CARITAS UNIVERSITY AMORJI-NIKE, EMENE, ENUGU STATE
Caritas Journal of Physical and Life Sciences
CJPLS, Volume 3, Issue 1 (2024)
Article History: ***Received: 11th July, 2024 Revised: 29th July, 2024 Accepted: 1st August, 2024***

SOLAR WIRELESS ELECTRIC VEHICLE CHARGING SYSTEM

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Abstract
This paper controller and LCD to develop the system, The system demonstrates how electric vehicles can any wires, No need to stop for charging, the vehicle charges while moving, Solar power a solar panel, battery, transformer, regular circuitry copper coils, AC to DC converter, at mega integrated is the road. The solar panel be charge the electric vehicle while moving on the road, eliminating the need to stop charging. Thus the system demonstrates a solar- powered wireless charging system for electric vehicles that can be described the design of solar-powered charging station for charging of electric vehicle describes the design of solar-powered charging station for charging electric vehicles that solves the key downside of fuel and pollution. Electric vehicles have now hit the road worldwide and are slowly growing in numbers. Apart from environmental benefits electric vehicles have also proven helpful in reducing the cost of travel by replacing fuel with way cheaper electricity. Well, here we develop an EV charging system that solves a unique innovative solution. This EV charging of vehicles without any wires, No need to stop for charging, the vehicle charges while moving, Solar power for keeping the charging system going, and No external power supply is needed. The system makes use of a solar panel, battery, transformer, regulator circuitry, copper coils, AC to DC converter, ATMEGA 328pu controller and LCD to develop the system. The system demonstrates how electric vehicles can be charged while moving on the road, eliminating the need to stop charging. Thus the system demonstrates a solar-powered wireless charging system for electric vehicles that can be integrated with the road. Furthermore, it is clear that solar wireless charging systems have the potential to improve energy efficiency, reduce carbon emissions and provide convenient charging experience for users.

Keyword: ***Atmega 328PU controllerR, AC to Econverter, LCD display, CD 40471C, Regulator Circuitry, Transformer***

Introduction

Electric Vehicles (EVs), represent a new concept in the transport sector around the world. It is expected that the market share of EVs will exponentially grow, comprising 24% of the U.S. light vehicle fleet in 2030, representing 64% of light vehicle sales this year. In this context, EVs battery charging process must be regulated to preserve the power quality in the power grids. Nevertheless, with the proliferation of Evs, a considerable amount of energy will be stored in the batteries, raising the opportunity for energy flow in the opposite sense. In the future of smart grids, interactivity with EVs will be one of the key technologies, contributing to the power grid's autonomous operation. The concept of the onboard bidirectional charger with V2G and V2H technologies is introduced.

The electric vehicle has become more competitive when compared to the conventional internal combustion engine vehicle due to lower carbon dioxide emissions and raising fossil fuels. However, the EV was not widely adapted to the market due to some limitations such as high vehicle cost. Limited charging infrastructure and limited all-electric drive. EVs are vehicles that are either partially or fully powered by electric power. Electric vehicles have low running costs as they fewer moving parts for maintenance and are also very environmentally friendly as they use little or no fossil. One of the significant advantages of the solar wireless charging system is its flexibility and convenience. Users can place their devices on or near the charging module without the need for physical connections or cables. This eliminates the hassle of dealing with tangled wires and allows for effortless charging on the go. Additionally, the system can be integrated into various environments such as homes, offices, public spaces, and even vehicles, making it versatile and adaptable to different charging needs.

Moreover, the integration of solar power makes the charging process eco-friendly and sustainable. By utilizing clean and renewable energy from the sun, the system reduces carbon emissions and helps mitigate the environmental impact associated with traditional electricity generation methods. However, it's important to note that the efficiency of solar wireless charging systems can vary based on factors such as the quality of solar panels, distance between the transmitter and receiver, and environmental conditions. Optimization and advancements in technology are continuously being made to improve the efficiency and reliability of these systems.

An electric vehicle (EV) is a vehicle that uses one or more electric motors or traction motors for propulsion. An electric vehicle may be powered through a collector system by electricity from off-vehicle sources or may be self-contained with a battery, solar panels, fuel cells or an electric generator to convert fuel to electricity. EVs include, but are not limited to, road and rail vehicles, surface and underwater vessels, electric aircraft and electric spacecraft. EVs first came into existence in the mid-19th century, when electricity was among the preferred methods for motor vehicle propulsion, providing a level of comfort and ease of operation that could not be achieved by the gasoline cars of the time. Modern internal combustion engines have been the dominant propulsion method for motor vehicles for almost 100 years, but electric power has remained common place in other vehicle types, such as trains and smaller vehicles of all type

The objective of studying solar wireless electric charging systems can vary depending on the context and specific goals of the study. Here are a few possible objectives:

1. **Efficiency Analysis**: One objective could be to assess the efficiency and effectiveness of solar wireless charging systems in terms of energy conversion and charging performance. This involves analyzing factors such as energy loss during wireless power transmission, charging speed, and overall system efficiency.

2. **Technical Feasibility**: The objective could be to determine the technical feasibility of implementing solar wireless charging systems in various applications and environments. This may involve evaluating the compatibility of different electronic devices with wireless charging technology, assessing the scalability of the system, and identifying any technical challenges or limitations.

3. **Environmental Impact Assessment**: Another objective could be to evaluate the environmental impact of solar wireless charging systems compared to traditional wired charging methods. This includes assessing the reduction in carbon emissions, energy consumption, and the overall sustainability benefits of using solar power for wireless charging.

4. **User Experience and Acceptance**: The objective could be to study the user experience and acceptance of solar wireless charging systems. This involves analyzing user perceptions, preferences, and satisfaction with the convenience, reliability, and practicality of wireless charging compared to traditional wired charging methods.

5**. Economic Viability**: An objective could be to assess the economic viability of implementing solar wireless charging systems. This includes analyzing the cost-effectiveness of the technology, evaluating the return on investment, and identifying potential business models and revenue streams associated with the deployment of such systems.

6. **Technological Advancements**: The objective could be to explore and contribute to the advancement of solar wireless charging technology. This involves conducting research and development activities to improve system

efficiency, optimize wireless power transmission, enhance compatibility with a wide range of devices, or develop new charging protocols.

It's important to note that these objectives are not exhaustive, and the specific objective of a study may vary depending on the researcher's or organization's interests, available resources, and intended outcomes.

The scope of a study on solar wireless electric charging systems can encompass various aspects related to the technology, its implementation, and its impact. Here are some possible areas that can be included within the scope:

1. **Technology Assessment**: The study can focus on evaluating the technical aspects of solar wireless charging systems, including the efficiency of solar panels, wireless power transmission efficiency, charging speed, and compatibility with different electronic devices. It may also examine the reliability, durability, and safety aspects of the technology.

2. **Energy and Environmental Analysis**: The study can analyze the energy savings and environmental benefits of using solar power for wireless charging. This may involve assessing the reduction in carbon emissions, evaluating the environmental impact of manufacturing and disposing of charging components, and comparing the overall energy consumption of wireless charging systems with traditional wired chargers.

3**. Market Analysis**: The study can explore the market potential and adoption trends of solar wireless charging systems. This includes analyzing the current market landscape, identifying key players and their products, assessing consumer demand and preferences, and evaluating potential barriers to market penetration.

4. **User Behavior and Acceptance**: The study can investigate user behavior and acceptance of solar wireless charging systems. This may involve conducting surveys, interviews, or user studies to understand user perceptions, preferences, and adoption patterns. Factors such as convenience, reliability, charging speed, and cost can be considered in assessing user acceptance.

5. **Economic Feasibility**: The study can assess the economic feasibility of implementing solar wireless charging systems. This includes analyzing the cost of deploying the technology, comparing it with traditional charging infrastructure, and evaluating the potential cost savings and return on investment for different stakeholders.

6. **Policy and Regulatory Considerations**: The study can examine the policy and regulatory landscape surrounding solar wireless charging systems. This may include analyzing existing regulations, standards, and incentives related to renewable energy and wireless charging, and providing recommendations for policy development to promote the adoption of the technology.

7. **Case Studies and Applications**: The study can include case studies and real-world applications of solar wireless charging systems. This may involve analyzing successful implementation examples in different sectors, such as residential, commercial, public spaces, and transportation, and highlighting their benefits and challenges.

It's important to define the specific boundaries and objectives of the study to ensure a focused and achievable scope. The scope can be adjusted based on available resources, the research timeframe, and the desired outcomes of the study.

Limitations:

When conducting a study on solar wireless electric charging systems, several limitations should be considered. These limitations can arise from various factors, such as technological constraints, research scope, and available resources. Here are some potential limitations to keep in mind:

1. **Technological Limitations**: Solar wireless charging systems may still face technological challenges that can limit their performance and efficiency. Factors such as energy loss during wireless power transmission,

limited charging distance, and the need for alignment between the transmitter and receiver can affect the overall effectiveness of the system.

2. **Sample Size and Generalizability**: If the study involves user surveys, interviews, or experiments, the sample size and demographic representation may be limited, making it difficult to generalize the findings to a broader population. The study's results may be influenced by the specific characteristics and preferences of the participants.

3**. Time and Resource Constraints**: Conducting a comprehensive study on solar wireless charging systems may require substantial time, financial resources, and access to specialized equipment. These constraints can limit the scope and depth of the research, leading to certain aspects being overlooked or not thoroughly examined.

4. **Availability of Data and Information**: The study's findings may be influenced by the availability and accuracy of data and information related to solar wireless charging systems. Access to industry-specific data, proprietary information, or up-to-date research findings can be limited, impacting the completeness and reliability of the study.

5**. Environmental Factors**: The performance of solar wireless charging systems can be affected by environmental conditions such as weather, shading, and variations in sunlight intensity. These factors can introduce variability and uncertainties in the study's results, especially if the research is conducted over a limited time.

6**. Evolving Technology**: Solar wireless charging systems are still evolving, and new advancements and innovations are constantly being introduced. A study conducted at a specific point in time may not capture the latest developments in the field, and the findings may become outdated as technology progresses.

7**. Economic and Market Dynamics**: The economic feasibility and market potential of solar wireless charging systems can be influenced by various factors, such as fluctuating material costs, competing technologies, and consumer demand. These dynamic factors can introduce uncertainties and make long-term projections challenging.

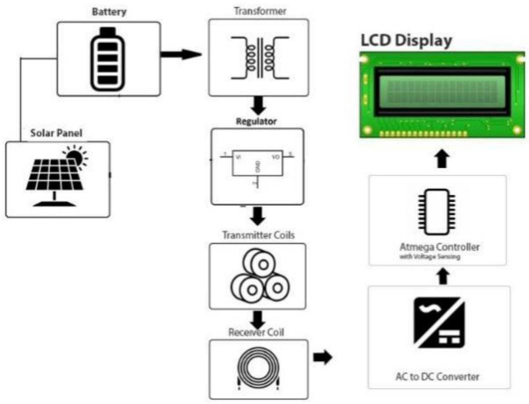
8. **External Factors**: The study's findings and recommendations may be influenced by external factors beyond the researcher's control, such as changes in government policies, regulations, or market dynamics. These factors can impact the feasibility and implementation of solar wireless charging systems.

Literature Review

Abhijith Nidmar et al (2019), has given the idea related to wireless charging by using solar. A solar panel is used for the supply. The direct current by using 555 timers and inductive coupling method is used for power transfer. Adel El-shahadat et al. (2019) have given knowledge about the essential requirements of electric vehicle charging and the various types of wireless charging methods compare to other methods, inductive power transfer has a great power transfer efficiency prototype for inductive wireless power transfer is detailed. A.M. Alsomali et al (2017) have detailed the strategies for charging electric vehicles pulse, width modulation which is used to step down the voltage to a constant level. To reduce the charging time, the time multiplexing method is us the time-time multiplexing method is a successful charging method by simulation.

BhuvaneshArulraj et al (2019) has given the idea of charging electric vehicle by using solar and wind system. Two separate batteries are used to store solar energy and wind energy. By compare these two voltage sensors Arduino, no one decides which gives the power to charge a vehicle e by a wireless charger the dynamic charging method is the fastest the idea given by Carlos A.et al (2016). This charging method helps to charge the vehicle battery while it is moving.

Material and Methods



Block diagram

Hardware Component:

1. **<u>Atmega 328p :</u>**

The Atmel ATmega328P is a 32K 8-bit microcontroller based on the AVR architecture. Many instructions are executed in a single clock cycle providing a through put of almost 20 MIPS at 20MHz[9]. The ATMEGA328-PU comes in a PDIP 28-pin package and is suitable for use on our 28-pin AVR Development Board. The computer on the one hand is designed to perform all the general purpose tasks on a single machine you can use a computer to run software to perform calculations or you can use a computer to store some multimedia files or to access the internet through the browser, whereas the microcontrollers are meant to perform only the specific tasks, e.g., switching the AC off automatically when room temperature drops to a certain defined limit and again turning it ON when temperature rises above the defined limit.

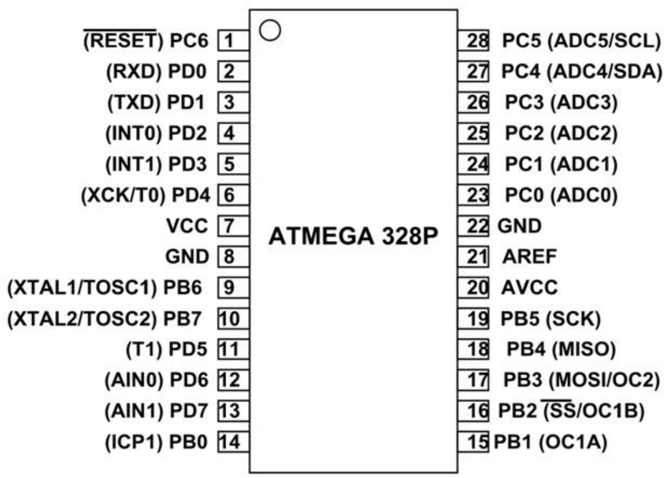


Diagram of Atmega 328P pin config.

Pin No. 1 - It is na as 'RESET'. It is an active low pin. When is pin the goes low the microcontroller and its program get reset.

Pin No. 2 - It is an input pin for serial communication(RX).

Pin No.3 - It is an output p on for serial communication (TX).

Pin No.4 - External Interrupt 0

Pin No.5 - External Interrupt 1

Pin No.6 - External Counter Source (Timer 0)

Pin No.7 - Positive input power pin

Pin No.8 - Negative or Ground Pin

Pin No.9 - (XTAL1)It is connected to one pin of the external crystal oscillator.

Pin No.10 - (XTAL12It is connected to another pin of the external crystal oscillator.

Pin No.11 - External Counter Source(Timer1)

Pin No.12 - Positive Analog Comparator i/ps
Pin No.13 - Negative Analog Comparator i/ps
Pin No.14 - Timer or counter input source
Pin No.15 - Counter or Timer compare match A.
Pin No.16 - Slave Choice i/p.
Pin No.17 - Master data output/slave data input for SPI
Pin No.18 - Master clock input/slave clock output
Pin No.19 - Master Clock Output/Slave Clock input for SPI
Pin No.20 - Positive voltage for Analog to Digital Converter(ADC) Power.
Pin No.21 - Reference voltage pin for ADC
Pin No.22 - Ground Pin
Pin No.23 - Analog Input Digital Value Channel 0
Pin No.24 - Analog Input Digital Value Channel 1
Pin No.25 - Analog Input Digital Value Channel 2
Pin No.26 - Analog Input Digital Value Channel 3
Pin No.27 - Analog Input Digital Value Channel 4/Serial Interface Connection for data
Pin No.28 - Analog Input Digital Value Channel 5/Serial Interface Clock Line

2. **4047 IC:**

The CD 4047 IC is one kind of multivibrator including a high voltage. The operation of this IC can be done in two modes like mono stable & Astable. This IC requires an exterior resistor & capacitor to decide the output pulse width within the mono stable mode & the o/p frequency within the a stable mode. This IC operates at 5 Volts, 10 Volts, 15 Volts&20 Volts. The 4047 IC is an a CMOS multivibrator that works in two modes mono stable & a stable. The 4047 IC applications include a wide range like generation of the pulse wave, sine wave, and DC signal to AC signal conversion etc.

3. **IN4007:**

Diodes are used to convert AC into DC these are used as half-wave rectifiers or full-wave rectifiers. Three points must be kept in mind while using any type of diode.

1. Maximum forward current capacity
2. Maximum reverse voltage capacity
3 .Maximum forward voltage capacity

4. **Coil:**

A circle, a series of circles, or a spiral made by coiling. 2: a long thin piece of material that is wound into circles.

5. **LED:**

LEDs are semiconductor devices. Like transistors and other diodes, LEDs are made out of silicon. What makes an LED give off light are the small amounts of chemical impurities that are added to the silicon, such as gallium, arsenide, indium, and nitride[13]. When current passes through the LED, it emits photons as a byproduct. Normal light bulbs produce light by heating a metal filament until its white hot .Because LEDs produce photons directly and not via heat, they are far more efficient than incandescent bulbs.

6. **16*2 LCD:**

This is an example of the Parallel Port. This example doesn't use the Bi-directional feature found on newer ports, thus it should work with most if not all Parallel Ports. It however doesn't show the use of the Status Port as an input for a 16 Character x 2 Line LCD Module to the Parallel Port[14]. These LCD Module are very common these days, and are quite simple to work with, as all the logic required to run them is on boar

Hardware Output:

The system makes use of a solar panel, battery, transformer, regulator circuitry, copper coils, AC to DC converter, at mega controller and LCD to develop the system. The system

Demonstrate show electric vehicles can be charged while moving on the road, eliminating the need to stop charging. The solar panel is used to power the battery through a charge controller. The battery is charged and stores dc power. The DC power now needs to be converted to AC for transmission. For this purpose we here use a transformer power is converted to AC using a transformer and regulated using regulator circuitry. This power is now used to power the copperoils that are used for wireless energy transmission. A copper coilis also mounted underneath the electric vehicle.
When the vehicle is driven over the coils energy is transmitted from the transmitter coil to ev coil. Please note the energy is still the DC that is induced into this coil. Now we convert this to DC again so that it can be used to charge the EV battery.

We use AC-to-DC conversion circuitry to convert it back to DC. Now we all measure the input voltage using an at mega microcontroller and display hisonan LCD. Thus the stem demonstrates a solar-powered wireless charging stem for electric vehicles that can be integrated into the road.

Results:

1. **Efficiency**: The study may reveal the efficiency of solar panels in converting sunlight into electrical energy and the efficiency of wireless power transmission from the transmitter to the receiver. This information could help assess the overall system efficiency and identify areas for improvement.
2. **Charging Performance**: The study may evaluate the charging performance of solar wireless charging systems, including the charging speed, reliability, and compatibility with different electronic devices. It could provide insights into the effectiveness of wireless charging compared to traditional wired chargers.
3. **Environmental Impact**: An assessment of the environmental impact may reveal the reduction in carbon emissions and energy consumption achieved by using solar power for wireless charging. This data can help demonstrate the sustainability benefits of the technology.
4. **User Acceptance**: The study may provide insights into user perceptions, preferences, and acceptance of solar wireless charging systems. It could reveal user satisfaction with the convenience and reliability of wireless charging and identify any concerns or barriers to adoption.
5. **Economic Feasibility**: An economic analysis could determine the cost-effectiveness of implementing solar wireless charging systems. It may evaluate the initial investment required, cost savings compared to traditional charging methods, and potential revenue streams associated with the technology.
6. **Market Potential**: The study may assess the market potential and adoption trends of solar wireless charging systems. It could identify key market segments, estimate market size, and provide recommendations for market entry and expansion.

Summary

In summary, a study on solar wireless electric charging systems would aim to assess various aspects of the technology, its implementation, and its impact. The results would depend on the research methodology, data collected, and analysis conducted. Hypothetical findings could include information on the efficiency of solar panels, charging performance, environmental impact, user acceptance, economic feasibility, and market potential. However, it's important to note that these are hypothetical results, and actual outcomes would require a comprehensive study with appropriate methodologies and data collection.

Conclusion

In conclusion, solar wireless electric charging systems offer a promising and innovative approach to charging electronic devices sustainably and conveniently. While the specific results of a study on this technology would depend on the research conducted, it is clear that solar wireless charging systems have the potential to improve energy efficiency, reduce carbon emissions, and provide a convenient charging experience for users.
However, it's important to acknowledge the limitations and challenges associated with solar wireless charging systems. Technological constraints, such as energy loss during wireless power transmission, limited charging distance, and alignment requirements, can impact the overall performance and efficiency of the systems. Additionally, factors like sample size, available resources, and evolving technology can introduce limitations to the study.

Despite these limitations, conducting a comprehensive study on solar wireless charging systems can provide valuable insights into their technical feasibility, environmental impact, user acceptance, economic viability, and market potential. Such studies can inform further advancements in the technology, identify areas for improvement, and guide the development of policies and regulations to support its widespread adoption.

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APPENDICIES

1. **Solar power:** Energy derived from sunlight through the use of photovoltaic cells or solar panels.
2. **Wireless charging:** The process of transferring electrical energy from a power source to a device without the need for physical connections or cables.
3. **Electric vehicle (EV) charging**: The act of replenishing the battery of an electric vehicle with electrical energy to enable its operation.
4. **Renewable energy:** Energy derived from natural sources that are continuously replenished, such as solar power, wind power, or hydropower.
5. **Photovoltaic cells:** Electronic devices made of semiconductor materials that convert sunlight directly into electrical energy.
6. **Inductive charging:** A wireless charging method that uses electromagnetic fields to transfer energy between a charging pad (transmitter) and a device (receiver) placed nearby.
7. **Resonant coupling**: A wireless charging technique that utilizes resonant circuits to enhance the efficiency of energy transfer between the charging pad and the device.
8. **Charging efficiency**: The effectiveness of the charging process in converting electrical energy from the power source to the battery of the electric vehicle.
9. **Charging speed**: The rate at which the battery of an electric vehicle is charged, often measured in kilowatts or miles of range gained per hour.
10. **Energy conversion**: The process of converting one form of energy (e.g., solar energy) into another form (e.g., electrical energy) to power the electric vehicle.

11. **Sustainability**: The concept of meeting current energy needs without compromising the ability of future generations to meet their own needs, often by utilizing renewable energy sources and minimizing environmental impact.

12. **Environmental impact**: The effects of a technology or activity on the natural environment, including factors such as carbon emissions, resource depletion, and ecosystem disruption.

13. **User experience:** The overall experience and satisfaction of users when using the charging system, including factors such as ease of use, reliability, and convenience.

14. **Convenience:** The ease and comfort provided by the charging system, such as the ability to charge wirelessly without the need for physical connections or cables.

15. **Alignment requirements**: The need for proper alignment between the charging pad and the device being charged to ensure efficient power transfer.

16. **Charging infrastructure**: The network of charging stations and associated equipment needed to support the widespread adoption of electric vehicles.

17. **Market potential**: The size and growth potential of the market for solar wireless electric vehicle charging systems, including factors such as demand, competition, and consumer preferences.

18. **Economic feasibility**: The assessment of whether the implementation of solar wireless electric vehicle charging systems is economically viable, considering factors such as costs, benefits, and return on investment.

19. **Carbon emissions reduction**: The reduction in greenhouse gas emissions, such as carbon dioxide (CO_2), is achieved by utilizing renewable energy sources like solar power for charging electric vehicles.

20. **Scalability:** The ability of the solar wireless electric vehicle charging system to be expanded or adapted to larger scales or different environments, such as residential, commercial, or public spaces.