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Smart Card Based Electric Vehicle Charging Station

Dr. Manoj Dhondiram Patil[1], Mr. Suraj More[2], Mr. Pranav Patil[3], Mr. Rohit Mortale[4], Miss. Komal Khot[5]
Associate Professor, Department of Electrical Engineering[1]
UG Students, Department of Electrical Engineering[2,3,4,5]
Annasaheb Dange College of Engineering & Technology, Ashta, Sangli, Maharashtra, India

Abstract: *The development of cost-effective green vehicle technology, such as electric vehicle has been prompted by the need for a cleaner environment. As the number of electric vehicle (EVs) on the road rises, charging infrastructure becomes increasingly important. The electric vehicle charging system has a number of issues, including ways to improve its operation and efficiency and a better understanding of current EV charging habits. As a result, this paper employs RFID (radio frequency identification) technology, which allows users to be automatically identified. Electromagnetic waves are used to transmit and receive data from users in this technology.*

Keywords: RFID, Electric Vehicle, Microcontroller, and Charging Station

I. INTRODUCTION

The Internet of Things, also known as things-linked internet, is a network that connects any object to the internet via RFID (radio frequency identification), infrared sensors, and other sensing devices, allowing data exchange and communication. This paper discusses the technical advantages of RFID technology for identifying electric vehicles and managing the entire battery charging compartment, as well as how RFID technology is used in battery charging stations. Because of these advantages, RFID technology can better serve the electric vehicle industry and support effective battery charging compartment management. Electric vehicle charging stations have begun to be installed in many areas, but they are not yet complete.

II. METHODOLOGY

2.1 Block Diagram

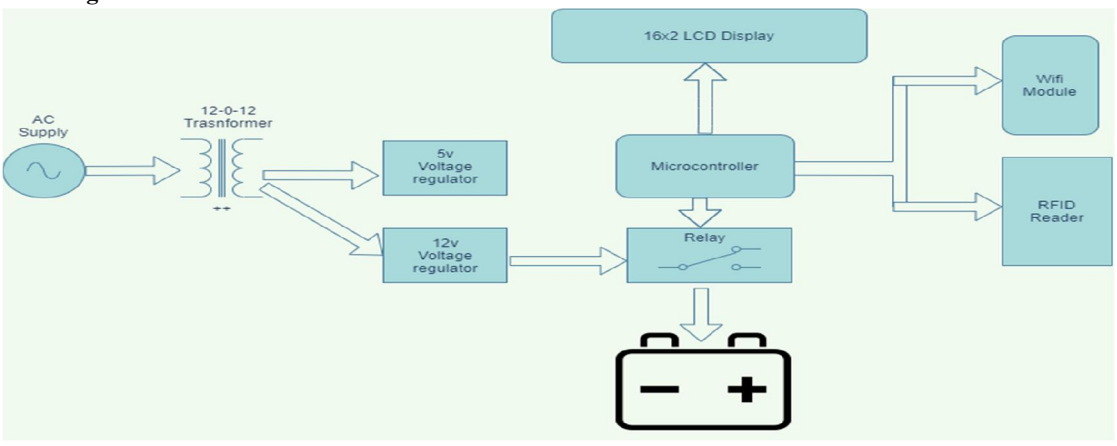

Figure 2.1: Block Diagram

The working model of an electric vehicle charging station consists of a transmitter with encoder, receiver with decoder, microcontroller, power supply circuit, and a set of relays. Users who want to charge their vehicles carry the transmitter, which has a variety of push buttons. The 8051 microcontroller is in charge of relay switching. The data was transmitted and

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received by the RF module after the user pressed the button. 2. When different push buttons are pressed, the microcontroller is programmed to connect the charger to the electric vehicle for a specific amount of time before disconnecting it.

2.2 Design Components

2.2.1 RF Module Technology

They must work over a certain distance with a certain amount of data within an information rate, which is the movement speed of the RF module; and they must work over a certain distance with a certain amount of data within an information rate, which is the movement speed of the RF module. The RF modules are small and can work with a wide range of voltages. For instance, 3V to 12V. The RC522 RFID module, which is based on the NXP MFRC522 IC and costs less than four dollars, is one of the most cost-effective RFID options available online. Typically, a 1KB memory RFID card tag as well as a key coxcomb tag are included. The best part is that it can hide messages and data from cycles using tags.

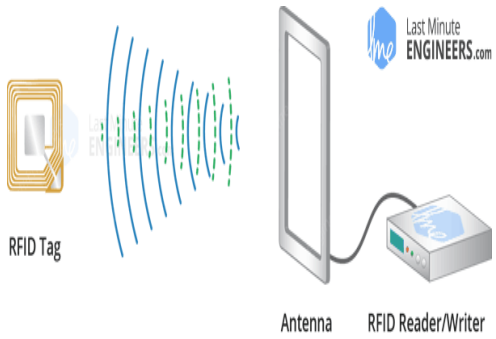

Figure 2.2.1: RF Module Technology

2.2.2 Voltage Controller

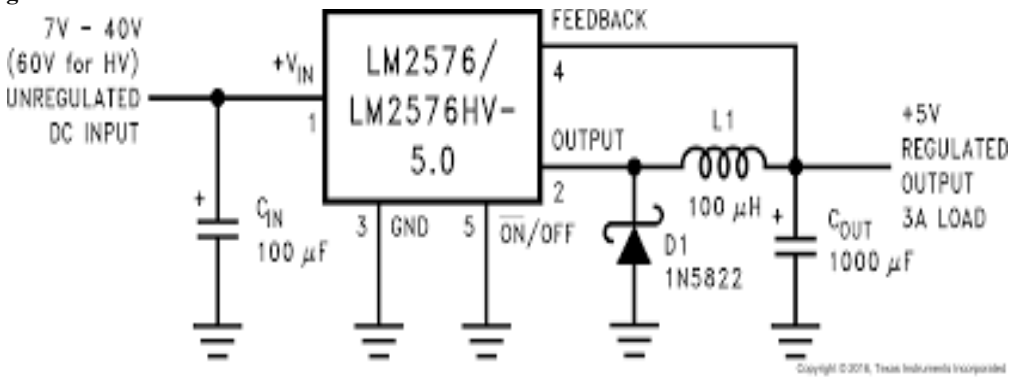

Figure 2.2.2: Voltage Controller

The LM2576 controllers are well-suited to the creation of a simple and cost-effective stepdown switching controller (buck converter). The 80 A reserve current is highlighted by the outside closure (2 percent of the time between 0 and 125 degrees Celsius) (standard). The result switch includes cycle-by-cycle current restriction as well as warm closure for complete assurance in the event of a short circuit. A 3.0 A heap with a lovely line and a burden guideline can be driven by any of the circuits in this series. When used with specified input voltages and result load conditions, the LM2576 has a guaranteed 4 percent yield voltage capacity as well as a 10% oscillator capacity.

2.2.3 Relay

At least one contact arrangement, a flexible iron armature, a profoundly (a solenoid), and an iron burden that provides a low-hesitance transition (there are two contacts in the transfer envisioned). The armature pivots around the load, and at least one set of moving contacts is meticulously connected to it. Because the armature is held in place by a spring, an air hole appears in the attractive circuit when the transfer is turned off. In this state, one of the planned transfer's two contact

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arrangements is closed, while the other is open. Depending on their capacity, different transfers may have more or less contact arrangements. A wire is also attached to the transfer in the image.

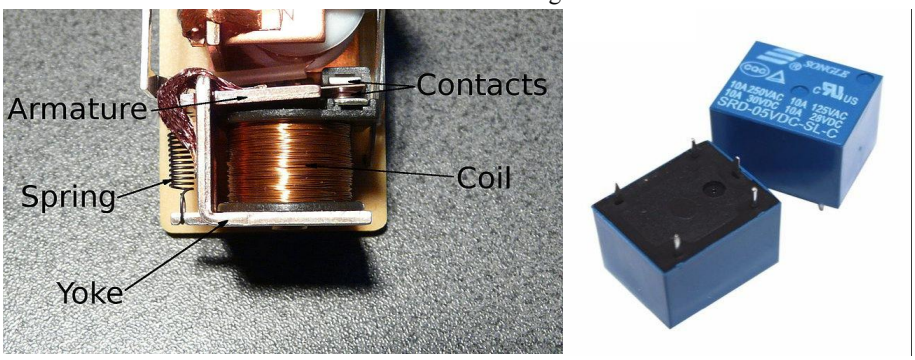

Figure 2.2.3: Relay

2.2.4 Microcontroller ATmega328P

The ATmega328/P is an 8-cycle CMOS microcontroller from Atmel that features AVR® upgraded RISC engineering. The ATmega328/P achieves throughputs near 1MIPS per MHz by executing strong directions in a single clock cycle. This activates a framework that prioritises power consumption reduction over processing speed.

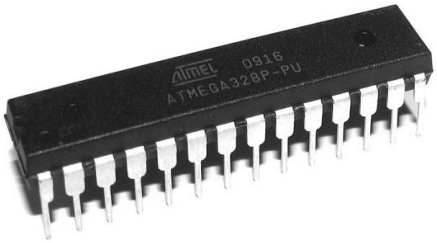

Figure 2.2.4: Microcontroller ATmega328P

The Arduino UNO Microcontroller- It's important to remember that your programme is run by a microcontroller on the Arduino board. If you already know this, you won't use the standard nonsense that "Arduino is a microcontroller" in the future. The ATmega328 microcontroller is the primary regulator in the Arduino UNO R3. The ATmega328 is an AVR 8-bit MCU, which means it has information transport engineering and interior registers that can handle eight identical data signals. There are three types of memory in the ATmega328:

- Nonvolatile memory of 32 KB (streak memory) Your applications will be saved here, so you won't have to transfer them every time.
- SRAM memory: unreliable memory of 2 KB. This is where the variables of the application are saved while it is running.
- EEPROM memory: nonvolatile memory of 1 KB This can be used to save data that needs to be accessed regardless of whether the board is on or off.

2.2.5 Wi-Fi Module

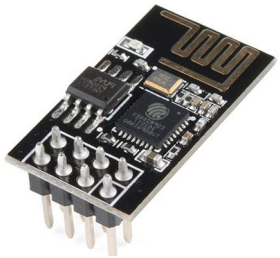

Figure 2.2.5: Wi-Fi module

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Express if Systems, based in Shanghai, developed the ESP8266, a low-cost Wi-Fi central processor with a full TCP/IP stack and microcontroller capacity. The ESP8285 is a single-chip device that uses an ESP8266 with 1 MB of underlying glimmer to connect to Wi-Fi.

III. Results and Discussion

The table below shows how long it takes to charge a battery and how much it costs. As the charging time in minutes increases, the cost rises. For ten minutes of charging, it costs ten rupees. Similarly, the cost rises as the charging time increases.

Table 1: Battery Charging Analysis

Sr. no	Battery Charging Time in minutes	Cost in Rs.
1.	10 min	10 Rs
2.	20 min	20 Rs
3.	30 min	30 Rs

1. We scan the QR code first, which recognises the card automatically, and then the user by username

Figure 3a: Display Menu

Figure 3b: User Profile

2.The system will then work as expected, displaying the time it will take to charge the battery.

Figure 3c: Cost per Consumption

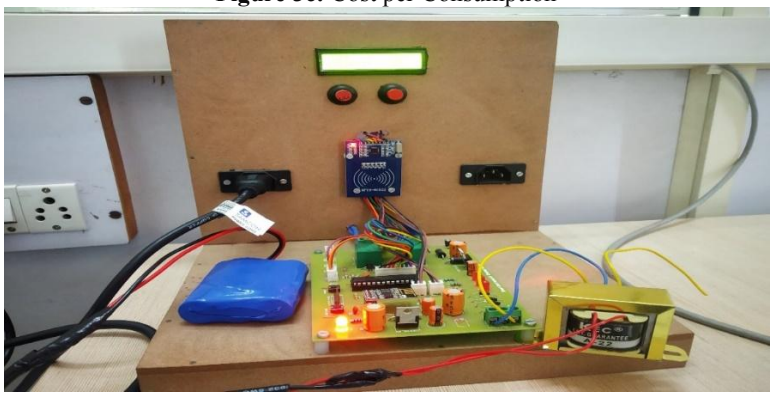

Figure 3d: System Setup

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The model's entire working setup is depicted in the image above. A smart card based electric vehicle charging station is made up of RFID, transformer, battery, microcontroller, wi-fi module, capacitors, LEDs, ports, and other components.

IV. Conclusion

Using a microcontroller, relays, and an RF module, we created a simple charging station for electric vehicles that can enable charging for the user's vehicle. This RFID charging station authorization system makes charging at a charging station simple and convenient for a user. By allowing charging authorization to happen automatically when an EV arrives, the proposed system outperforms the current system. This method reduces operation time by incorporating an RFID system at the charging station, which allows for automatic user authorization. This system will have a long operating range due to the RF transmitter and receiver.

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