Chapter 2
RFID-Enabled Wireless Charging System for Electric Vehicles

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ABSTRACT

The RFID-Enabled Wireless Charging System for Electric Vehicles (EVs) represents a significant advancement in sustainable transportation infra- structure. By integrating Radio Frequency Identification (RFID) technology with wireless charging capabilities, the system not only enhances user experience but also promotes environmental sustainability. One key feature of the system is its security and efficiency. Charging is initiated only when a valid RFID card is swiped, ensuring that only authorized users can access the charging facility. This helps prevent unauthorized usage and ensures that the system operates smoothly and efficiently. The system allows EV batteries to be charged using solar panels, tapping into renewable energy sources and reducing reliance on non-renewable energy. This not only reduces the carbon footprint of EV charging but also promotes the use of clean energy in transportation. The wireless charging capability of the system is facilitated by two copper coils one on the charging pad and the other integrated into the EV.

1. INTRODUCTION

The rise of electric vehicles (EVs) as a disruptive technology in transportation and energy has ushered in a new era of energy efficiency, environmental sustainability, and technology outcomes. Electric cars, powered by electricity stored in onboard batteries, are a great alternative to traditional internal

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combustion engine cars and bring many benefits to people and the world. Global interest in electric vehicles continues to grow due to concerns about air pollution, climate change, and energy security, with demand for electric vehicles becoming increasingly effective. This study expands on the motivation behind the development of consumer electronics in trucks, addressing key concepts such as benefits, environmental impact, economics, technological advancement, and policy considerations. The transition to electric vehicles represents a revolution in transportation, and electric vehicles will play an important role in reducing household emissions, reducing pollution, and solving transportation problems. The energy efficiency of electric vehicles, combined with advances in battery technology and renewable energy connections, enables them to achieve significant benefits in transportation, being clean and green. However, widespread adoption of EVs depends on energy efficiency and availability, demonstrating an urgent need for consumer electronics that can meet these needs, differentiate between EV owners, and facilitate connected charging.

Electrification is another important reason why consumers are paying for electric vehicles. Optimizing the charging process to reduce energy consumption, increase charging, and extend battery life is crucial for the long-term support of electric vehicles. Smart payment algorithms, smart grid integration, and robust load management strategies play an important role in achieving energy savings while balancing grid stability, security (Muralikrishnan et al., 2020), and demand-side management goals. In addition, integrating renewable energy sources such as solar and wind energy (Vinayak Rangrao Patil, 2020) into electric vehicle charging further increases the sustainability of electric vehicles. Environmental factors also emphasize the importance of user-friendly electric vehicle charging systems. By encouraging the use of electric vehicles and reducing dependence on fossil fuel-powered vehicles, consumers are spending money to help improve air quality, reduce noise, and protect the environment. Analysis of the electrical life cycle, including supply, production, vehicle operation, and end-of-life repair, highlights the importance of the need to manage the business. Integrating safety standards into the design, operation, and management of the charging system makes the electric vehicle a valuable contribution to global efforts to reduce climate change and achieve carbon neutrality targets.

Business and consumer preferences are driving the evolution of consumer electronics. Understanding the needs, preferences, and behaviors of electric vehicle owners and potential customers is essential to creating solutions that meet customer needs, increasing and improving the overall user experience. Factors such as affordability, charging options, charging speed, interoperability, network coverage, and convenience will influence consumers' decisions and behaviors to use electric vehicles. Therefore, promote collaboration between business partners, policy makers, service providers, technology developers, and end users to create energy- and user-centric charging infrastructure to adapt to the changing market of electric vehicles. Technological advances in electric vehicle charging, including charging technology, wireless charging solutions, vehicle-to-grid integration (V2G), and smart payment features, help improve the customer experience. Fast charging can quickly top up electric car batteries, shorten charging time, and make it more convenient for users. Wireless charging solutions simplify the charging process and make it easier for users by eliminating the need for physical cables and connectors. V2G integration allows electric vehicles to interact with the grid, provide grid services, improve energy efficiency, and support bidirectional energy use. Smart payment can instantly monitor, control, and optimize the payment process based on the grid, energy costs, customer preferences, and power outages, thereby improving overall performance and user satisfaction. Policy decisions and administrative procedures also play an important role in the payment process. Encouraging the widespread use of electronic devices for charging vehicles. Government grants, subsidies, tax credits, and regulations encourage investment in

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