ATMEGA CONTROLLER BASED SOLAR WIRELESS ELECTRIC VEHICLE CHARGING

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Abstract-

Electric vehicles can be charged using the Atmega solar-based EV charger, which uses solar energy as its main energy source. The Atmega microcontroller, which manages the power management system and the charging process, is the system's foundation. The charger collects solar energy from photovoltaic (PV) panels and stores it in a battery bank for later use. The system has a user interface as well, which shows the charging state and gives the user control over the charging procedure. The safety of the car and the charging system are both guaranteed by the charger's inclusion of safety features, including over-voltage and over-current prevention. Electric vehicle charging in remote places can be done using the Atmega solar-based EV charger, which is both affordable and sustainable. The current method allows the EV to charge at the wireless charging station as well as while moving in case the system runs out of charge.

Keywords—IoT, misting method.

I. Introduction

The Atmega Solar-Based EV Charger is a sophisticated charging system designed to charge electric vehicles using solar energy. It is built around the Atmel Atmega328 microcontroller and incorporates a number of advanced features to ensure efficient and reliable charging.

The charger is designed to work with a range of electric vehicles, and its charging output can be adjusted to suit the requirements of different vehicles. It uses a high-efficiency DC-DC converter to convert the solar energy into the required charging voltage and current and a sophisticated charging algorithm to ensure that the battery is charged safely and efficiently.

The Atmega Solar-Based EV Charger is also equipped with a range of safety features, including overvoltage and overcurrent protection, as well as short-circuit protection. It is designed to be rugged and durable, making it suitable for use in a range of different environments.

In terms of technical specifications, the Atmega Solar-Based EV Charger is capable of charging electric vehicles with a voltage range of 24-48VDC and a current range of up to 20A. It is designed to operate with solar panels with a maximum power output of 500 watts and has a maximum charging efficiency of 95%. Overall, the Atmega Solar-Based EV Charger is a highly advanced and reliable charging system that provides a sustainable and cost-effective solution for electric vehicle charging.

Atmega solar-based EV chargers are an interesting area of work that involves the integration of several technologies, such as microcontroller programming, power electronics, and renewable energy. Here are some potential areas of work related to this field:

Solar panel and battery selection: The performance of the EV charger depends on the efficiency and capacity of the solar panels and batteries used in the system. As a developer, you need to select the appropriate solar panels and batteries based on factors such as the EV's location, charging requirements, and energy consumption.

Microcontroller programming: The microcontroller is the heart of the EV charger system. You need to develop software that controls the charging process, monitors the battery voltage and temperature, and regulates the power flow to the EV. You may also need to incorporate communication protocols such as CAN or Ethernet to communicate with the EV and other devices.

Power electronics: The power electronics in the EV charger system include components such as DC-DC converters, inverters, and voltage regulators. You need to design and optimize these components to ensure efficient power transfer and protection of the EV and the charging system.

System integration and testing: Once you have designed and developed the individual components of the system, you need to integrate them and test the complete system for performance, reliability, and safety. This may involve testing the system under different environmental conditions, charging profiles, and loads.

Regulatory compliance: The EV charger system must comply with various regulatory standards and certifications, such as UL, CE, and FCC. You need to ensure that the system meets these requirements and obtain the necessary approvals before deploying it.

Overall, working on a solar-based EV charger system is a challenging and rewarding experience that requires a multidisciplinary approach and a strong understanding of various technologies.

A. Background

The Atmel AVR Microcontroller, specifically the Atmega series, has been a popular choice for hobbyists and engineers in creating solar-powered electric vehicles (EV) since the mid-2000s.

The Atmega series was introduced by Atmel Corporation in 1996 as a low-power, high-performance 8-bit microcontroller. It was designed to be easy to use, and it had a wide range of applications, including automotive, industrial control, and consumer electronics.

In the mid-2000s, with the increasing interest in renewable energy and sustainable transportation, hobbyists and engineers began experimenting with using Atmega microcontrollers in solar-powered EVs. They used the microcontroller to control the motor, battery charging, and other components of the EV.

One notable project was the Sun Chaser," a solar-powered electric vehicle, which was built by students at the University of Minnesota in 2006. The vehicle used an Atmel Atmega32 microcontroller to control the motor and solar panels and was able to reach a top speed of 30 mph.

Since then, there have been many other projects and designs that use Atmega microcontrollers in solar-powered EVs. These include the "Solar Bug" by Solar botics, the "Sunny Buddy" solar charger by Spark Fun Electronics, and the "Sun Eagle" solar-powered aircraft by AeroVironment.

Today, the Atmega series has been largely replaced by newer and more powerful microcontrollers, such as the Atmel SAM series and the Arduino boards, but its legacy lives on in the many solar-powered EVs that were built using Atmega microcontrollers.

B. Related Work

An Overview of the systems that are currently in place in this domain was done before the project began. The work of eminent researchers is carefully surveyed, and an excerpt from that work is presented here in a review of the literature.

Bugatha Ram Vara Prasad et al [1] A solar wireless electric vehicle charging system is a technology that allows electric vehicles to be charged through the wireless transfer of energy from solar panels. The system eliminates the need for cables and can provide a convenient and environmentally friendly way to charge electric vehicles.

V. Sagar Reddy, Gujjala Ramya, V. Moneesh Reddy [2] The paper proposes a time-horizon-based model predictive control (MPC) approach for volt/var optimisation in smart grids with electric vehicle (EV) charging loads. The proposed method considers a time horizon of 24 hours for optimisation and incorporates EV charging loads in the optimisation process.

Dr. R. Natarajan's [3] work focuses on the development of a smart electric bulk charging system for electric vehicles using renewable energy sources such as solar and wind power. The system aims to reduce the carbon footprint of transportation and increase the accessibility of electric vehicles by providing a reliable and efficient charging solution.

Haddy Prasetya Susanto [4] designed a power bank for mobile devices that utilizes a solar panel and is controlled by an Atmega 328 microcontroller. The device can charge mobile devices using solar energy, and the microcontroller ensures efficient charging and prevents overcharging.

The first paper proposes a time-horizon-based model predictive control approach for volt/var optimization in smart grids with electric vehicle charging loads. The second paper focuses on the development of a smart electric bulk charging system for electric vehicles using renewable energy sources. Finally, the third paper discusses the design of a solar-powered power bank for mobile devices that is controlled by a microcontroller to ensure efficient charging and prevent overcharging.

II. Methodology

The steps listed below can be used to create a methodology for Atmega controller-based solar EV charging:

Define the criteria: Specifying the system's needs is the initial stage. This contains the battery bank size, the maximum charging time, and the maximum power rating of the EV charger

Create the circuit: Create a circuit for the Atmega controller-based solar EV charging system based on the specifications. This entails picking the proper parts, such as the Atmega microcontroller, battery, charger controller, and solar panel.

Creating the software Create the Atmega microcontroller's software. This contains the program that manages the charging procedure, checks the voltage and current of the battery, and communicates with the EV.

System evaluation: the Atmega controller-based test.

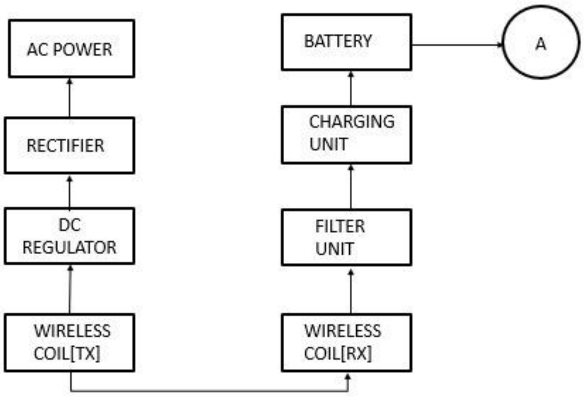


Fig 2.1: Block diagram for the wireless charging station

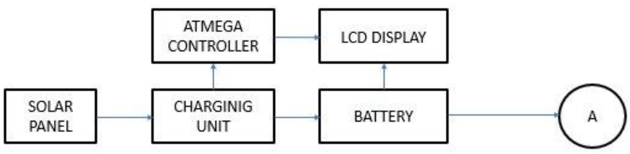


Fig 2.2: Block diagram for charging while in motion.

The system uses a solar panel, battery, transformer, regulator circuitry, copper coil, AC to DC converter, Atmega controller, and liquid crystal display to power the gadget. The device demonstrates how electric vehicles can be charged while moving on the road, eliminating the need to stop for charging. The solar panel is used to power the battery through a charge controller. The battery is charged and stores DC electricity. The AC power is then converted to DC for transmission using a rectifier. The power is regulated using a regulator circuitry and used to power the copper coils for wireless electricity transmission. The solar panels are photovoltaic panels that convert sunlight into electrical energy that can be used to recharge EV batteries, and the voltage value is displayed on the LCD.

Fig 2.1 shows the block diagram of the wireless charging station. This system uses solar energy to produce and store the electricity. The EV can be charged wireless with the help of transmitting and receiving coils. The coils charge by electromagnetic induction. Further this current is used to move the EV.

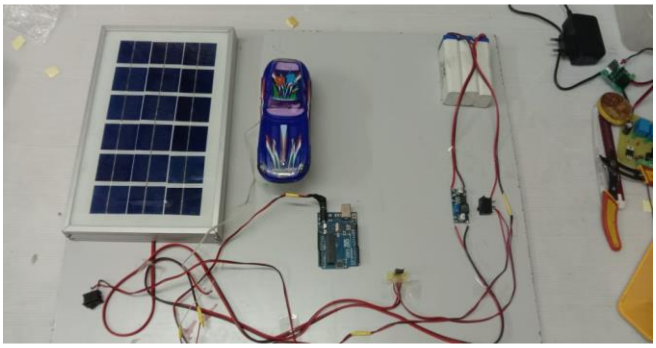
Fig 2.2 shows the block diagram of the system which is used to charge the EV while moving. This block is inserted above the EV, so the solar panel generates the power and it is stored in the battery.

This system enables us to first charge the system at the charging station as well as while the EV is in motion.

III. RESULT

Charging efficiency: Report the charging efficiency of the system. This could be measured as the percentage of energy transferred wirelessly from the charging pad to the vehicle's battery.

Charging time: Report the charging time required to fully charge the electric vehicle using the wireless charging system. Compare this with the charging time required using conventional charging methods.



Energy generation: Report the amount of energy generated by the solar panel(s) used in the system. You could also report the efficiency of the solar panel(s) in converting sunlight into electrical energy.

Wireless charging distance: Report the maximum distance between the charging pad and the electric vehicle within which wireless charging is possible. You could also report any factors that influenced the charging distance, such as the orientation of the charging pad or the presence of obstacles.

Controller performance: Report the performance of the ATMEGA controller in managing the charging process. This could include how well the controller regulated the charging current, monitored the battery state-of-charge, and communicated with the charging pad.

Overall system performance: Finally, summarise the overall performance of the system in terms of its ability to wirelessly charge an electric vehicle using solar energy. You could also compare the performance of your system with other existing wireless EV charging solutions.

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