International Journal of Research Publication and Reviews, Vol 5, no 3, pp 3523-3527 March 2024

WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Dynamic Wireless Charging Station Using Solar

[1]Pooja Waghadhare, [2]Dhiraj Ghait, [3] Prof Ashwini Walde

[1,2,3]Department of EE, NIETM, Nagpur, India

ABSTRACT:

Wireless power transfer (WPT) using magnetic resonance is the technology which could set human free from the annoying wires. In fact, the WPT adopts the same basic theory which has already been developed for at least 30 years with the term inductive power transfer. WPT technology is developing rapidly in recent years. At mill watts to kilowatts power level, the power transfer distance increases from several millimetres to several hundred millimetres with a load efficiency above 90%. The advances make the WPT very attractive to the electric vehicle (EV) charging applications in both stationary and dynamic charging scenarios. This seminar represents the technologies in the WPT area applicable to EV wireless charging. By introducing WPT in EVs, the obstacles of charging time, range, and cost can be easily mitigated. Battery technology is no longer relevant in the mass market penetration of EVs. It is hoped that researchers could be encouraged by the state-of-the-art achievements and push forward the further development of WPT as well as the expansion of EV.

Introduction:

Road transportation is the majorly used transportation in the entire world. Usage of the car has drastically increased and the need for petrol and diesel has increased. So recently, Electric vehicles (EVs) are becoming popular, as they decrease reliance on fossil fuels and reduce greenhouse emissions. The problem of the Electric Vehicle is nothing else but the electricity storage technology, which is the major drawback today due to its unsatisfactory energy density, limited lifetime, and high cost. So, our project proposes a novel idea to charge the Electric vehicle wirelessly through the inductive power transfer principle using the transmitting and receiving coil while simultaneously decreasing the battery size and improving the convenience and without the requirement of the cable. The electric vehicle can be charged both by the static wireless power transmission (SWPT) and dynamic wireless power transmission (DWPT) method.

Objectives:

The specific objectives of the project include:

Designing and testing different configurations of the copper coils to optimize the wireless power transfer efficiency.

Selecting and integrating the appropriate wireless power transfer technology into the system, such as inductive or resonant coupling.

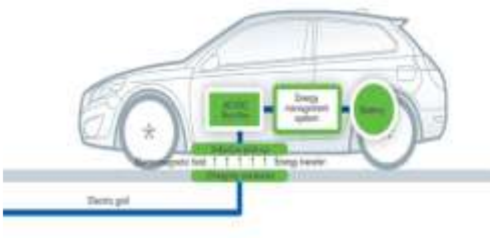
Developing an Arduino Nano-based control system that manages the power transfer and displays the battery percentage of the EV on a 16x2 LCD display.

Building a functional prototype of the wireless charging system that demonstrates its capability to wirelessly charge an EV on the road and display the battery percentage on the LCD display.

Conducting tests to evaluate the performance of the wireless charging system, including its efficiency, safety, and reliability.

Analysing the test results and refining the design to improve the system's performance, efficiency, and safety.

Creating a final report that summarizes the design and testing process, the performance of the wireless charging system, and any recommendations for future improvements.



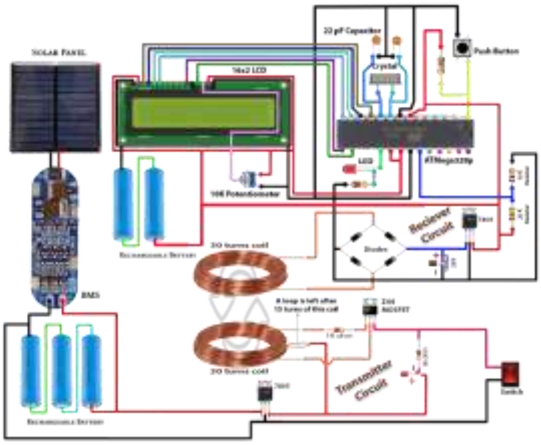
Literature Review

A centralized electrical vehicle (EV) recharge scheduling system for parking lots is developed by [7]. This system based on the realistic vehicular parking pattern which focus on individual parking slot. It considers two types of EV based on their mobility. One is regular EVs and another is irregular EVs. Electrical Vehicles require sufficient time for charging. This paper suggests a PLRS system which notices arrival and departure time of vehicle, battery state of EV, distance travelled by it. Then system deigns its own schedule of charging for EVs. This system works for day and night time period. This system contributes to increase the number of recharged Electrical Vehicles as well as parking lot revenues. Proposed system has two layered PLRS system for recharging EVs based on parking patterns of these vehicles.

[8] presented a review on Intelligent Wireless Charging Station for Electric Vehicles, induction or magnetic coupling techniques are suitable methods in WPT, for EV charging. In this study, an intelligent WPT system is introduced and simulated to charge EV. The charging process is proscribed by misalignment, innovative method is required to improve flexibility of the EV wireless charging. using finger print method, this technique is able to align transmitting coil with receiving coil automatically. Proposed system is able to save required time, minimize mistakes done by human, minimize use of energy and also able to charge car based on real time information about system.

Another approach to Electrical Vehicle (EV) charging scheduling problem is presented by [9]. This paper studies charging problem under a parking garage which involves total use if time. When EV arrives at entrance of garage it takes information such as arrival time, suggested departure time, current and required battery SOCs and garages charging management system (CMS). This CMS able to take decision about to admit or to decline the customers charging requirement. It manages the required power supply based on the decision. After completion

Circuit Diagram



Software Requirements

Arduino IDE

The Arduino Integrated Development Environment (IDE) is the main text editing program used for Arduino programming. It is where you'll be typing up your code before uploading it to the board you want to program. Arduino code is referred to as sketches.

Figure 1: Arduino IDE

MAJOR HARDWARE COMPONENTS

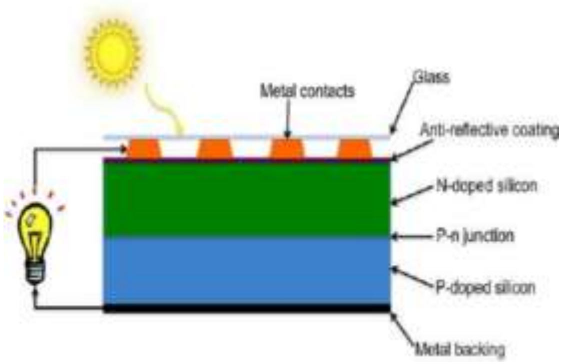
ATMega328p microcontroller IC

ATMEGA328P is high performance, low power controller from Microchip. ATMEGA328P is an 8-bit microcontroller based on AVR RISC architecture. It is the most popular of all AVR controllers as it is used in ARDUINO boards.

The Atmel 8-bit AVR RISC-based microcontroller combines 32 KB ISP flash memory with read-while-write capabilities, 1 KB EEPROM, 2 KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per MHz.

Solar Panel: Solar panels are devices that convert light into electricity. A solar panel is a collection of solar cells. Lots of small solar cells spread over a large area can work together to provide enough power to be useful. The more light that hits a cell, the more electricity it produces.

Solar Photovoltaic (PV) is a technology that converts sunlight (solar radiation) into direct current electricity by using semiconductors. When the sun hits the semiconductor within the PV cell, electrons are freed and form an electric current.

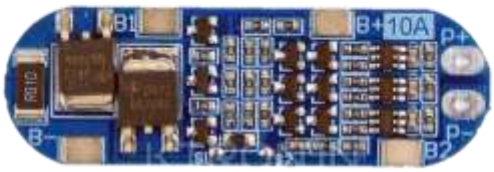


Battery Management System (BMS)

A battery management system (BMS) is any electronic system that manages a rechargeable battery (cell or battery pack), such as by protecting the battery from operating outside its safe operating area.

A BMS may monitor the state of the battery as represented by various items, such as:

- ✓ Voltage: total voltage, voltages of individual cells, or voltage of periodic taps
- ✓ Temperature: average temperature, coolant intake temperature, coolant output temperature, or temperatures of individual cells
- ✓ Coolant flow: for liquid cooled batteries
- ✓ Current: current in or out of the battery
- ✓ Health of individual cells
- ✓ State of balance of cells

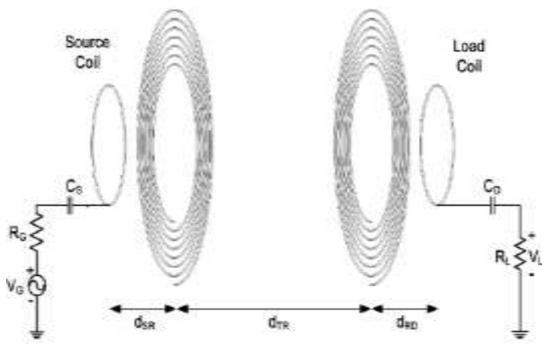


Rechargeable Battery:

A rechargeable battery, storage, secondary battery, or accumulator is a type of electrical battery which can be charged, discharged into a load, and recharged many times, while a non-rechargeable or primary battery is supplied fully charged, and discarded once discharged. Several different combinations of electrode materials and electrolytes are used, including lead – acid, nickel cadmium (NiCd), nickel metal hydride (Ni-MH), lithium ion (Li-ion), and lithium-ion polymer (Li-ion polymer).

Copper Coil

The wireless power transmission can be defined as, the energy can be transmitted from the transmitter to a receiver through an oscillating magnetic field.AC current back into DC current, that becomes working power..



Conclusion

The conclusion of building a wireless charging prototype for electric vehicles using multiple copper coils and an ATMega Microcontroller control system is that the technology has the potential to offer a practical and efficient alternative to traditional charging methods for EVs. The prototype successfully demonstrated the capability of wirelessly charging an EV while driving on a road with multiple copper coils. The use of an ATMega Microcontroller based control system also allowed for easy monitoring of the battery percentage through a 16x2 LCD display.

However, the prototype also highlighted some potential areas for improvement. For example, the efficiency of the wireless charging system could be further optimized, and the technology would need to be scaled up for commercial use. Additionally, safety and regulatory considerations would need to be considered before the technology could be implemented on public roads. Overall, the prototype provides a promising starting point for further research and development of wireless charging technology for electric vehicles and offers a glimpse into the future of sustainable transportation.

Future Scope

Some potential recommendations for future improvements or advancements of your project could include:

Increasing the efficiency of the wireless charging system

Scaling up the charging system for commercial use:.

Exploring alternative power sources:

Integrating with autonomous vehicle technology:

Improving the user interface:

REFERENCES

[1]. Supriyadi, Edi Rakhman, Suyanto, Arif Rahman and Noor Cholis Basjaruddin, "Development of a Wireless Power Transfer Circuit Based on Inductive Coupling, "TELKOMNIKA, Vol.16, No.3, June 2018, pp. 1013~1018

[2]. Govind Yatnalkar and Husnu Narman, "Survey on Wireless Charging and Placement of Stations for Electric Vehicles, "Conference: 2018 IEEE International Symposium on Signal Processing and Information Technology (ISSPIT), December 2018

[3]. N. uthaya Banu, U. Arun Kumar, A. Gokula Kannan, M.K. Hari Prasad and A.B. Shathish Sharma, "Wireless Power Transfer in Electric Vehicle by Using Solar Energy, " Asian Journal of Electrical Sciences, Volume 7, Issue 1, January-June 2018

[4]. Md M. RANA, WEI XIANG, Internet of Things Infrastructure for Wireless Power Transfer Systems, IEEE Access, volume 6, pp.19295-19303, 24 Jan 2018.IEEE

[5]. Julian Timpner, Lars Wolf, A Back-end System for an Autonomous Parking and Charging System for Electrical Vehicles, International Electrical Vehicle Conference Greenville, SC, USA IEEE 2012

[6]. Mehmet Sukru Kuran, Aline Carnerio Viana, Luigi Iannone, Daniel Kofman, Gregory Mermound, Jean P. Vasseur, A Smart Parking

[7]. Adilet Sultanbek, Auyez Khassenov, Yerassyl Kanapyanov, Madina Kenzhegaliyeva, Mehdi Nagheri, Intelligent Wireless Charging Station for Electrical Vehicles, International Siberian Conference on Control and Communication, 2017, IEEE

[8]. Zhe Wei, Yue Li, Yongmin Zhang, Lin Cal, Intelligent Parking Garage EV Charging Scheduling Considering Battery Charging Characteristic, IEEE Transaction on Industrial Electronics, Vol 65, 3 March 2018

[9]. Sahil Rupani, Nishant Doshi, A review on smart parking using internet on things (IOT), The 3rd International Workshop on Recent advances on Internet of Things: Technology and Application Approches (IoT-T&A 2019) Nov 2019, Coimbra, Portugal.