IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

ADVANCED CHARGING SYSTEM FOR AUTOMOBILES

[1]Dr.V.Raveendra Reddy, [2] K.Saranya Reddy

[1] Associate.Professor, [2] Assistant Professor

[1] Electrical & Electronics Engineering,

[1]RSR Engineering college, Kadanuthala, Kavali,SPSR Nellore Dist,A.P,India

Abstract: Transportation systems play an important role in this modern era. At the same time, it accounts for about 27% of CO2 emissions. Carbon emissions are very important because they increase global warming to alarming levels. Global warming causes drastic changes in climate and threatens human life. Burning fossil fuels is a major source of carbon emissions. The world is currently transitioning to electric mobility to reduce emissions from non-renewable fossil fuel vehicles. Thus the electric car was born. Electric vehicles are the best alternative to traditional transportation systems. Electric vehicles are nearly emission-free and are growing in popularity around the world. For electric vehicles, charging batteries via chargers and cables is expensive, dangerous and impractical. Also, the downside of cable charging technology is that you have to wait hours at a charging station. Wireless charging now makes it possible to charge a vehicle simply by parking it in a parking lot, or to charge an electric vehicle while driving. You can further reduce your electric bill by charging in-house with renewable energy such as solar panels. Therefore, the annual cost of operating an electric vehicle is lower. Despite the many benefits, electric vehicle users face major challenges when charging due to lack of infrastructure. Wireless energy transfer can be implemented as static and dynamic charging systems. To overcome these difficulties, this article presents how electric vehicles are charged at charging stations and how charging methods are being developed.

Index Terms **- Electric vehicle (EV), wireless charging, Wireless power transfer (WPT), Inductive power transfer (IPT), Dynamic wireless charging , wireless energy transmission (WET)**

I. INTRODUCTION

Wireless transmission of power to power and charge electrical devices and devices has been explored since the days of Tesla. However, this was not possible as the relevant technology was not available at the time. Traditional wired or plug-in charging systems are also called conductive charging systems. These wired charging systems have some issues. For example, you need heavy charging cables and connectors. Additionally, the charger must be manually connected to a power source and the device to be charged [6]. Wired charging systems are neither user-friendly nor environmentally friendly [7]. Due to high temperature, friction with the ground or the charger itself, a short circuit or poor insulation of the charging cable can cause fatal electric shock [8]. To shorten charging time and reduce possible hazards, a large number of rechargeable batteries can be used and empty rechargeable batteries can be replaced with charged ones when necessary [9].

For example, if a vehicle can travel a certain distance on one charge with a certain number of batteries, then using more batteries can increase the range. Alternatively, the vehicle's battery can be replaced with a charged battery at a charging station while driving. However, batteries have their own issues [10]. Batteries are heavy, expensive, and short-lived. Due to weight, it may not be possible to transport more than a certain number of batteries.

Future innovations in energy storage devices may help overcome these issues. However, another possible way to overcome battery related issues is WPT. Electric vehicle (EV) charging is one of many other areas where wireless power transfer (WPT) options have great potential and are being actively researched due to their many advantages [4]. ,Five]. To understand wireless charging, you need to understand how wireless power transfer works. Wireless power transfer (WPT), wireless power transfer, wireless power transfer (WET), or electromagnetic power transfer, is the transfer of power without wires as a physical connection. A wireless power transfer system is a transmitting device that uses electrical energy to produce a time-varying electromagnetic field. A power source transmits power across space, and a receiving device extracts power from the field and applies it to an electrical load. Wireless power transfer technology eliminates the need for cables and batteries, making electronic devices more mobile, convenient and secure for all users. Wireless power transfer helps power electrical devices where connecting wires are impractical, dangerous, or impossible**.**

II METHODOLOGIES

We have two types of electric vehicle wireless charging technology:

1. Static wireless charging technology and
2. Dynamic wireless charging technology.

Static wireless charging technology system: In this charging method, the vehicle is charged while stationary. It was therefore possible to easily park the electric car in a dedicated parking space or in a garage with an integrated wireless charging station. The receiver is installed in the vehicle chassis and the transmitter is installed underground. Before leaving the vehicle to complete the charging process, the positions of the transmitter and receiver are adjusted. Distance between transmitter and receiver, pad size, and AC power level all affect charging time. The best place to build this wireless electrostatic charging station is where electric vehicles will be parked for a period of time.

Dynamic wireless charging systems: Dynamic wireless power transfer is an effective way to alleviate EV range concerns and reduce vehicle battery prices. Wireless charging is becoming more popular in purely electric vehicles. Charging while driving is also possible. In this method, a stationary transmitter transmits energy through the air to a moving vehicle's receiving coils. With dynamic wireless charging systems, driving an electric vehicle on roads and highways while continuously charging the battery can potentially increase the range of the vehicle. Less bulky energy storage devices are required, thus reducing vehicle weight. Depending on the operating technology, there are four different categories of dynamic wireless charging systems: (a) Wireless capacitive charging system for electric vehicles (b) Wireless charging system for electric vehicles with permanent magnet transmission (c) inductive wireless charging systems for electric vehicles; (d) Resonant inductive charging system for electric vehicles Based on the above two charging methods, this article considers an inductive wireless charging system for electric vehicles.

The Inductive Wireless Electric Vehicle Charging System

Nikola Tesla created the conventional Inductive Power Transfer in 1914 to transmit power wirelessly. It is inspired by EV charging systems. The transfer of power from a source to a receiver has been tested. It's used in a wide range of applications. The primary coil of the magne-charge, also referred to as a recharging paddle (inductive coupler), was put into the vehicles charging port. The secondary coil was able to charge the EV. The main function of wireless charging is to transfer power from one place to another. Modifications to the battery charging process are necessary to attain greater reliability as electric vehicles are a better alternative to pollution. Wireless power transfer can be used to charge the electric vehicle battery.

If the car is available in the slot, the car will be turned on charging through the relay. There is a website that can be used to check the availability of slots. A transistor is used in the charging station to provide efficient power. DC is converted to AC. The figure shows the diagram.

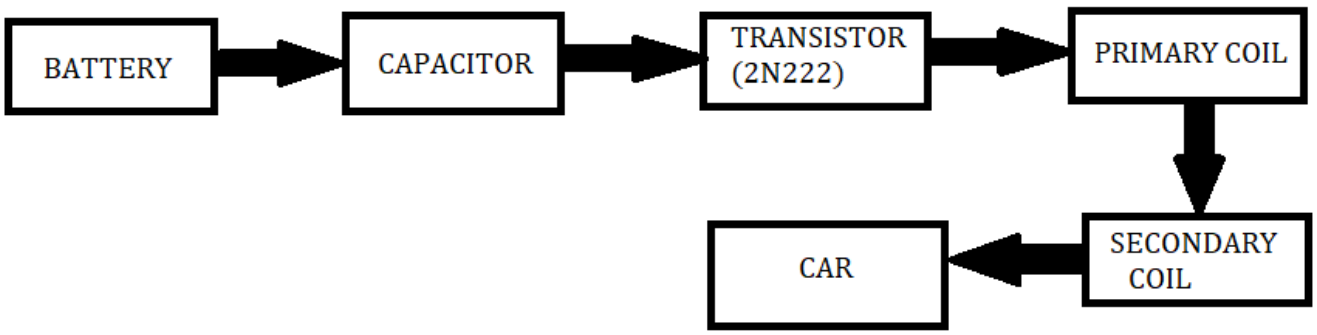

Fig 1: Simple representation of the system

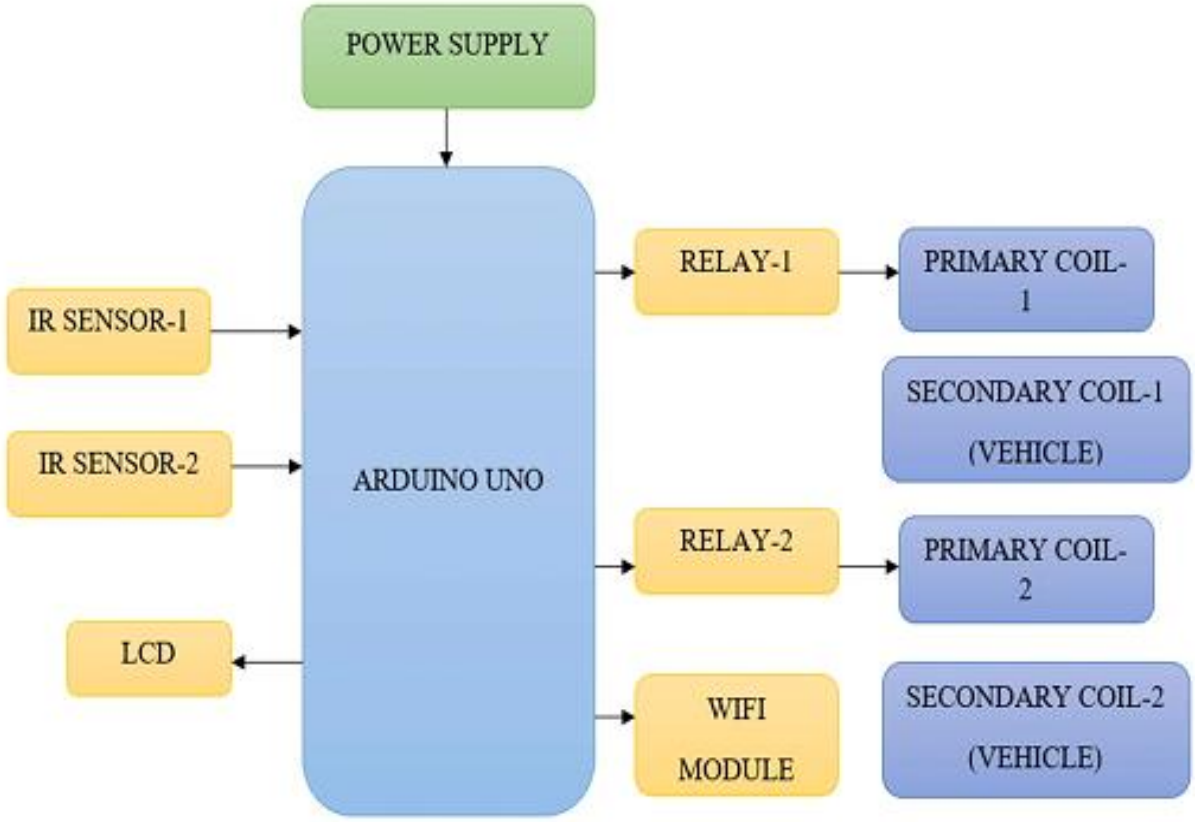

Fig2: Proposed Block Diagram

III .PRINCIPLE OF OPERATION&WORKING

The charging station works according to the principle of electromagnetic induction or magnetic-inductive coupling. Electromagnetic induction is a process whereby a conductor placed in a changing magnetic field causes a voltage to be generated across the conductor. This process of electromagnetic induction, in turn, causes an electrical current to induce the current. This field can induce an electric current in an adjacent coil of wire without actually touching it. Inductive charging uses an electromagnetic field to transfer energy between two objects. This is usually done with a charging station. The energy is sent via an inductive coupling to an electrical device, which can then use that energy to charge batteries or power the device.

Wireless Techniques: Three main techniques for wireless charging are magnetic-inductive coupling, magnetic resonance coupling and microwave radiation. Electromagnetic coupling and magnetic resonance coupling operate in the near field, with the generated electromagnetic field dominating the area near the emitter or scattering object. The near-field power is attenuated as the power of the reciprocal of the distance. Alternatively, microwave radiation acts at greater distances. Far-field power decreases inversely with distance. In addition, the absorption of the radiation in far-field technology has no effect on the transmitter. With near-field techniques, on the other hand, the absorption of the radiation influences the load on the transmitter.

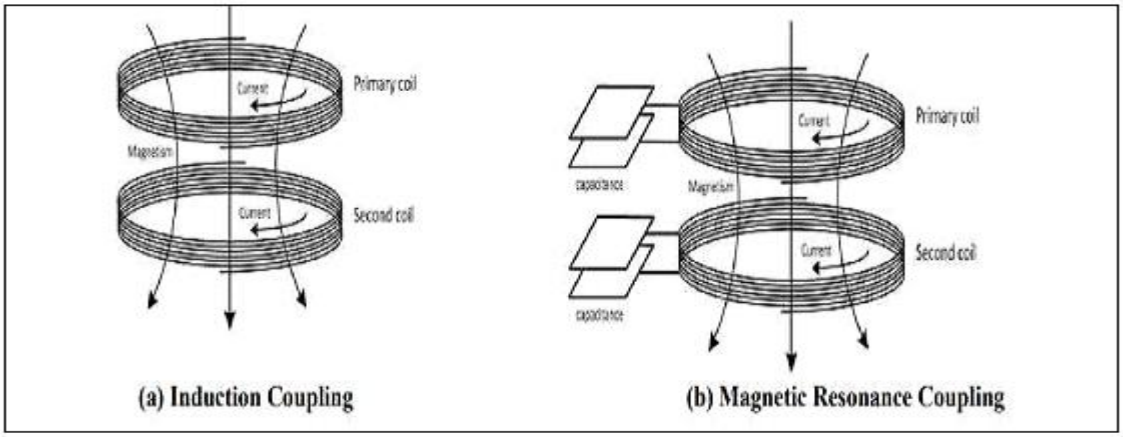

Fig3: Coupling diagrams of wireless charging

WORKING

The main feature of wireless charging is that it can transfer energy through an electromagnetic field. This will increase the use of electric vehicles, making them reliable and efficient even over long distances. The transmission of electrical power from source to load over a distance without conducting wires or cables is called wireless power transmission. Wireless power transmission can bring about a remarkable change in the field of electrical engineering, eliminating the use of traditional copper cables and live wires. For this purpose we use a high frequency transformer to convert the mains input to 12 VDC. This output is fed to the coil of the charging pad. When the adapter coil comes within range of the charging pad coil, the power is wirelessly transmitted to the receiving coil and this 12V DC is delivered to the small DC fan. The system also allows us to wirelessly charge the mobile without plugging it in. The system can be further improved by integrating the charging adapter into the mobile phone itself, so that the user only has to place their mobile phone on the charging station to charge it.

IV. HARDWARE KIT DIAGRAM

The hardware kit diagram is shown in the following figure the components used in this hardware are

TRANSFORMER

POWER SUPPLY

ARDUINO UNO

WI-FI MODULE

IR SENSORS

RELAY

LCD

MOSFET TRANSISTOR

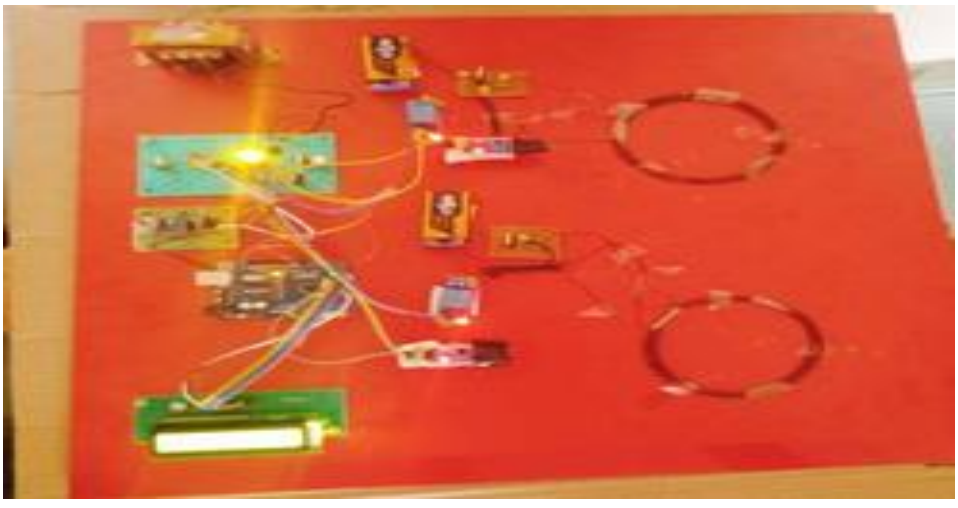

Fig4: Hardware kit of the wireless charging system

V .RESULTS

CASE1: The below figure shows that when both slots are empty the lcd displays that slot-1 and slot-2 are empty.

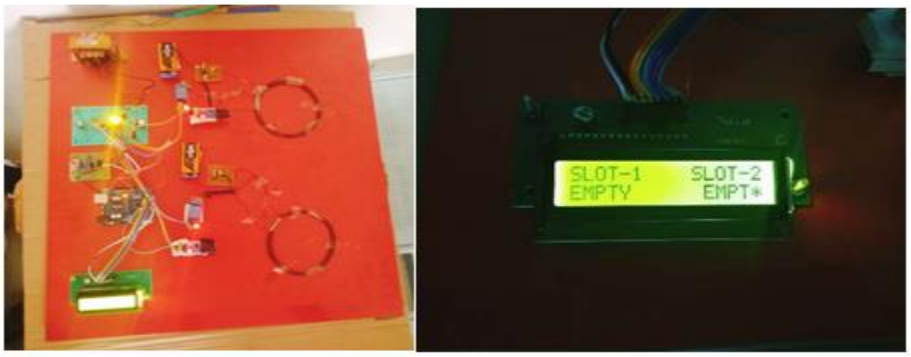

Fig5: LCD displays output when two slots are empty

CASE:2 Now we have put the car in a slot. Once the car arrives at the charging station of a specific slot, the LED light will turn on, indicating that the car is being charged using the principle of mutual induction. Now the LCD shows that SLOT-1 is full and slot -2 is empty

Fig6: LCD displays output as slot1 is full

CASE 3: Likewise, we put the car in a different slot. Once the car has reached the charging station of a specific slot, the LED light will turn on, indicating that the car is charging. Now the LCD shows that SLOT-2 is full and Slot -1 is empty

Fig7: LCD displays output as slot2 is full

CASE 4 : Here we place both cars in both slots. Both cars are now charging at the charging station. The LCD will indicate both slots are full as shown in the figure below.

Fig8: LCD displays output both slots are full

With the help of the so-called Thing Speak technology, we can check whether the slots of the charging stations are empty or full. With the help of this website we can check whether the slots of the charging stations are full or empty. If it shows that they are empty, we can forward them to the nearest charging station. If it shows that the slots are full, then we need to check other charging stations. The cases verified through the thing speak website are listed below.

CASE1:

Fig9: Thingspeak Display Both Slots Are Off Condition

CASE2:

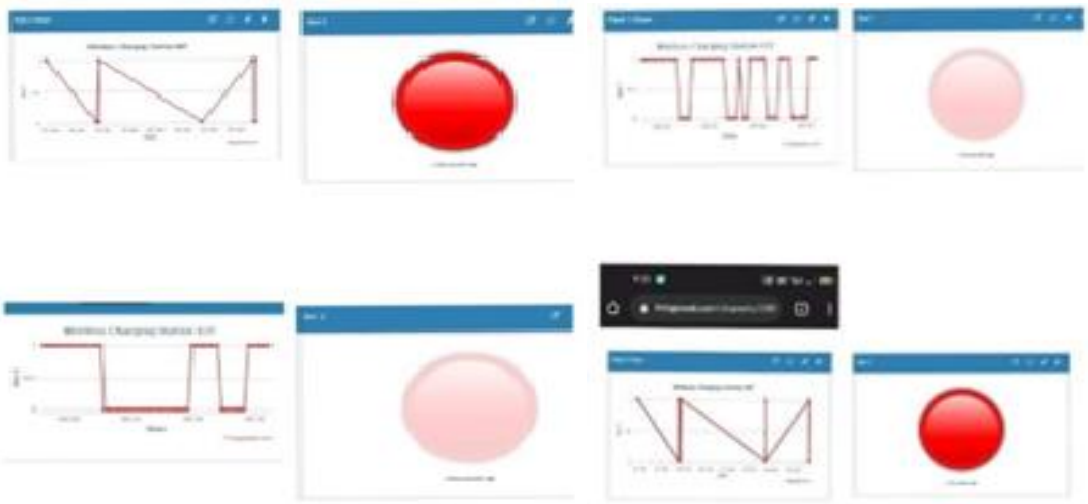

Fig10: Slot1OnAnd2Off Slot1OffAnd2On

CASE3:

Fig11: Both Slots Are On

Conclusion:

Wireless charging is one of the most convenient charging infrastructures for electric vehicles. It is expensive, but still attracts many researchers. Because electric vehicles can drive for many hours without stopping to charge, they become truly autonomous. Perhaps the most exciting aspect is that electric vehicles equipped with wireless charging technology on the go can have significantly smaller batteries. As a result, this technology reduces both the environmental impact and the cost of introducing electric vehicles.

REFERENCES

[1] X. Kong, G. L. Plett, M. S. Trimboli, Z. Zhang, D. Qiao, T. Zhao, Y. Zheng, Pseudo-two-dimensional model and impedance diagnosis of micro internal short circuit in lithium-ion cells, Journal of Energy Storage 27 (2020) 101085

[2] C. Jiang, K. Chau, C. Liu, C. H. Lee, An overview of resonant circuits for wireless power transfer, Energies 10 (7) (2017) 894

[3] B. Vaidya, H. T. Mouftah, Wireless charging system for connected and autonomous electric vehicles, in: 2018 IEEE Globecom Workshops (GC Wkshps), IEEE, 2018, pp. 1–6

[4] S. Kuroda, T. Imura, Derivation and comparison of efficiency and power in non-resonant and resonant circuit of capacitive power transfer, in: 2020 IEEE PELS Workshop on Emerging Technologies: Wireless Power Transfer (WoW), IEEE, 2020, pp. 152–157.

[5] A. Ahmad, M. S. Alam, R. Chabaan, A comprehensive review of wireless charging technologies for electric vehicles, IEEE Transactions on Transportation Electrification 4 (1) (2018) 38–63.

[6] P. Eekshita, N. S. V. Narayana, R. Jayaraman, Wireless power transmission system, in: 2021 International Conference on Computer Communication and Informatics (ICCCI), IEEE, 2021, pp. 1–4.

[7] S. R. Khan, S. K. Pavuluri, G. Cummins, M. P. Desmulliez, Wireless power transfer techniques for implantable medical devices: A review, Sensors 20 (12) (2020) 3487

[8] R. Pandey, B. Singh, A high efficiency modular EV charger using bridgeless and resonant converters, in: 2020 IEEE Industry Applications Society Annual Meeting, IEEE, 2020, pp. 1–6.

[9] A. A. Mohamed, A. Meintz, L. Zhu, System design and optimization of in-route wireless charging infrastructure for shared automated electric vehicles, IEEE Access 7 (2019) 79968–79979.

[10] Wave - wireless advanced vehicle charging, Tech. rep., WAVE (2019).