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Development of Solar Wireless Electric Vehicle Charging System

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Abstract: ***Within the conveyance sector, Electric cars (EVs) are a type of groundbreaking development. EVs is anticipated to dominate the vehicle industry soon. To maintain the integrity of power networks, the charging process for EVs must be regulated. However, with the proliferation of EVs, the substantial energy stored in their batteries could be harnessed for feedback into the grid. This bidirectional interaction between EVs and the electrical grid is a crucial technology for upcoming smart grids, supporting grid autonomy. As a result of higher fossil fuel prices and declining emissions cost of carbon dioxide, EVs have become more competitive than traditional internal combustion engine vehicles. Despite these advantages, EV adoption has been slow due to high vehicle costs, a lack of fast - charging stations, and a limited number of all - electric models.***

Keywords: Wireless Power Transfer (WPT), Electric Vehicle, Wireless Charger

1. Introduction

Two categories exist for EVs: those that run entirely on electricity as well as those that are only partially electric. EVs have minimal costs of operation and minimal environmental impact, utilizing little to no fossil fuels. Eventually, EVs are anticipated to become the primary mode of transportation, necessitating improved charging station efficiency. The main barrier to EV acquisition is the absence of infrastructure for charging. Testing of a portable EV charger has shown that renewable energy can reduce charging time. A system of hybrid power provides a special long - distance EV service driver, especially in areas lacking charging stations. Wireless EV chargers are an excellent option for charging EVs with electricity. Despite the increasing cost - competitiveness of EVs due to falling CO2 levels and growing fossil fuel prices emissions, they have not been widely adopted because of high costs and infrastructure limitations. EVs can be fully or partially electric. They have lower operating costs than gasoline - powered vehicles due to fewer moving parts and minimal environmental impact. A project system involving solar panels, batteries, transformers, regulator copper coils, circuits, and AC to DC converters, an operator, and an LCD display aims to enable EVs to charge while traveling. The system connects a solar panel to a battery via an apparatus for charging, storing DC electricity in the battery. This DC power is then transformed into AC electricity using a transformer, enabling continuous charging without stopping.

2. Methodology and Implementation

The methodology for implementing a solar wireless electric vehicle (EV) charging system involves several key steps and components. The Fig 1. Shows the block diagram of methodology adopted in wireless charger.

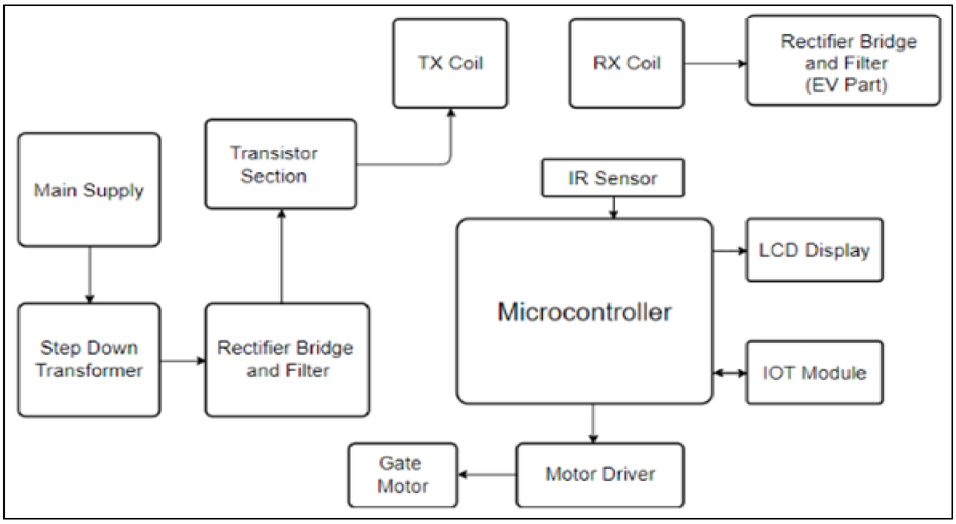

Figure 1: Block diagram of methodology adopted in wireless charger

- Power Supply Initiation: The system starts with the application of power to the transistor. When the power supply is connected, the transistor begins to switch on and off rapidly, generating wireless power through electromagnetic induction using a copper coil.
- Transmitter Coil Installation: Multiple transmitter coils, made of copper, are embedded within the road surface. These coils are responsible for creating the electromagnetic field necessary for wireless power transfer.
- Receiver Coil in EV: Each electric vehicle is equipped with a receiver coil, also made of copper, installed inside the vehicle. This coil is designed to capture the electromagnetic energy generated by the transmitter coils on the road and convert it back into electrical energy to charge the vehicle's battery.
- Charging Process: As the vehicle drives over the section of the road embedded with transmitter coils, the receiver coil in the vehicle picks up the wireless power without any physical connections. The power transfer continues as long as the vehicle remains within the active charging zone.
- Payment via Smartphone: The system is designed to accept payments through a smartphone application, providing a convenient and seamless payment method for the user.
- Exit Mechanism: Once the payment is successfully processed, an automated gate at the end of the charging section opens, allowing the user to exit the charging area. This ensures that only paid users can complete the charging process and leave the area.

Circuit diagram

The Fig.2 shows the circuit diagram of wireless charger. The main components are IOT ESP8266 Node MCU, LCD Display (16X2), IR Sensor, Transformer, Rectifier and filter Motor and Motor Drive, Cooper Coil etc.

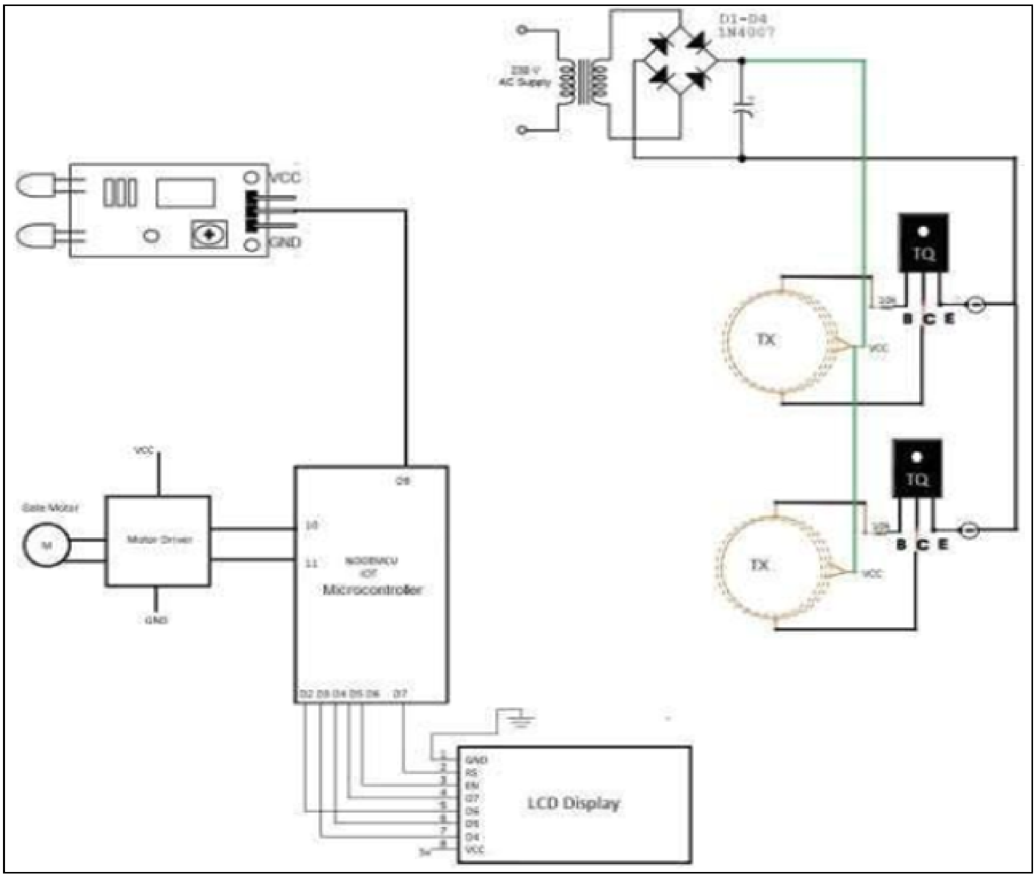

Figure 2: Circuit diagram of Wireless charger

3. Working Model and Implementation

The circuit diagram shown in Fig.2 is implemented on PCB shown in Fig.3.

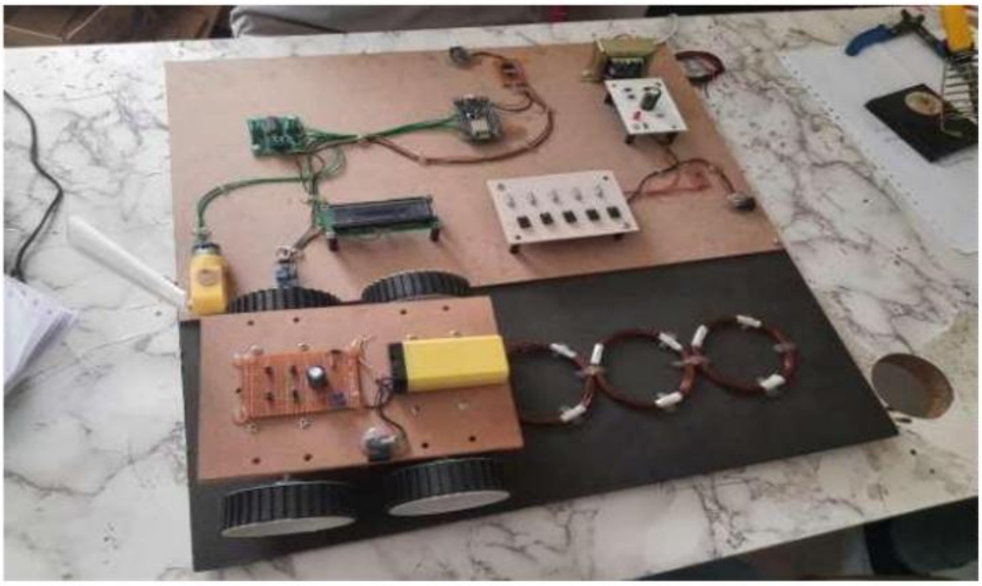

Figure 3: Working model of wireless charger

The more common methods of connected or plug - in power supply are referred to as "conductive charging". However, there are certain disadvantages to these hardwired charging methods. For instance, they need long charging cords and plugs. In addition, the charger requires manual connection between the power supply and the item being charged. Furthermore, the tethered charging method is disliked by both consumers and the environment. A deadly electric shock could occur if the insulation on the charging line deteriorates because of things like extreme temperatures, contact with the ground, or the charging device itself. The time required for charging and the associated risks can be decreased by using many batteries or by replacing empty ones with fresh ones. An automobile's battery count can be increased will extend the vehicle's range if it can cover a specific distance on a single charge. As an alternative, fully charged batteries can be installed in the car at rest stops along the route. The batteries do not, however, come without issues. Because the batteries run out quickly and must be replaced, they are expensive to buy and cumbersome to transport. It might not be possible to move more batteries than a specific number due to their weight. If energy storage devices are improved in the future, maybe these issues can be fixed. In contrast, Wireless Power Transfer (WPT) offers an extra option for resolving battery - related issues. Utilizing the dynamic wireless power charging system can reduce the entry price of the entire system by doing away with the requirement for big, bulky batteries. The WPT approach is incredibly practical and easy to use because it eliminates the mess of cables and connectors that are usually present in manually plugged - in charging systems. Extensive study has been conducted on WPT and its practical applications due to its potential utility in various industrial and engineering contexts. Electric cars and electronic gadgets (EVs) are two application areas for WPT.

4. Results and Discussions

A research and education - focused wireless power transfer (WPT) technology for charging electric vehicles (EVs). Coupling magnetic resonance technology, which allows power transfer in the non - radiative near field, is the foundation of the simulation. A streamlined topology for the power transmission system is suggested and put into practice. This is done to examine and recreate the suggested billing plan mathematically. This architecture was used to simulate and study the counter electromotive force (counter EMF, CEMF) in the receiving coil in response to constant transfer distance and driving frequency.

Charging an electric device with a cord and charger car battery is labor - intensive, expensive, and risky. There needs to access to electric vehicle charging facilities for drivers who plan to undertake lengthy trips. To cover great distances, a greater number of stations are to be arranged thoughtfully. Furthermore, it frequently takes three hours to fully recharge a battery, which is far longer than it takes to fill a gas - powered vehicle. Unsecured charging cables lying about the floor could cause trips and falls. Leakage from outdated or faulty cable may cause the owner to have additional concerns in colder areas. Changes in primary - secondary coil spacing and lateral distance can impact wireless power transmission efficiency. worry that an automobile won't have enough power or about its range

The DC output voltage and current for the best - case scenario are 5 volt and 0.018 ampere. There will be an increase in the use of electric vehicles and associated charging infrastructure in the near future. The capability of charging electric vehicles will be one important characteristic. The lack of a widespread charging network is the biggest obstacle to the market's growing demand for EVs. We looked at the portable EV charger, which uses renewable energy to shorten the time required to recharge an electric vehicle. The technology showcased here provides long - distance electric vehicle drivers with a cutting - edge hybrid power system car battery charging station service. However, it can be challenging for owners of electric cars to locate handy charging stations next to highways and freeways. Using a wireless EV charger is preferable to plugging in when charging their autos.

5. Conclusion

The project detailing design of a Wireless Charging System underscores the inexorable trend towards electrification

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across various sectors, driven by environmental imperatives and the need to mitigate electricity - related challenges.

Indeed, contemporary advancements in wireless technology have propelled its integration into a myriad of electronic applications. The evolution of wireless communication systems has rendered them increasingly sophisticated, user - friendly, and compact, thereby expanding the scope of devices that can benefit from wireless solutions.

Wireless technologies offer an array of advantages, chief among them being convenience and efficiency. The elimination of physical connectors simplifies usage and reduces wear and tear on devices, while also streamlining the charging process. This convenience is particularly significant in applications where frequent charging or power transfer is necessary, such as smartphones, electric toothbrushes, and electric vehicles.

Furthermore, the compact nature of wireless charging systems enables their integration into various environments with minimal disruption. This flexibility opens up possibilities for innovative applications, such as integrating charging pads into furniture or infrastructure, thereby seamlessly integrating power transfer into everyday life.

The design of wireless charging systems exemplifies the pervasive influence of electrification trends across diverse sectors. As wireless technologies continue to advance and proliferate, their adoption promises to enhance sustainability across various applications. By leveraging the principles of wireless power transfer, this project underscores the transformative potential of wireless solutions in shaping the future of energy transmission and utilization.

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