

ELECTRIC VEHICLE WIRELESS CHARGING USING RFID

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Abstract— Electric vehicle (EV) wireless charging using radio-frequency identification (RFID) is a novel technology that enables the charging of electric vehicles without the need for wires or cables. The technology utilizes RFID tags that are installed on the EV, which communicate with the charging pad through electromagnetic fields. The charging process is initiated when the RFID reader detects the presence of the EV with the installed RFID tag, and the charging pad is activated. The power transfer is then enabled between the charging pad and the EV, allowing for the charging process to begin. RFID-based wireless charging technology offers numerous benefits over traditional wired charging systems. For instance, it eliminates the need for physical connectors, thereby reducing the wear and tear of components and increasing the convenience of charging. Moreover, the technology is more efficient, with minimal energy losses, and reduces the risk of electrical hazards. It also minimizes the impact of weather conditions and road debris on the charging process, making it suitable for both indoor and outdoor charging application. In conclusion, EV wireless charging using RFID is a promising technology that can potentially revolutionize the EV charging industry. It offers numerous benefits, including increased convenience, efficiency, and safety, and has the potential to significantly reduce the environmental impact of transportation.

Keywords-Electric vehicle, Wireless Charging, RFID

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INTRODUCTION

Electric vehicle wireless charging using RFID is an innovative technology that allows electric vehicles (EVs) to be charged wirelessly without the need for physical contact between the charging station and the vehicle. RFID stands for Radio Frequency Identification, which is a technology that uses radio waves to identify and track objects. In the context of electric vehicle charging, an RFID reader is used to identify the vehicle and initiate the charging process[1][16]. The RFID tag is installed on the vehicle, and it contains information such as the vehicle's unique identification number and charging requirements. When the vehicle is parked over the wireless charging pad, the RFID reader sends a signal to the tag, which in turn sends back the necessary information to the charging station. This information includes the charging requirements of the vehicle, such as the battery capacity and the charging rate, which are used to adjust the charging process to optimize efficiency and prevent damage to the battery[2][12][16]. One of the main advantages of electric vehicle wireless charging using RFID is that it eliminates the need for physical contact between the charging station and the vehicle, making the charging process more convenient and efficient. Additionally, the technology is safer than traditional charging methods, as there is no risk of electric shock or other accidents. Overall, electric vehicle wireless charging using RFID is an exciting and innovative technology that has the potential to revolutionize the way we charge electric vehicles, making it easier and more convenient for people to adopt this eco-friendly mode of transportation[3][11].

LITERATURE SURVEY

Due to their numerous benefits, in the transportation sector, internal combustion (IC) engine-powered cars are regarded as being replaced by electric vehicles (EV). Modern electric car batteries should be charged wirelessly whenever possible. This study performs a thorough review of the various wireless EV battery charging methods. There are two alternative ways to wirelessly distribute power to charge an electric vehicle's battery: static EV charging and dynamic EV charging [1]. For power transfer in static wireless EV battery charging techniques, both capacitive and inductive methods are employed; however, in dynamic wireless EV battery charging techniques, only inductive methods are used. This study provides a comprehensive evaluation of these approaches with an emphasis on compensating circuit topologies, magnetic linked inductor core types, and various converters and controllers for wireless power transfer (WPT) systems. In addition, design considerations for a static wireless EV battery charging system are discussed in this work, along with an analysis of its equivalent circuit. This report also explains the difficulties and potential future developments in wireless charging of EV batteries.

Due to improvements in battery life and their low emission levels, electric vehicles (EVs) have attracted a lot of attention recently. Similar to how more devices can now be connected because to the growth of the Internet of Things (IoT) [4][13]. The current restricted battery range and the dearth of outlets for charging or battery changing are two main issues for EVs. Building the required infrastructure and having a reliable battery management system (BMS) that can accurately estimate the amount of power left over are two solutions. Battery switching may potentially be an option for some EVs, either at authorized charging stations or even directly from other EV users. In order to provide

drivers with information on a successful battery charge or exchange, a network of EV information is necessary[3].

This study presents two blockchain implementations for an EV BMS that use blockchain as the network and data layer of the application. The first solution builds smart contracts on top of the Ethereum blockchain, whereas the second builds them on top of the IOTA tangle and a directed acyclic graph (DAG). The two strategies are put into practice and contrasted to show that both systems can offer a workable solution for an effective, partially decentralized, data-driven BMS [4].

Customers accept electrical vehicles because they are simple to use. It has a lot of requirements, one of which is a pleasant charging and parking area. The suggested model combines these two systems to provide an effective solution. The design of a system that can manage free parking spaces and charge schedules is discussed in this article. The parking systems in place today are not capable of handling all kinds of automobiles. There must be parking and a charging station for electric vehicles. The suggested model offers the option to reserve a charging area using a smartphone[5][14]. The system then controls all associated processes depends upon data which include the arrival time of the car, battery life, etc. Customer manager, vehicle manager, map manager, and lot manager are the key elements. Java Platform and Enterprise Edition (Java EE) is the program in use. Security idea is another thing to consider. User ID, which is also used for the billing process, is necessary for this.

Electric vehicles will raise gasoline prices while reducing greenhouse gas emissions. In electric cars, transferring electricity over a short distance is the primary function of wireless transmission. A transmitter and receiver portion that are separated by a short distance make up the wireless power transfer system. An adaptable electromagnetic field is used in wireless transmission technology. The EMF is produced between the coils and transferred to the receiver by this electric field, which is formed in a free environment and carries a fixed quantity of energy that generates a magnetic field around it and contains energy. A BMS is a system for managing batteries[6]. We utilize a master battery and a slave battery in EVs. In the BMS, the master battery is given priority. The relay will transition from the master battery to the slave battery whenever the master battery's charge drops automatically.

Introduced energy meters might be electromechanical or electronic. The biggest issue with this technique is that a utility representative must visit each neighborhood individually to read the energy meters and give out the bills. That interpretation claims that the customer paid the invoice. Even when bills are consistently paid, mistakes like an excess billing amount or a communication from the provider are frequently made[7]. We are recommending an IoT-based prepaid energy meter to get around this problem. The ADE7758 meter circuit, Atmega328p microcontroller, and Wi-Fi module make up this system. This meter tracks the amount of unit utilized and transmits both the unit and cost online. If consumption is getting close to the predetermined point, an alarm is given to the user. The mechanism will cut power if usage rises over the predetermined level. The balancing current approach is often used to identify demand theft [2][15].

Energy is produced naturally and comes in a variety of forms, including solar energy, nuclear energy, and chemical energy from fuels. The study provides solar-powered wireless charging methods for electric vehicles. The gasoline used by current automobiles causes noise, air pollution, and significant environmental effects[8]. But the difficulties with pollution are solved by wireless charging technology. Technology known as Wireless Power Transmission (WPT) is incredibly dependable, effective, silent, and pollution-free.

It was suggested to conduct a state-of-the-art study of electric car technology, charging procedures, standards, and optimization methods[9]. The fundamental differences between an electric vehicle and a hybrid vehicle are first explained. The most recent findings on EV charging technologies such as conductive charging (CC), wireless power transfer (WPT), and battery swap stations (BSS) are then presented. The examination of EV standards, including charging rates and their configurations, comes next. The most popular optimization methods for determining the size and location of EV charging stations are then examined. Finally, a number of suggestions are made for additional study based on the learned insights.

A hybrid energy management system (EMS) is suggested for the operation of electric distribution systems (DS) and charging stations for electric vehicles (EVCS). Improved Artificial Cell Swarm Optimization (IACSO) and the Marine Predators Algorithm (MPA) are both used in the suggested hybrid technique, which is referred to as the IACSO-MPA strategy. Through the crossover and mutation operators, the searching behavior of ACSO is improved, hence the term IACSO. In this case, MPA improves how the IACSO updates. This work's main goal is to increase DS's capacity for assigning charging schedules to EVCS while lowering the cost of ownership. This goal serves as the foundation for the proposed IACSO-MPA approach, which is designed to analyze the energy management interaction process in EVCS and DS as well as to find an equilibrium solution. The suggested system is turned on via the MATLAB/Simulink website, and its effectiveness is then measured against a number of currently used methods, including the Crow search optimization (CSO), BAT algorithm, and Particle Swarm Optimization. Additionally, using the suggested current approach, the performance assessment of the EVCS and distribution system (DS) is evaluated. The EVCS 1 obtains 621.73 using the suggested approach. DS is 4391.26, EVCS 2 is 3576.90, EVCS 3 is 4441.72[10]. According to the experimental findings, benefits connected by EVCS may be maximized at least to 7.8% while expenses of the integrated energy system (IES) can be reduced by 3.89%. Additionally, the suggested approach may more correctly and effectively discover the best global solutions than the current methods.

According to studies, the demand for a cleaner atmosphere has encouraged the development of affordable green car technologies, such as electric vehicles. Infrastructure for charging electric vehicles (EVs) is becoming more and more crucial as the number of EVs on the road climbs. A greater knowledge of existing EV charging behaviors is necessary in order to enhance the operation and efficiency of the electric car charging system[3][11]. So, in order to automatically identify users, this article uses RFID (radio frequency identification) technology. In this technique, data from users is transmitted and received via electromagnetic waves.

“An Efficient Scheme for Wireless Charging of Electric Vehicles Using RFID with an Optimal Path Planning”, in the year 2022 in IEEE globecom workshop, one of the main reasons for the emergence and acceptance of electric cars (EVs) in contemporary smart cities in recent years is the detection of the harmful CO₂ emissions in the environment from traditional fuel-based vehicles. In this situation, EVs offer a green setting in the contemporary smart city[9]. However, there are several obstacles to using EVs in the contemporary smart city (such as smart charging, route planning, information distribution, etc.). Therefore, new methods and approaches are required to raise the effectiveness of the EVs' current charging system. Keeping these concerns in mind, this study suggests a new method for wirelessly charging electric vehicles utilizing RFID tags in conjunction with

optimized path planning to have the lowest possible charging costs. The use of RFID tags placed at various locations across the city is employed in the proposed plan to have an effective payment mechanism while EVs are being charged. An algorithm that offers navigation is also created to demonstrate the suggested scheme[3]. For the purpose of determining the best approach, the effectiveness of the suggested plan is evaluated in light of the EVs' mobility. The outcomes demonstrate the efficacy of the suggested remedy.

METHODOLOGY

The methodology of RFID wireless charging involves designing the RFID system, developing the charging infrastructure, placing and calibrating the RFID tags, initiating the charging process, and monitoring and controlling the charging process. The first step in implementing an RFID wireless charging system is to design the system itself. This involves selecting the appropriate RFID tags and readers, as well as determining the optimal frequency and power levels for the system. Once the RFID system is designed, the next step is to develop the charging infrastructure. This involves installing the RFID readers and antennas in the charging stations, as well as configuring the system to communicate with the RFID tags. The RFID tags used in wireless charging systems need to be placed in a specific location on the device being charged. This location can vary depending on the device, so calibration is required to ensure that the charging process is efficient and effective. Once the system is calibrated and the RFID tags are in place, the charging process can begin. The RFID reader sends a signal to the RFID tag, which then sends back a signal that is used to initiate the charging process. During the charging process, the RFID system can monitor the charging status and adjust the power levels as needed to ensure efficient charging. Additionally, the system can control the charging process, such as stopping the charging when the battery is full.

SYSTEM ANALYSIS

EXISTING SYSTEM

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

DRAWBACKS

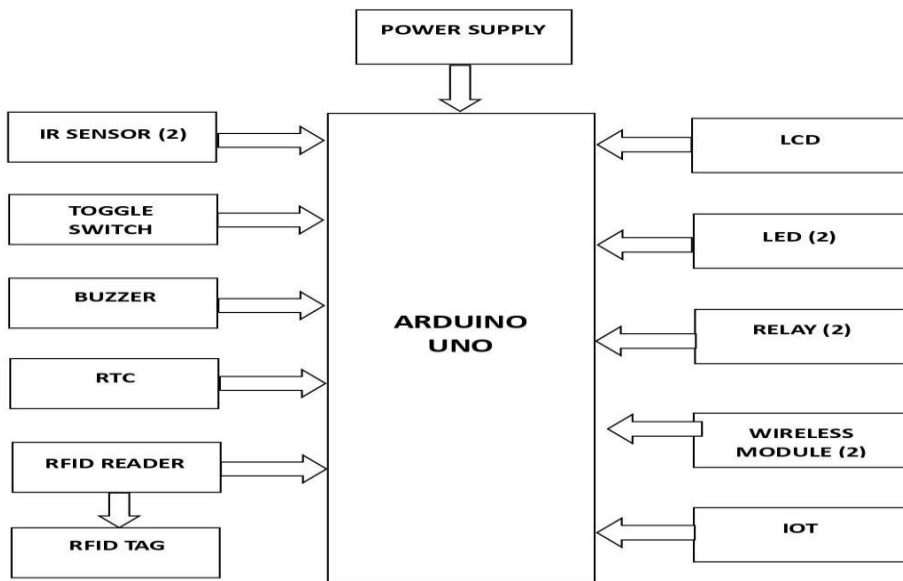
- Higher cost of installation and maintenance compared to traditional plug-in charging systems
- Lower charging efficiency and slower charging times compared to plug-in systems
- Limited availability of wireless charging infrastructure
- Limitations in the range and alignment of the charging pad and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

PROPOSED SYSTEM

The system of electric vehicle wireless charging using RFID (Radio-Frequency Identification) is a technology that allows electric vehicles to be charged wirelessly through a magnetic field generated by a charging pad. The system uses RFID technology to authenticate the vehicle and initiate the charging process, making it convenient and easy for EV owners to charge their vehicles without having to physically connect a charging cable to the car. The system consists of two main components: the charging pad and the RFID tag. The charging pad is installed on the ground and generates a magnetic field that transfers energy wirelessly to the vehicle's battery through an induction coil. The RFID tag is placed on the vehicle and contains information about the vehicle, such as its identification number, battery capacity, and charging requirements.

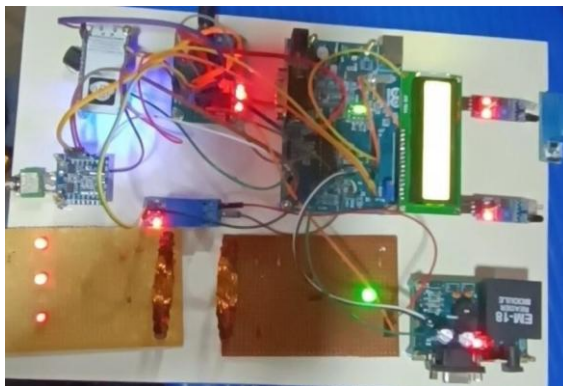
When an EV with an RFID tag enters the charging pad's range, the system reads the tag and identifies the vehicle. The charging pad then generates a magnetic field that transfers energy wirelessly to the vehicle's battery. The RFID tag also allows the system to monitor the charging process and adjust it to optimize the charging time and battery life. Once the battery is fully charged, the system stops the charging process and releases the vehicle from the charging pad. In conclusion, the system of electric vehicle wireless charging using RFID is a promising technology that offers numerous benefits for EV owners. With the continuous advancement of technology, the system has the potential to revolutionize the EV industry and provide a more convenient and efficient way of charging electric vehicles.

PROPOSED MODEL



RESULT AND DISCUSSION

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



transportation sector.

CONCLUSION

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

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