendly, and significantly safer alternative to traditional wireless power transfer (WPT) systems. WPT has the ability to transform a variety of daily activities, including charging mobile devices and powering healthcare equipment. This system, which uses inductive coupling, has the potential to revolutionize our daily experiences and processes. Specifically, the technology uses inductive coupling to send electricity from a source to devices such as electric vehicle batteries, removing the need for wires and giving customers with a more convenient charging alternative. Importantly, this strategy decreases the likelihood of battery damage, boosting longevity and safety.

2.5 study of a wireless power transfer system for electric vehicles in motion using a continuous repeater coil on the power transmission side literature survey:

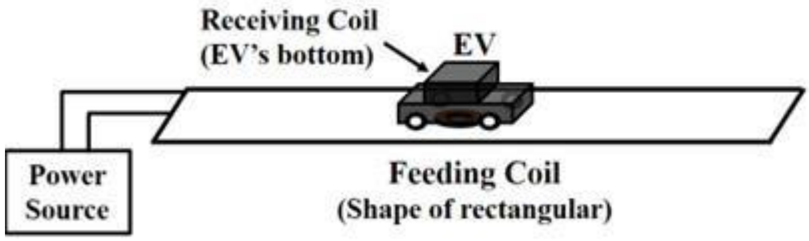
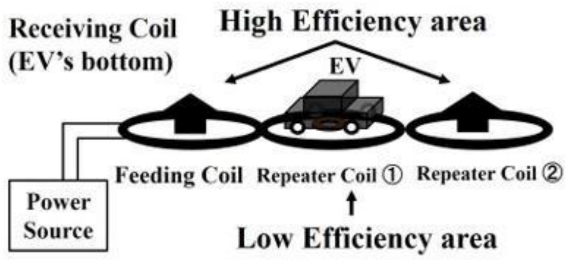
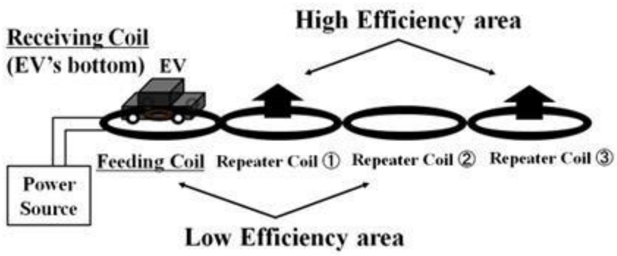


FIG 7: WIRELESS POWER TRASFER SYSTEM FOR ELECTRIC VEHICLE WHILE DRIVING

In this study, we look at wireless power transfer by electromagnetic induction. Figure [7] depicts a contactless power transfer system while the vehicle is in motion. Currently, multiple research institutes are investigating this technology, experimenting with various transmitting and receiving coil shapes. When compared to traditional spiral coils, rectangular coils have advantages, particularly their ability to stretch along the direction of vehicle travel. Furthermore, rectangular coils are better adapted to accommodating vehicle misalignment since they are wider on both sides than the receiving coil. This system's intended use extends across several tens of kilometres along highways. However, manufacturing coils of this length has practical hurdles. To address this issue, numerous power transmission coils can be used, resulting in an increase in the number of power sources. To address this issue, a repeater coil system has been offered as a solution.



(a) Odd number of coils on transmission side



(b) Even number of coils on transmission side

FIG 8: FEATURE OF REPEATER COIL METHOD

This new technique involves improving the power feed section by positioning an LC resonant coil, distinct from the power source, near the power transmission coil in the direction of vehicle movement. However, earlier research has demonstrated that power-feeding efficiency varies at key points depending on whether the number of coils on the power transmission side is odd or even (see Figures 8(a) and 8(b).

2.6 literature review on wireless charging technologies future trend for electric vehicle:

Wireless Power Transfer (WPT) has sparked significant interest in a variety of industries due to its ability to eliminate the requirement for conductive elements in circuits and power electrical loads without the usage of cables. Various types of WPT are available to meet varying user needs, with technology selection influenced by a number of factors. Charging electric vehicles wirelessly eliminates the need for cords, providing users with a hassle-free experience. With this technology, consumers simply park their vehicles, and they begin charging without any physical connections. Wireless Charging has two primary modes of operation: static and dynamic. In static mode, the vehicle remains still while charging, whereas in dynamic mode, the vehicle charges while it is moving.

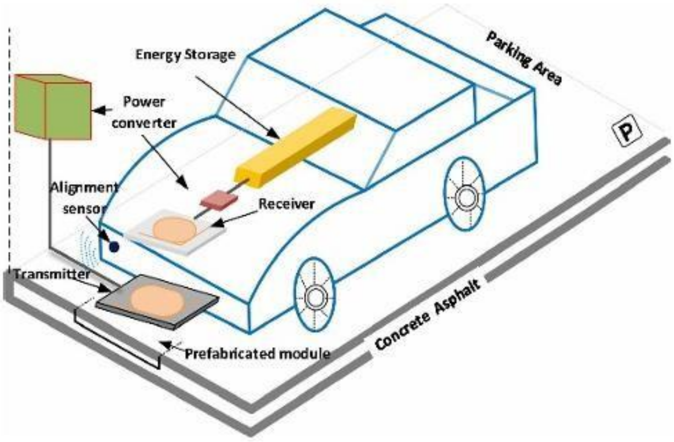


FIG 9: BASIC DIAGRAM OF STATIC WIRELESS ELECTRIC VEHICLE CHARGING SYSTEM

Wireless Charging (WC) for electric vehicles (EVs) introduces a simplified charging process where users only need to park their cars on designated charging stations embedded in the ground. This system comprises a primary coil placed beneath the road or ground, accompanied by additional power converters and circuitry. Positioned underneath the EV's front, rear, or centre, the reception coil, also called the secondary coil, captures the charging signal. Upon reception, the alternating current (AC) energy is converted into direct current (DC) by a power converter before being channelled to the battery bank for storage.

Safety is paramount in this setup, with power control and battery management systems integrated into a wireless communication network. This network receives input from the primary side, ensuring safe and efficient charging operations. The charging duration is influenced by various factors including the power level of the source, dimensions of the charging pad, and the air gap between the two coils. For light electric vehicles, conventional supply power levels are typically employed without plagiarism concerns. typically vary from 3.7 kW to 22 kW, while recharging stations catering can reach up to 200 kW [9]. For light-duty cars, the ideal air-gap spacing between the coils is between 150 and 300 mm.

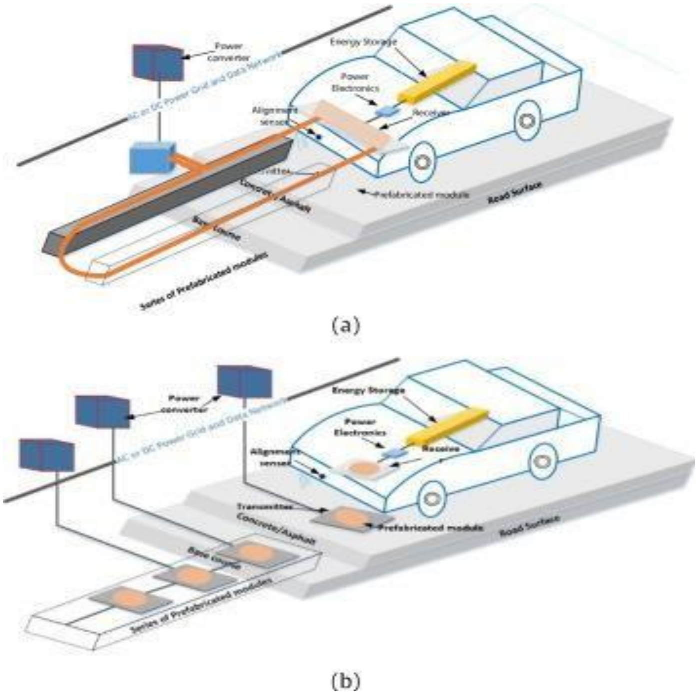


FIG 10: BASIC DIAGRAM OF DYNAMIC WIRELESS ELECTRIC VEHICLE CHARGING SYSTEM

Dynamic Wireless Power Transfer (WPT) is a crucial mode for charging electric vehicles (EVs) while they are in motion. This mode facilitates the concept of road-powered electric vehicles (RPEVs), which can be utilized for private transportation or public transit systems such as buses or trams. Specific lanes are equipped with the necessary electronics to enable this technology.

In dynamic WPT, as an EV moves over the transmitter pads embedded in the road, it captures a magnetic field with a receiver coil. This captured energy is then converted into direct current (DC) through a power converter and Battery Management System (BMS) to charge the vehicle's battery bank.

Compared to traditional EV charging methods, the widespread deployment of dynamic WPT infrastructure has the potential to reduce overall battery demand by approximately 20%. However, implementing dynamic WPT requires careful planning and strategic placement of transmitter pads and power supply segments along predefined paths.

These power supply segments can be categorized into individual and centralized power frequencies. In the centralized approach, multiple small charging pads are used on a large coil, typically around 5-10 meters long, embedded in the road surface. However, this centralized system may suffer from increased losses and reduced efficiency, necessitating further optimization efforts.

2.7 Analysis of Solar PV Fed Dynamic Wireless Charging System for Electric Vehicles Literature Survey:

It is a renewable environmentally friendly energy source that provides a clean alternative to traditional methods of energy creation. With a growing emphasis on environmental protection, solar roofing is set to become a typical element in new residential projects. In the near future, integrating solar photovoltaic (PV) systems with dynamic wireless charging systems (DWCS) has the potential to transform charging infrastructure, particularly for electric vehicles. Despite its obvious benefits, solar energy confronts several problems, including intermittency, unpredictability, and regulatory limits. Addressing these difficulties necessitates novel technologies that assure the optimum use of solar power. One such technology combines PV systems with dynamic wireless charging to provide power and load levelling capabilities. The present literature identifies various undiscovered research areas for solar PV-based Dynamic Wireless Charging Systems (DWCS). This suggests a strong need for additional research on solar PV-powered DWCS. One of the key goals of DWCS is to reduce battery size while increasing battery life cycle. In this context, our research focuses on taking advantage of the intermittent nature of solar PV systems with the help of a DC grid. By incorporating solar PV technology into DWCS, we want to improve charging efficiency and dependability. This study helps to advance our understanding of how solar PV systems can efficiently support DWCS by addressing important difficulties including intermittency and energy management.

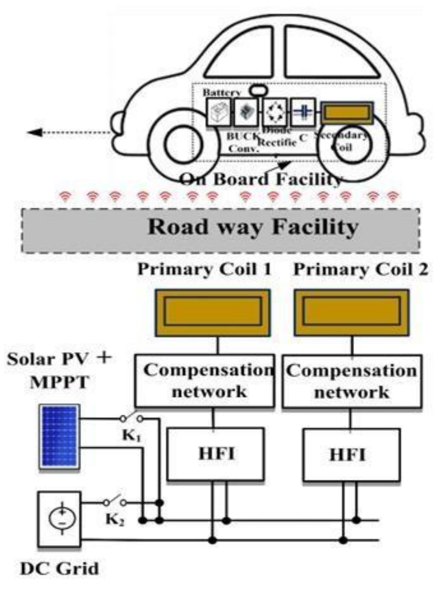


FIG 11: SCHEMATIC OF DYNAMIC WIRELESS CHARGING SYSTEM

The Dynamic Wireless Charging System (DWCS) is engineered to recharge vehicles while they are in motion. The DWCS diagram, depicted in Fig. 11, incorporates several components including a DC source, a high-frequency inverter (HFI), a compensation system, primary and secondary coils, a diode bridge rectifier, a buck converter, and a battery.

DWCS utilizes an inductor-capacitor-capacitor (LCC) compensation network for the primary coil and a series capacitor (C) compensation network for the secondary coil. The DC source supplies power to the HFI, which is then compensated by LCC at the primary coils.

This system can be implemented as either a long track or a segmented track system. For the purposes of this study, a segmented track system is examined due to its flexibility and reduced losses. This design allows for selective energization of specific areas of the primary coil, thereby enhancing efficiency.

In our analysis, we consider two primary coils and one secondary coil. The HFI drives both primary coils using LCC compensation, and they are magnetically linked to the secondary coil. The secondary coil is connected to a diode bridge rectifier, which converts the induced AC voltage from the secondary coil into DC. This DC output is then directed to a buck converter for battery charging.

2.8 Vehicles Charging Using on the Go Wireless Power Transmission for Modern Cities Literature Survey:

FIG12: BLOCK DIAGRAM OF PROPOSED DIAGRAM

Wireless Power Transmission (WPT) technology is a solid solution with applications in a variety of domains. This method efficiently tackles pollution problems by allowing energy to be transferred from a source to an electrical load without the use of physical connections. WPT is especially useful in situations where conventional wiring is difficult or impossible. One notable area that benefits from WPT is the field of electric vehicles (EVs), which provide an environmentally benign alternative to traditional internal combustion engine automobiles. In this environment, the EV system has emerged as a possible path toward sustainable transportation. Within the electric vehicle sector, WPT employs the principle of mutual induction, which includes components such as an alternating current (AC) source, transmission coil, reception coil, transformer, and the battery as the electrical load. By seamlessly integrating WPT with electric car infrastructure, we can reduce our dependency on fossil fuels and contribute to a more sustainable transportation ecology. This technology has the potential to transform the way we power our automobiles, paving the path for a cleaner, more sustainable future. Our major goal is to design and build a prototype model to test wireless power transmission, specifically on-the-go charging. This prototype attempts to effectively charge batteries wirelessly while also incorporating critical sensors and end systems for power monitoring and SMART grid control. Furthermore, it will be seamlessly connected to a solar power source, ensuring sustainability and environmental friendliness. The block diagram of proposed diagram fig [12]. The prototype will incorporate new wireless power transmission technology, allowing for simple battery charging without the need for physical connections. This technology will be enhanced with sensors strategically placed to monitor numerous aspects critical to effective power transmission and control. The growing demand for sustainable energy solutions, as well as the emergence of electric vehicles (EVs), are driven by serious climate change concerns and their consequences. Governments and organizations around the world are being pressed to commit to lowering carbon emissions by adopting renewable energy sources and encouraging the use of electric vehicles. Despite the existence of EV technology, various difficulties prevent its seamless incorporation into real-world circumstances.

Extended Charging Times: One major barrier is the lengthy time necessary to charge EV batteries, which leads to longer wait times at charging stations for vehicles. This difficulty may dissuade potential EV users and slow the general adoption of electric vehicles.

Safety Concerns for High-Power Charging Stations: The implementation of high-power charging stations creates safety concerns, as they potentially endanger both people and automobiles. Electric shock hazards and the possibility of trips and falls are among the risks, underlining the importance of strong safety measures to protect users and the general public.

Infrastructure Management and Long-Term Wiring: Managing the infrastructure required to enable EV charging presents issues, notably in terms of the durability and longevity of wiring systems. Ensuring the long-term reliability and sustainability of EV charging infrastructure necessitates careful planning, maintenance, and investments in resilient technologies.

2.9 A Solar Powered Wireless Power Transfer for Electric Vehicle Charging Literature Survey:

India's transportation sector is a major consumer of crude oil, with over 80% of the consumption attributed to on-road transportation. This heavy reliance on fossil fuels contributes significantly to greenhouse gas emissions, exacerbating environmental challenges. To address this issue, electric vehicles (EVs) are emerging as a promising solution to decarbonize the transportation sector. Integrating renewable energy sources into EV charging infrastructure is crucial for achieving global net-zero emissions goals.

Solar power stands out as an attractive option for charging EVs, thanks to recent advancements in photovoltaic (PV) technology that have lowered the cost per watt, making solar energy more accessible and cost-effective. While plug-in conductive charging methods are commonly used, wireless charging for EVs is gaining traction as a viable alternative. Wireless charging offers several advantages, including durability, safety, intelligence, and convenience, providing users with a seamless charging experience and facilitating the transition to electric transportation.

By leveraging solar power and wireless charging technology, India has the potential to significantly reduce its dependence on fossil fuels, curb greenhouse gas emissions, and transition towards a more sustainable transportation ecosystem. These advancements align with India's commitments to combat climate change and promote the use of renewable energy sources. Overall, these innovations pave the way for a cleaner, greener future in India's transportation sector.

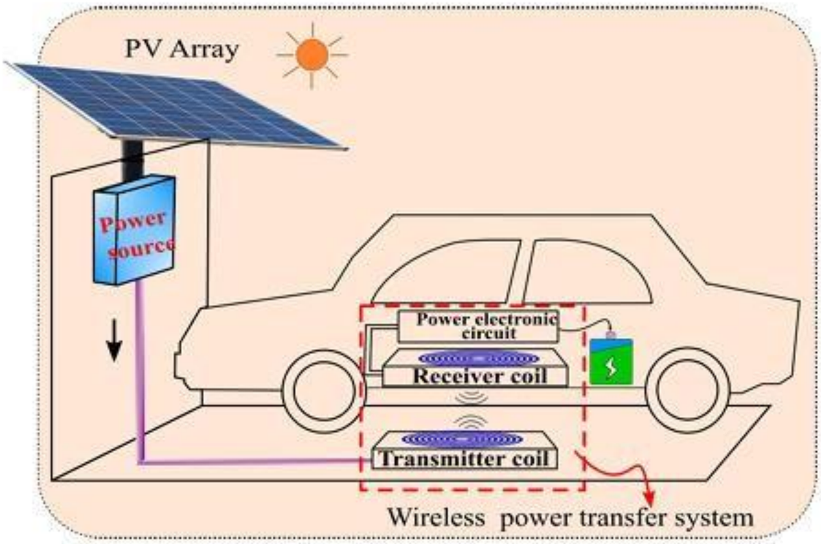


FIG 13: SOLAR POWERED ELECTRIC VEHICLE CHARGING SYSTEM USING WPT

Wireless Power Transfer (WPT) works on the basis of magnetic flux coupling between a transmitter coil, often located underground, and a receiver coil fig [13] built into the vehicle chassis. However, the large air gap between the ground and the chassis causes loose coupling between the coils, resulting in lower power transfer efficiency. To solve this issue, compensatory procedures are performed on both sides of the WPT system, utilizing various resonant networks. The series-series (S-S) compensation method is notable for its simplicity and efficacy in improving efficiency. Despite these improvements, WPT systems are prone to misalignment and load changes, which further reduces efficiency. While many studies have addressed these issues in grid-connected systems, maximizing power output is critical in solarpowered WPT configurations. Solar-powered WPT systems require sophisticated optimization approaches to obtain the highest power output from the solar source. These techniques account for environmental fluctuations and enable efficient energy transfer to the vehicle's batteries. To achieve this optimization, sophisticated control algorithms and adaptive mechanisms must be used to maintain optimal performance throughout a wide range of operating situations.

2.10 Self-Contained Solar-Powered Inductive Power Transfer System for Wireless Electric Vehicle Charging Literature Survey:

In today's globe, sustainable development faces two major challenges: energy scarcity and environmental damage. Petroleum, known for its high energy density, is the predominant fuel for personal transportation. The global spread of gasoline automobiles is expected to increase, fuelled by rising purchasing power in developing countries, complicating efforts to reduce dependency on petroleum fig[14]. However, gasoline automobiles emit toxic exhaust emissions and greenhouse gasses, worsening environmental issues in metropolitan areas. Fortunately, the introduction of electric vehicle (EV) technology presents a possible solution to both energy scarcity and environmental damage. Electric vehicles (EVs) provide a cleaner and more sustainable alternative to personal transportation. EVs are especially advantageous in urban regions where pollution levels are high. They help to reduce hazardous emissions. EVs play an important role in reducing the environmental effect of traditional gasoline vehicles by using electricity as an energy source. In summary, advancements in EV technology pave the way for a more promising future in addressing the concerns of energy scarcity and environmental pollution. We create a course for sustainability by transitioning to electric-powered mobility, reducing our reliance on petroleum-derived fuels and nurturing a cleaner, greener future

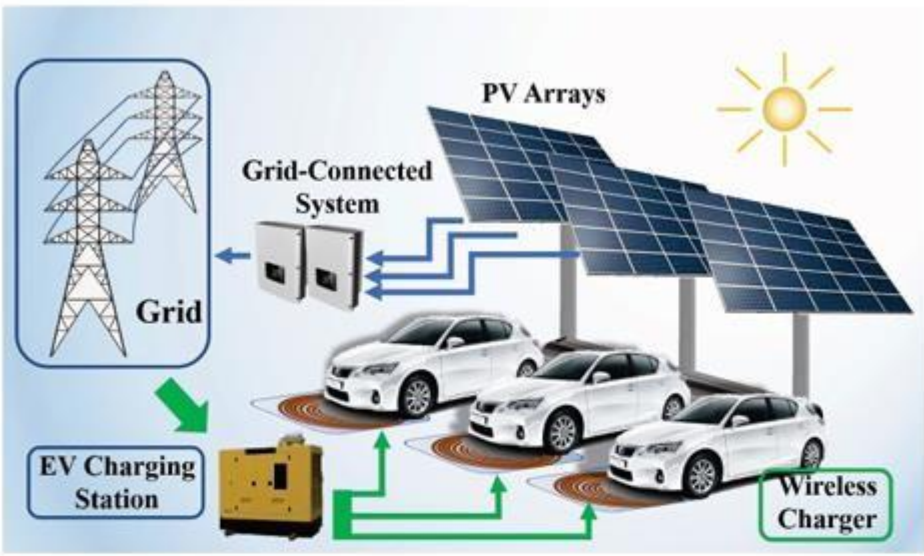


FIG 14-A: CENTRALIZED SOLAR POWER EV CHARGING SYSTEM

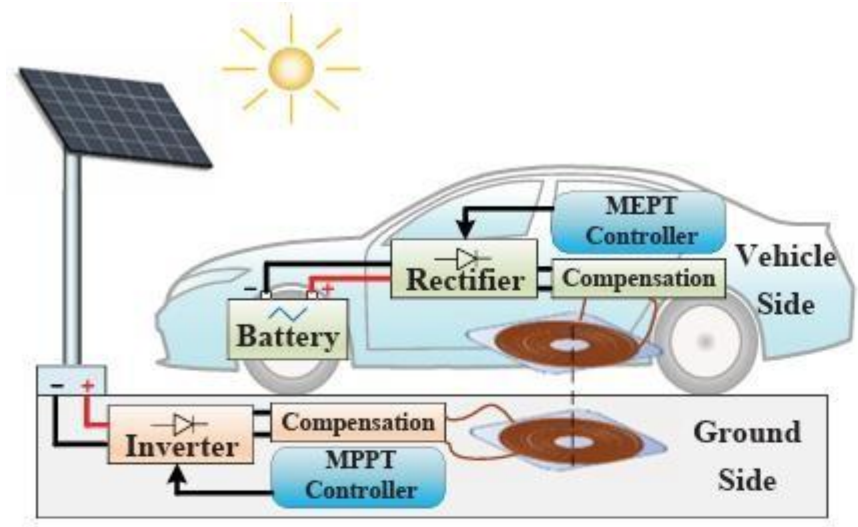


FIG 14-B: PURPOSED SELF CONTAINED SOLAR POWERED EV CHARGING SYSTEM

There are two primary types of solar-powered EV charging systems: centralized and selfcontained. In a centralized design, depicted in Fig. 14(a), photovoltaic (PV) panels capture solar energy and convert it into electricity to charge EVs. However, to maintain a balance between supply and demand, access to the power grid is often necessary. This requirement results in higher construction costs and limitations on suitable building sites.

Alternatively, we propose a self-contained solar-powered EV charging station, illustrated in Fig. 14(b), where PV panels solely provide power to a single EV. This approach eliminates the need for additional converters that interface with the power grid or the EV's battery to manage power or store energy. This streamlined system design reduces construction costs and allows for modular deployment.

Moreover, the self-contained solar-powered EV charging station offers flexibility in site selection since it can be installed in locations without access to the power grid. This flexibility enhances accessibility and scalability, making it an attractive option for global deployment.

2.11 HISTORY AND INNOVATION OF WIRELESS POWER TRANSFER VIA MICROWAVES:

Wireless Power Transmission (WPT) using microwaves has a rich history, marked by significant inventions and advancements that have shaped its evolution over time. This article provides an analysis of the historical development, key inventions, and current state of radio laws governing WPT via microwaves, with a focus on wide-beam and narrow-beam transmission techniques. Additionally, it explores the utilization of various technologies such as transformers, heaters, near-field communication, and contactless charging prior to the widespread adoption of resonance coupling in WPT systems. Radio laws and regulations: The current state of radio laws governing WPT via microwaves is critical to ensuring the safe and efficient operation of these systems. Regulatory bodies such as the Federal Communications Commission (FCC) in the United States and similar agencies worldwide establish guidelines and standards to govern the use of radio frequencies for WPT applications. Technological applications: Prior to the widespread adoption of resonance coupling in WPT systems, various technologies were employed for wireless power transmission, including transformers, heaters, near-field communication, and contactless charging. These technologies served as precursors to the development of more efficient and sophisticated WPT systems.

Optimization techniques: Optimization techniques are proposed to improve the efficiency and distance of power transfer in magnetic resonance WPT systems. This includes optimizing coil geometry, tuning resonant frequencies, and enhancing coupling coefficients through innovative design approaches. By systematically optimizing key parameters, the paper aims to achieve higher efficiency and extend the range of power transfer, making magnetic resonance WPT systems more practical and viable for real-world applications. Future Directions: The paper concludes by outlining future directions for research and development in magnetic resonance WPT systems.

By continuing to innovate and refine magnetic resonance WPT technology, researchers aim to unlock new possibilities for wireless power delivery in diverse applications ranging from consumer electronics to automotive and healthcare. In summary, this paper provides a detailed analysis of magnetic resonance Wireless Power Transfer systems, offering insights into optimization techniques to improve efficiency and distance of power transfer. By advancing our understanding of magnetic resonance WPT and proposing innovative solutions, the paper contributes to the ongoing evolution of wireless power technology

CHAPTER 3

PROBLEM STATEMENT

The need of a dependable solar-powered wireless electric vehicle (EV) charging system that addresses the issues of technological integration, cost-effectiveness, and environmental sustainability while providing EV users with a convenient and safe charging experience is essential. Creating such a system is a difficult task, with the goal of providing a low-cost, high efficiency solution that allows EV owners to charge their vehicles wirelessly using solar energy. This novel design combines wireless power transfer technologies with solar panels to provide a long-lasting and user-friendly charging solution. It is critical to overcome obstacles such as maximizing energy conversion, regulating power distribution, assuring compatibility with various EV models, and resolving environmental and infrastructure concerns. Finally, by using innovative and scalable dynamic wireless EV charging driven by solar energy. An indispensable necessity is a reliable solar-powered wireless electric vehicle (EV) charging system that addresses the issues of technology integration, cost-effectiveness, and environmental sustainability, while ensuring that EV users can easily and safely charge their vehicles. Creating such a system is a difficult task, aiming to provide a solution that is both economical and effective, with the goal of allowing electric car owners to wirelessly charge their vehicles using solar power. This revolutionary design combines solar panels with wireless power transfer technologies to offer a durable and user-friendly charging solution. To overcome obstacles including optimising energy conversion, managing power distribution, assuring compatibility with different electric car models, and addressing environmental and infrastructural concerns, it is crucial to tackle these difficulties concurrently. Finally, via the use of state-of-the-art and adaptable wireless electric car charging technology that is fuelled by solar electricity.

CHAPTER 4

OBJECTIVE

The objective of the project is to design a prototype of a wireless charging model for electric vehicles where it works both in static and dynamic mode. Phase-1 was done with static mode where the copper coil is placed on the bottom and a car prototype having a coil on the bottom surface were placed in contact and the charging voltage was noted. For phase-2 we have done the same thing with dynamic mode where a set of 4 coils were places and a car with coil on the bottom was made to pass through the coils and the charging voltage was noted. In order to accomplish the goals of the project, a prototype of a wireless charging model for electric vehicles that is capable of operating in both static and dynamic modes will be developed. During the initial phase, the static mode was utilised, and the copper coil was positioned on the bottom of the apparatus. Additionally, a car prototype that had a coil on the bottom surface was brought into contact with the coil, and the charging voltage was recorded. This helped to determine the charging voltage. We have done the same thing with dynamic mode for phase 2, which is that we have installed a set of four coils, and then we have created a car with a coil on the bottom pass past the coils, and we have recorded the charging voltage. This is what we have done.

CHAPTER 5

METHODOLOGY

In this project we are going to use different copper coils like circular coil and oval shape coils to determine the wireless power transfer process. Here circular coil is the primary coil where the oval shape coil is the secondary coil. We have four types of coils o Circular coil with static wireless power transfer o Circular coil with dynamic wireless power transfer o Oval shape coil with static wireless power transfer o Oval shape coil with dynamic wireless power transfer

5.1 CIRCULAR COIL:

Coil springs, also known as helical coils, are an important component in a variety of industries due to their unique cylindrical shape and helical winding structure. These coils are made by wrapping a continuous copper wire around a cylindrical mandrel or form, giving them amazing flexibility, durability, and ease of installation.

Here's a detailed overview:

Circular coils are made by helically winding copper wire around a cylindrical core, which results in many turns that create the coil. The coil's diameter and pitch can be adjusted to meet individual application needs, providing flexibility in design and functionality. Circular coils have a wide range of applications, including solenoid valves, relays, actuators, and electric motors. Furthermore, they play an important role in antennas for wireless communication, RFID systems, and induction heating applications. Circular coils are typically made of copper wire because to its great electrical conductivity and corrosion resistance, but they may also use aluminium or alloy wires depending on the application. Circular coils are essential components in many technological systems, performing crucial activities such as electrical conductivity, magnetic field creation, and mechanical support. Their versatility, dependability, and broad utility highlight their importance in modern engineering and electronics.

5.2 OVAL SHAPE COIL:

Oval-shaped coils, often called elliptical coils, are a type of electromagnetic coil distinguished by its extended oval or elliptical shape. When compared to standard circular or rectangular coils, these coils provide various advantages and uses. Below is an overview of oval-shaped coils. Construction: Like circular coils, oval coils are made by winding copper wire around a core or shape. Instead of winding the wire in a circular pattern, it is coiled in an elongated oval shape, yielding a coil with an oval cross-section.

Shape: The oval shape of these coils provides various advantages over circular coils. It provides a higher surface area for electromagnetic induction while occupying a smaller footprint, making it excellent for applications with limited space or irregular shapes.

Applications: Oval-shaped coils are used in a variety of sectors that have space limits or special geometrical requirements. They are widely utilized in electronic gadgets, wireless power transmission systems, medical equipment, and scientific instruments.

5.3 CIRCULAR COIL WITH STATIC WIRELESS POWER TRANSFER:

A circular coil for static wireless power transfer is designed to efficiently transmit electrical power without requiring direct physical touch. This technology is based on electromagnetic induction. This system normally consists of two coils: a transmitter coil and a receiver coil. When an alternating current flows through the transmitter coil, which is connected to a power source such as a battery or an outlet, it produces an alternating magnetic field. This magnetic field creates an electric current in the receiving coil, which is located nearby. The receiver coil then turns the induced current into electrical power, which can be used to charge a device or power electronic components. By carefully constructing the coils and optimizing their placement and orientation, effective power transfer over short distances can be achieved without the use of wires or cables. One advantage of this technology is that it can transmit power through a variety of materials, including plastic and wood, allowing for discreet or covert charging options. However, because power transfer efficiency declines with distance, these systems are best suited for short-range applications. To summarize, circular coil static wireless power transfer offers a handy, cable-free alternative for charging gadgets and powering equipment in a variety of situations, including homes, offices, and public spaces.

5.4 CIRCULAR COIL WITH DYNAMIC WIRELESS POWER TRANSFER:

Circular coil with dynamic wireless power transfer involves the effective transmission of electrical power without the need for physical connections. The coil is commonly formed of conductive material and arranged in a circular shape. Unlike static wireless power transfer, which operates within a set range, dynamic wireless power transfer allows electricity to be transmitted while the receiving device is moving. This method works on the theory of electromagnetic induction and uses two coils: a transmitter coil and a reception coil. When an alternating current is sent into the transmitter coil, it produces an alternating magnetic field. This magnetic field creates an electric current in the nearby receiver coil. What distinguishes dynamic wireless power transfer is its capacity to adjust power transmission parameters like frequency and amplitude. This adjustment accounts for variations in the distance and orientation of the transmitter and receiver coils when the receiving device moves. As a result, it provides continuous and efficient power transfer even while in motion. Dynamic wireless power transmission can be used to charge mobile devices while they are in use or to power electric cars on the go. By eliminating the need for physical connections, this technology provides ease and versatility, allowing for seamless power transfer in dynamic conditions. In conclusion, circular coils with dynamic wireless power transfer offer a diverse solution for powering electronic devices and vehicles, providing freedom of mobility and ease in a variety of scenarios.

5.5 OVAL SHAPE COIL WITH STATIC WIRELESS POWER TRANFER:

The notion of using an oval-shaped coil for static wireless power transfer entails using a coil, usually composed of conductive material, designed in an oval form to efficiently transmit electrical power without the need for physical connections. This technology, like circular coils, operates on the electromagnetic induction principle. The oval-shaped coil system, like circular coil systems, consists of two main components a transmitter coil and a receiver coil. When an alternating current is applied to the transmitter coil, which is coupled to a power source such as a battery or outlet, an alternating magnetic field is created. This magnetic field creates an electric current in the nearby receiver coil. The receiver coil then turns the induced current into electrical power, which can be utilized to recharge gadgets or power electronic components. Effective power transfer over short distances can be done without the use of physical connections by carefully designing and optimizing coil location and orientation.

One advantage of using an oval-shaped coil for static wireless power transfer is its ability to fit into different locations or satisfy certain design specifications. Furthermore, depending on the design and configuration of the oval coil, it may provide advantages such as increased efficiency or greater power transfer characteristics over standard circular coils. In summary, static wireless power transfer with an oval-shaped coil is a practical and cable-free alternative for charging gadgets and powering equipment in a variety of settings. It provides flexibility in design and installation while relying on the benefits of electromagnetic induction for efficient power transfer.

5.6 OVAL SHAPE COIL WITH DYNAMIC WIRELESS POWER TRANSFER:

Oval-shaped coil with dynamic wireless power transfer uses a coil, often made of conductive material and shaped like an oval, to permit the effective transmission of electrical power without the need for direct physical connections. In contrast to static wireless power transfer, which operates within a defined range, dynamic wireless power transfer allows for continuous power transmission even when the receiving device is in motion. This method works on the theory of electromagnetic induction and uses two coils: a transmitter coil and a reception coil. When an alternating current passes through the transmitter coil, which is connected to a power source such as a battery or an outlet, it produces an alternating magnetic field. This magnetic field causes an electric current in the reception coil, which is located near the transmitter coil.

The dynamic wireless power transfer is its capacity to adjust power transmission parameters, such as frequency and amplitude, to account for variations in distance and orientation between the transmitter and receiver coils as the receiving device moves. This dynamic adjustment guarantees that power is transferred smoothly and efficiently, even while in motion. Dynamic wireless power transfer with oval-shaped coils offers a variety of applications, such as charging mobile devices while they are in use or powering electric vehicles while they are moving. By eliminating the need for physical connections, this technology provides ease and versatility, allowing for seamless power transfer in dynamic conditions. To summarize, an oval-shaped coil with dynamic wireless power transfer is a versatile option for powering electronic devices and vehicles, providing freedom of movement and ease in a variety of settings.

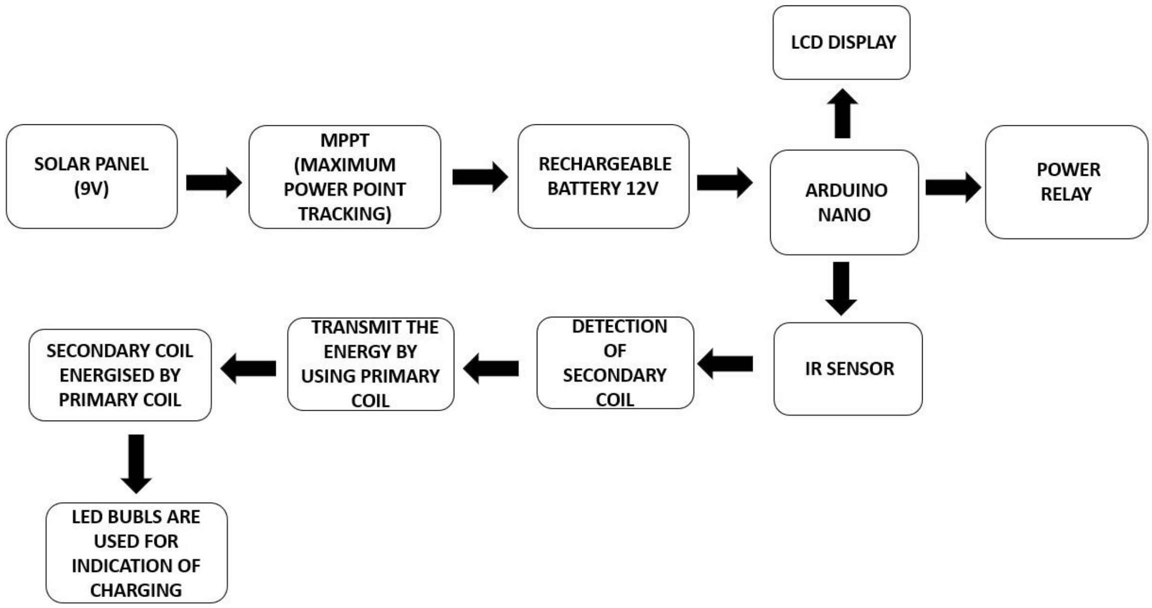


FIG 15. BLOCK DIAGRAM OF WPT IN CAR PARKING

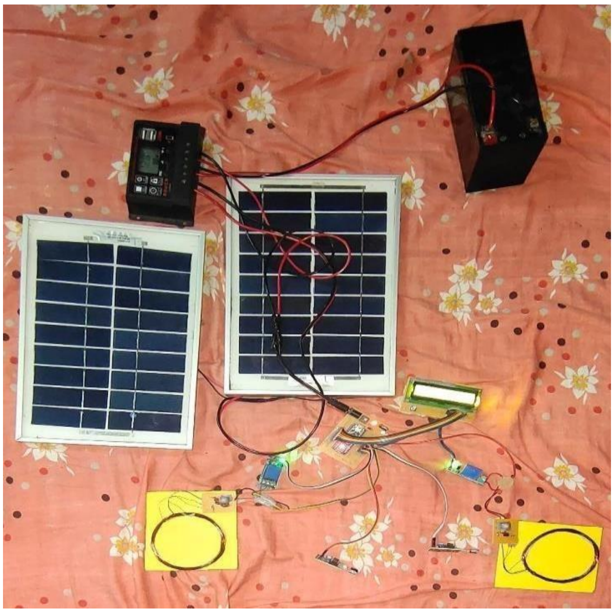


FIG 16: HARDWARE WITHOUT POWER TRANSFER

FIG 17: HARDWARE WITH POWER TRANSFER

A 9v solar panel is connected to a 12v battery to recharge it repeatedly when in need to use it to supply the power to the Arduino UNO. The power which is collected in the battery is indicated in the MPPT (maximum power point tracking) device which shows voltage of the battery which is collected through the solar panel. Arduino is connected to two different charging stations where each station has a coil with 45 turns which is connected to 2N2222A transistor which is used to control the direction of current flow. Each station has an IR sensor which indicates the presence of any vehicle. Power relays are connected to Arduino to check is sufficient amount of power is provided to the coil. All these are displayed using lcd display where the slots are indicated if presence is detected and the amount of power which is supplied to the car when it is charging. Once the car at the station lcd show if the slot is full or empty.

The charging is measured using led’s where we have given 4 led’s to indicate the percentage of charging.

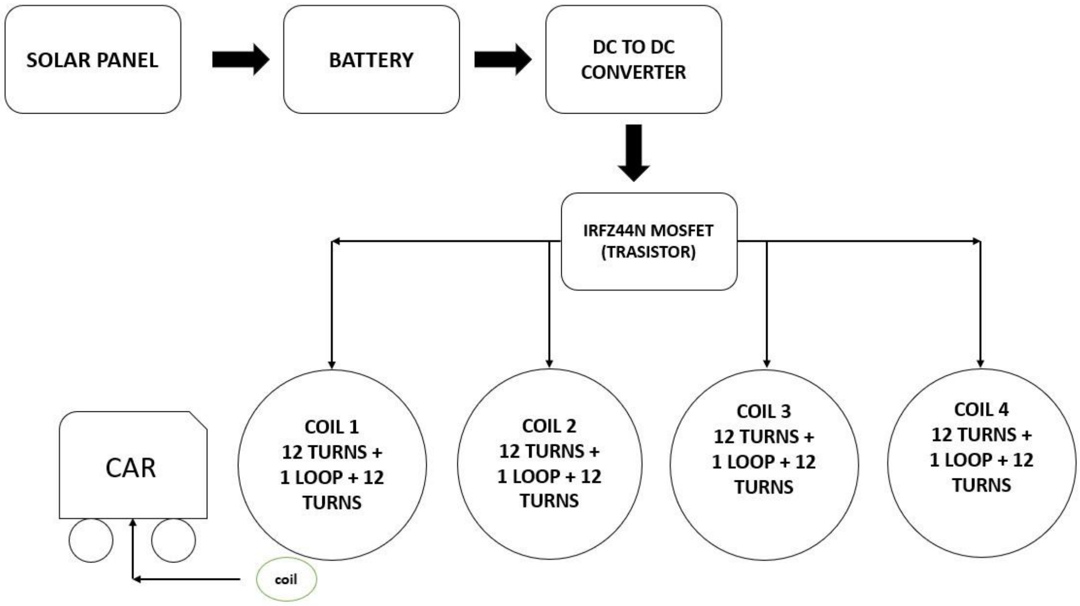


FIG 18: BLOCK DIGRAM OF WPT USING COILS

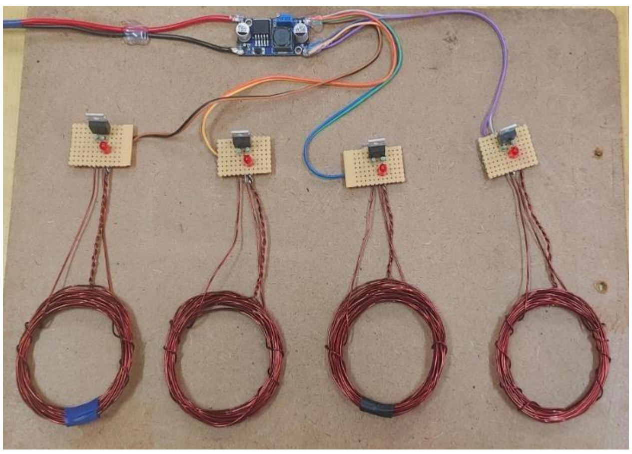


FIG19: HARDWARE WITHOUT POWER TRANSFER

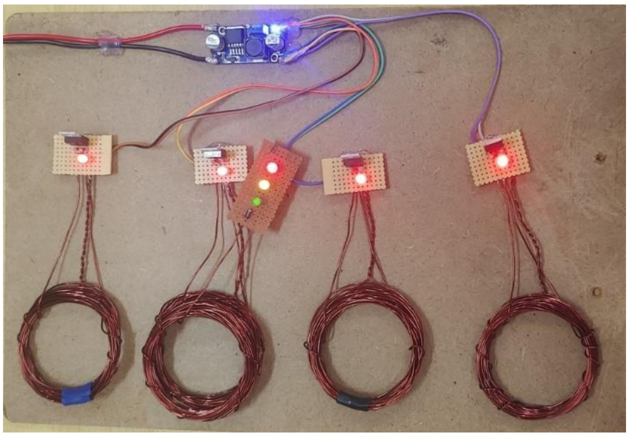


FIG 20: HARDWARE WITH POWER TRANSFER

Similarly in phase 2 we have created a dynamic wireless charging model where a car is made to pass a set of 4 coils which are placed on the ground at equal distances. Each coil is connected with a led and a MOSFET IRFZ44N which is used to switch voltage from AC to DC. Each coil is of 24 turns I.e., 12turns+ one loop + 12 turns. And a receiver coil is of 30 turns with a gage of 20. All the transmitters are connected to an DC- DC converter which is used to convert one voltage level to our required voltage level of 5v. The receiver is connected with three led’s which indicated the battery percentage of the car.

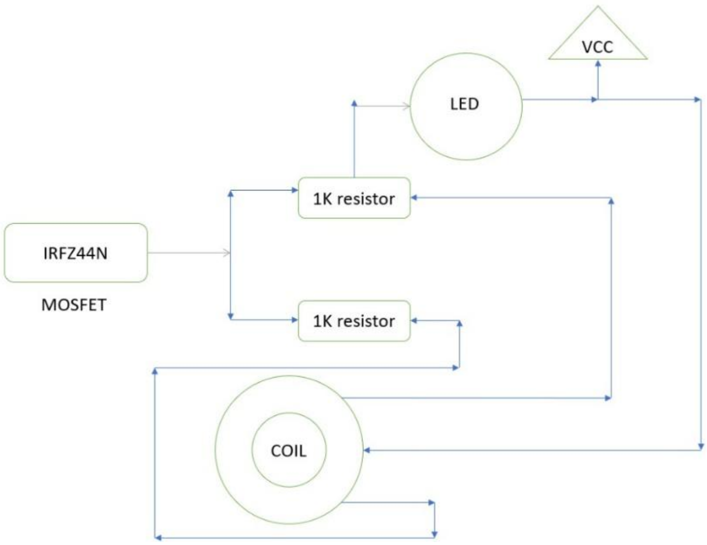


FIG 21: CIRCUIT DIAGRAM OF THE COILS

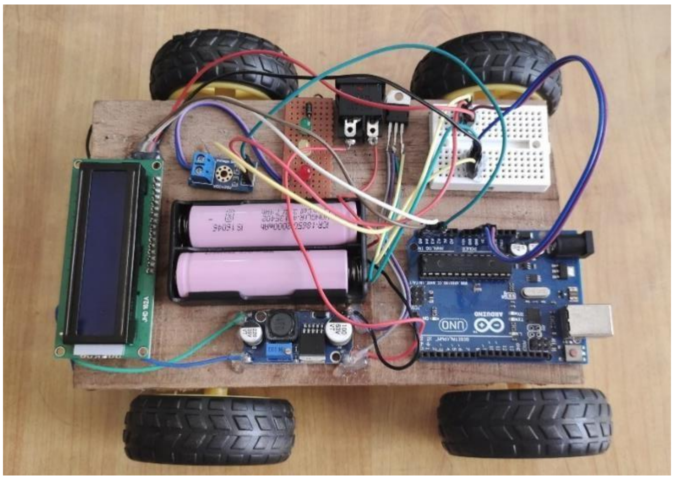


FIG 22: HARDWARE WITHOUT POWER TRANSFER IN A CAR

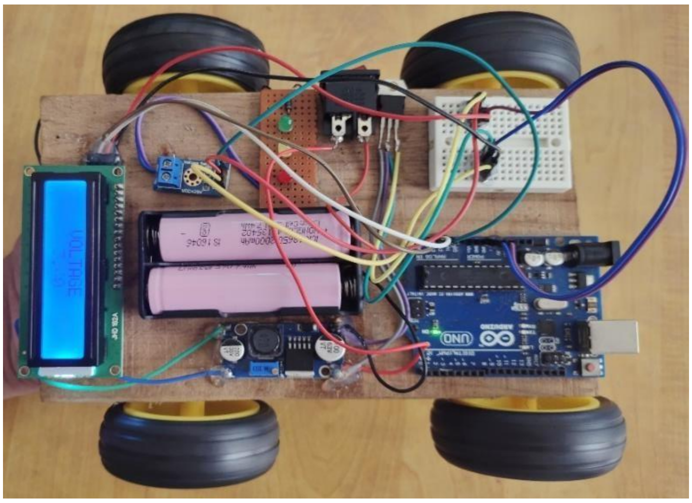


FIG 23: HARDWARE WITH POWER TRANSFER IN A CAR

A car model is created where an Arduino uno is considered to dump the code to run the car at our needed speed. LM7805 MOSFET is used to control the voltage from the Arduino which is connected to the analog pins A1, A2 and A3. A switch is given to switch on and off the motors of the car. A voltage sensor sensor is used to read the voltage transmitted and received and that is displayed in the lcd display. Power is provided through two batteries of each 3.7v. DC to DC converter is used to take necessary 5v of voltage from the transmitter of the dynamic station

CHAPTER 6

RESULT

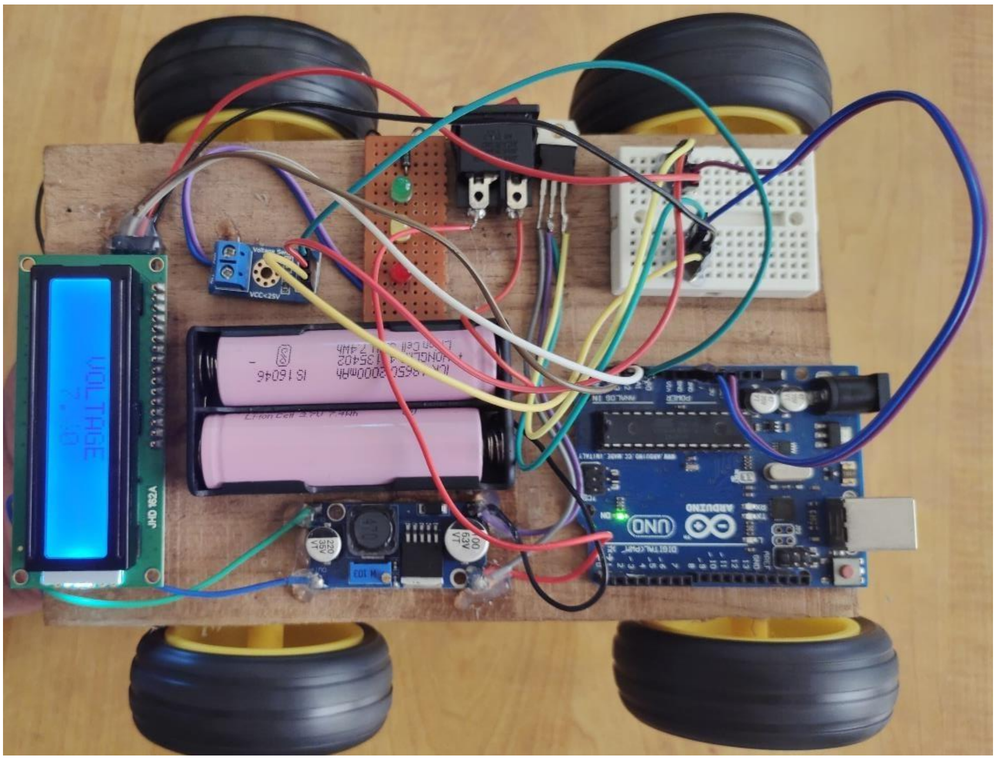


FIG 24: OUTPUT RESULT

In order to ensure accurate measurement of the charging voltage, a vehicle that was fitted with a coil on its underside was built to be able to pass through other coils. The accomplishment of this goal was accomplished by strategically positioning a collection of four coils in the appropriate areas. In this work, two primary objectives were pursued: first, to evaluate the realtime efficiency of wireless power transfer (WPT) inside a dynamic model; and second, to suggest innovative receiver designs for electric vehicles (EVs). Both of these objectives were accomplished via the conducting of this study. The key goals of this project were to evaluate the effectiveness of wireless power transfer (WPT) and to come up with innovative receiver designs that were specifically designed for electric vehicles (EVs). The findings of the study were subjected to exhaustive testing and verification, which was accomplished by utilising simulation techniques and physical prototypes from the very beginning of the research development process. When the two coils are placed 2.2 metres away from one another, there is perfect isolation between them. The voltage of our system ranges from a minimum of 6.9 volts to a maximum of 7.5 volts, with the lowest value being higher than the highest number. At the moment, the voltage that we have is at its lowest possible level. In order to control the voltage that is produced by the Arduino, which is coupled to the analogue pins A1, A2, and A3, the LM7805 MOSFET is employed. All of this is done in order to get the desired result. For the purpose of separately activating and deactivating the motors of the vehicle, there is a switch that is given. For the purpose of measuring and displaying the voltage readings that have been delivered and received on the LCD display, a voltage sensor is utilised. Consequently, this makes it possible to monitor voltage. There are two batteries that are used to supply power, and each battery has a voltage of 3.7 volts. A total of two batteries are used. It is possible to get the necessary 5 volts of power from the transmitter of the dynamic station by making use of a converter that converts direct current to direct current.

CHAPTER 7

CONCLUSION

In conclusion, this study thoroughly investigated the design and implementation of a wireless EV charging system powered by solar energy. We demonstrated our proposed hardware and confirm that the system effectively charges electric vehicles wirelessly while utilizing renewable energy sources, so reducing carbon emissions and decreasing reliance on nonrenewable fuels. Furthermore, our study has contributed significantly to the development of sustainable transportation infrastructure. First, we devised a groundbreaking wireless charging framework that elegantly merges solar panels with inductive power transfer technology, addressing various disadvantages of traditional cable charging methods. Second, our optimization algorithms and control approaches have improved the overall performance and dependability of the charging process, resulting in excellent energy transmission and compatibility with a wide range of EV models. Furthermore, our findings highlight the need of tackling practical implementation issues such as scalability, interoperability, and costeffectiveness. By addressing these difficulties straight on, we hope our research will provide useful insights for the future development of wireless EV charging infrastructures on a larger scale.

To summarize, the wireless EV charging system described in this study is a significant step in developing sustainable transportation ecosystems. Through the combined use of solar energy and wireless technology, we can pave the way for a cleaner, more ecologically friendly future in which electric vehicles play a vital role. We sincerely hope that our findings will spark further investigation and innovation in this dynamic and continuously changing industry.

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