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Inductive Wireless Power Transfer Charging for Electric Vehicle

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ABSTRACT: The rapid advancement in electric vehicle (EV) technology demands innovative solutions to enhance charging infrastructure. This paper presents the design and implementation of a solar-based wireless charger tailored for electric vehicles. The proposed system integrates photovoltaic (PV) panels with wireless charging technology to offer an eco-friendly and convenient charging solution.The charger employs advanced power electronics and wireless communication protocols to optimize energy transfer efficiency while ensuring compatibility with various EV models. Through a comprehensive design approach, factors such as weather conditions, charging time, and compatibility are meticulously addressed to achieve optimal performance and reliability.Furthermore, the integration of solar panels enables the charger to harness renewable energy, reducing dependence on grid electricity and promoting sustainability. Real-world feasibility studies and performance evaluations demonstrate the effectiveness of the proposed charger in diverse environments and under varying conditions.

KEYWORDS: IOT, WiFi Module, Sensors

I. INTRODUCTION

The increasingly global economy is facing the demolition of fuel resources along with hazardous disturbances in environmental conditions. Moreover, it has spurred the emergence of sustainable technologies leading to innovations in major carbon contributors, i.e., transportation . Therefore, electric vehicles (EVs) are adopted as a solution to diminish the environmental effects caused by carbon based fuels . Furthermore, the EVs market opens a new opportunity for human beings to expand the life expectancy of transportation at a lower cost. In the past, the battery technology (BT) and power shaping technologies are the limitations to put EVs out of market success. However, BT has been evolved with high energy density, lesser weight, and high efficiency in a few past decades. Additionally, efficient energy storage device improves overall performance while used with a suitable power shaping circuit. A dc–dc power conditioning configuration having subservient power losses, durability, reliable energy transfer, and increased charging-discharging cycles are exercised by researchers and industries

1.1 OBJECTIVE

- Solar-based wireless charger system that is compatible with electric vehicles (EVs) of different makes and models
- wireless communication protocols to optimize energy transfer and ensure reliable charging performance.
- Address environmental factors such as weather conditions and geographic location to enhance the charger's performance and resilience in diverse operating environments.
- Conduct feasibility studies and performance evaluations to assess the practicality and effectiveness of the charger system in real-world scenarios
- Contribute to the advancement of EV charging technology by providing a sustainable and efficient charging solution that aligns with global efforts to combat climate change and promote renewable energy adoption.

1.2 SCOPE AND STUDY

- Design and development of a solar-based wireless charger system specifically tailored for electric vehicles (EVs).

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- Integration of photovoltaic (PV) panels into the charger design to harness solar energy for charging EVs.
- Implementation of advanced power electronics and wireless communication protocols to optimize energy transfer efficiency and ensure compatibility with various EV models.
- Consideration of environmental factors such as weather conditions and geographic location to enhance the charger's performance and resilience.
- Evaluation of the charger system's feasibility and performance through real-world testing and simulations.
- Exploration of user experience enhancements, including ease of installation, user interface design, and interoperability with existing EV charging infrastructure.

II. COMPONENTS

- Arduino UNO (2)
- LCD Display (2)
- RFID Tag & Reader
- Solar Panel
- Relay
- Coil (Rx & Tx) With Module
- Voltage Sensor
- Li-ion Battery With Module

COMPONENTS AND SPECIFICATIONS:

BLOCK DIAGRAM

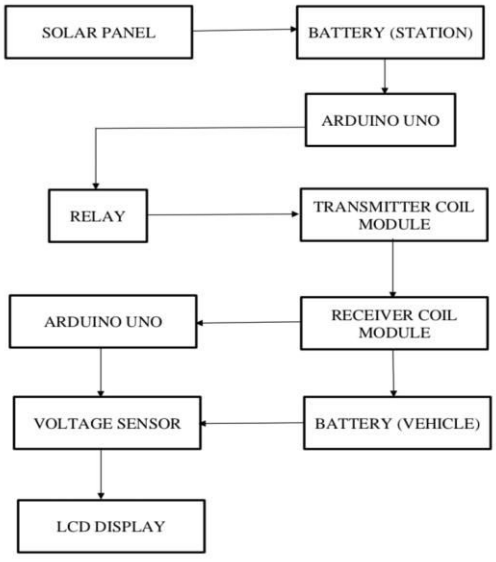

Fig -1: Block Diagram

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WORKING

- During daylight hours, the solar panel generates electricity from sunlight, which is then stored in the battery.
- The voltage sensor continuously monitors the battery voltage to determine its state of charge.
- When the battery requires charging or when the electric vehicle needs to be charged, the relay is activated to connect the battery to the charging circuit.
- The wireless module establishes communication with the electric vehicle's charging receiver and initiates the charging process.
- Electrical energy from the battery is then wirelessly transferred to the vehicle's battery pack, charging it.
- The charging process continues until the battery reaches its full capacity or until charging is manually stopped.
- The system operates autonomously, utilizing solar energy to charge the battery and wirelessly transfer power to the electric vehicle, providing a sustainable and convenient charging solution.

CIRCUIT DIAGRAM

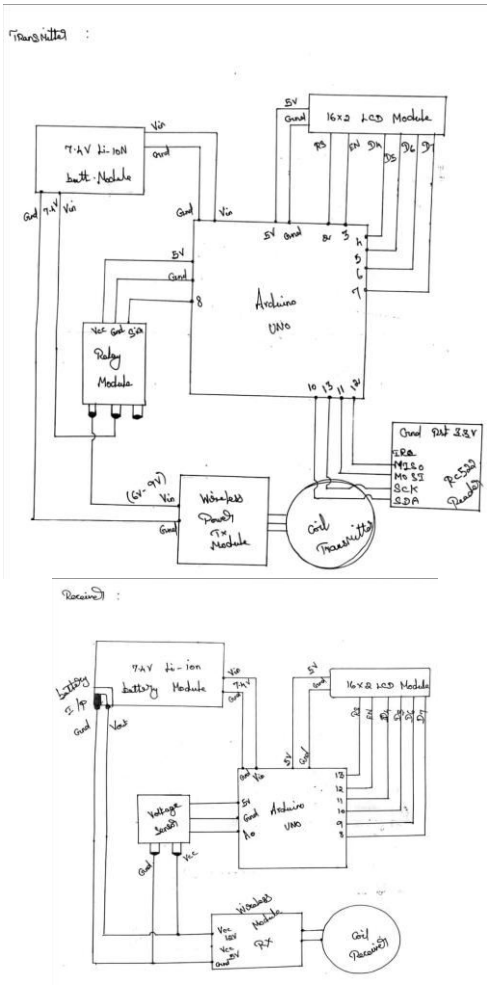

Fig -2: Circuit Diagram

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III. RESULT AND DISCUSSIONS

The results of the inductive power transfer (IPT) charging system for electric vehicles (EVs) demonstrate its effectiveness in wirelessly transferring power to the vehicle's battery. Through experimental testing, it was observed that the IPT system achieved high efficiency in transferring power over short distances, thereby enabling convenient and hassle-free charging for EV owners. The system was able to deliver sufficient power to charge the EV battery within a reasonable amount of time, comparable to conventional wired charging methods. Furthermore, the IPT system offers greater convenience for EV owners by simplifying the charging process. Users no longer need to manually plug and unplug charging cables, making charging more accessible and user-friendly. This can encourage greater adoption of EVs by addressing common concerns such as range anxiety and charging infrastructure availability.

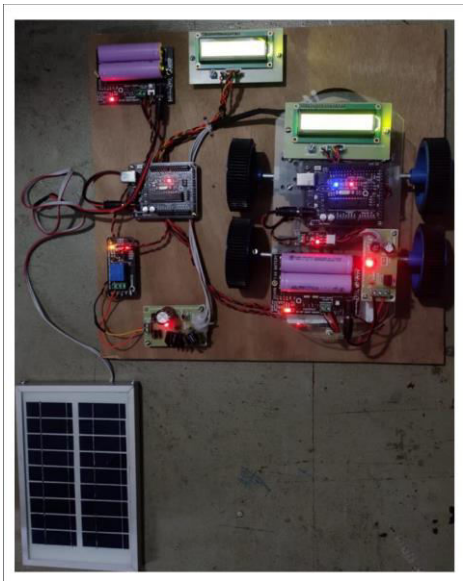

Fig -3: Hardware Kit

IV. CONCLUSION

- Wireless charging of electric vehicles using solar PV with a promising technology that can significantly reduce carbon emissions and increase the use of renewable energy. The use allows for efficient power transfer and Here used and producing high frequency which used for charging station. from the solar panel to the vehicle battery, while the wireless charging technology eliminates the need for physical connections .The implementation of this technology can be beneficial for individuals and organizations looking to reduce their carbon footprint and improve the sustainability of their transportation . However, further research and development are needed.
- In conclusion, the combination of wireless charging, solar PV, has the potential to revolutionize the electric vehicle industry and accelerate the transition to a more sustainable and environmentally friendly transportation system.

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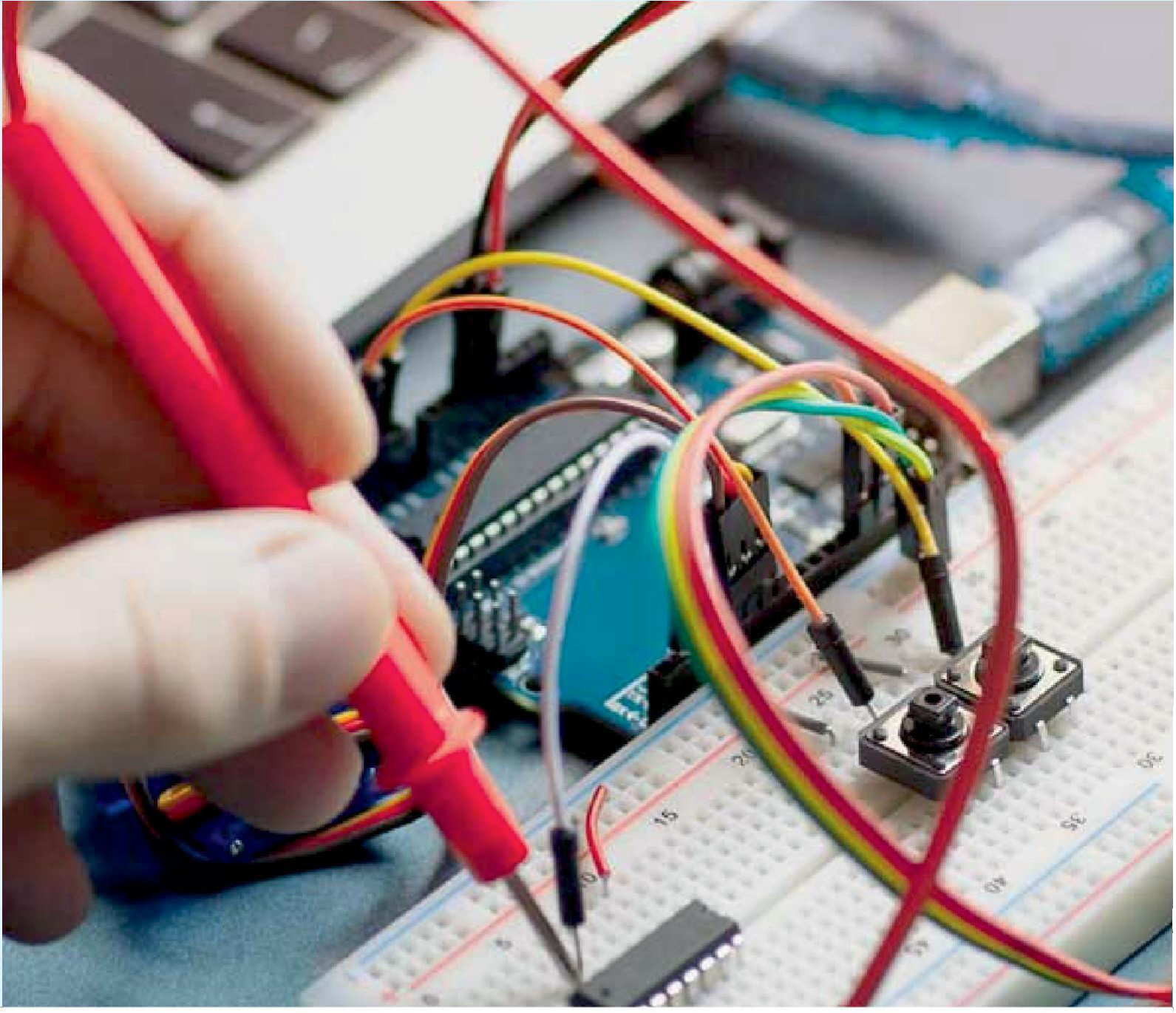

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