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WIRELESS POWER TRANSFER FORCHARGING ELECTRICVEHICLE

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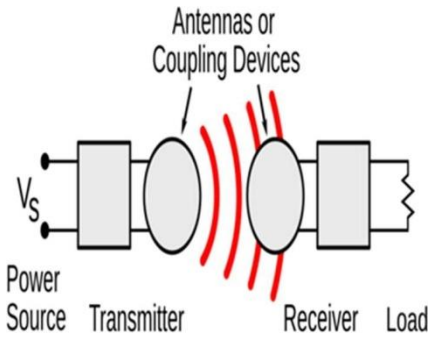
ABSTRACT

Wireless power transfer (WPT) technology has the potential to revolutionize the way electric vehicles (EVs) are charged. Combining WPT with renewable energy sources such as solar power and the grid offers several benefits such as reduced carbon footprint, lower energy costs, and improved grid stability. This abstract provides an overview of the various aspects involved in wireless power transfer for charging electric vehicles using solar and grid energy. It starts with an introduction to the concept of WPT and its history, followed by a description of the different WPT technologies available for solar and grid integration. Then outlines the various factors that affect the efficiency of WPT, including distance, alignment, and frequency, and how these factors can be optimized for solar and grid integration.

INTRODUCTION

The increasing adoption of electric vehicles (EVs) has led to a growing demand for more efficient and sustainable charging solutions. Wireless Power transfer (WPT) technology, which eliminates the need for physical connections between the charging infrastructure and the EV, is emerging as a promising alternative to traditional wired charging methods. When combined with renewable energy sources such as solar power and the grid, WPT offers numerous advantages, including reduced carbon footprint, lower energy costs, and improved grid stability. This combinational so has the potential to enhance their liability and availability of power, while offering load management and peak shaving benefits. This paper provides an overview of the various aspects involved in wireless power transfer for charging electric vehicles using solar and grid energy. The paper begins with a brief history of WPT technology and a description of the different WPT technologies available for solar and grid integration. It then discusses the factors that affect the efficiency of WPT, including distance, alignment, and frequency, and how these factors can be optimized for solar and grid integration.

The paper examines the benefits of using solar power for WPT, including reduced carbon emissions, lower energy costs, and improved grid stability, as well as the challenges of solar integration, including the variability of solar energy and the need for energy storage solutions. The paper also discusses the benefits of grid integration, including increased reliability and availability of power, and the potential for load management and peak shaving.

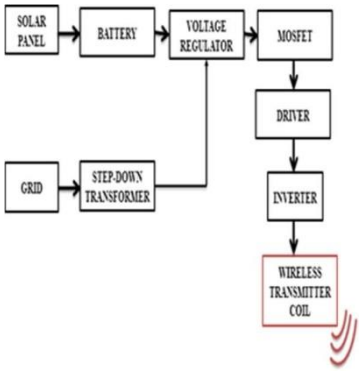


The paper concludes with a discussion of the current state of WPT for EV charging using

Solar and grid energy, including the progress made in developing standards and regulations, the commercial availability of WPT charging systems, and the future prospects for this technology. Overall, the combination of WPT with renewable energy sources such as solar and grid power has the potential to significantly improve the sustainability and efficiency of EV charging.

WIRELESSPOWERTRANSFER

Wireless power transfer (WPT), wireless energy transmission, or electromagnetic power transfer is the transmission of electrical energy from a power source to an electrical load, such as an electrical power grid or a consuming device, without the use of discrete human-made conductors. Wireless power is a generic term that refers to a number of different power transmission technologies that use time-varying electric, magnetic, or electromagnetic fields. In wireless power transfer, a wireless transmitter connected to a power source conveys the field energy across an inter vening space to one or more receivers, where it is converted back to an electrical current and then used. Wireless transmission is useful to power electrical devices in cases where inter connecting wires are in convenient, hazardous, or are not possible. Wireless power techniques mainly fall into two categories, non-radiative and radiative. In near field or non-radiative techniques, power is transferred by magnetic fields using inductive coupling between coils of wire, or by electric field susing capacitive coupling between metal electrodes. Inductive coupling is the most widely used wireless technology; its applications include electric tooth brush chargers, RFID tags, smart cards, and chargers for implant table medical devices like artificial cardiac pace makers, and inductive powering or charging of electric vehicles like trains or buses. A current focus is to develop wireless systems to charge mobile and hand held computing devices such as cellphones, digital music players and portable computers without being tethered to a wall plug. In far-field or radioactive techniques, also called power beaming, power is transferred by beams of electromagnetic radiation, like microwaves or laser beams. These techniques can transport energy longer distances but must be aimed at the receiver. Proposed applications for this type are solar power satellites, and wireless powered drone aircraft.



EXISTINGSYSTEM

Solar-based mobiles were designed. An advanced wireless charger, particularly for small load systems, was implemented recently. Further more, a prototype of the whole system, consisting of a commercial panel, the thermal and electrical circuits, and an innovative wireless remote data acquisition system, has been setup. The latter, based on an open-source electronic platform, has the necessary accuracy and remote data capture and flexibility features. The model has been carefully calibrated and the simulated results, based on the solar irradiance, the ambient temperature, and the wind speed, have been compared with experimental data. The results are analyzed and discussed. Such a validated model can be used to establish if and when it is more convenient to use a hybrid structure rather than two separate devices.

DISADVANTAGES

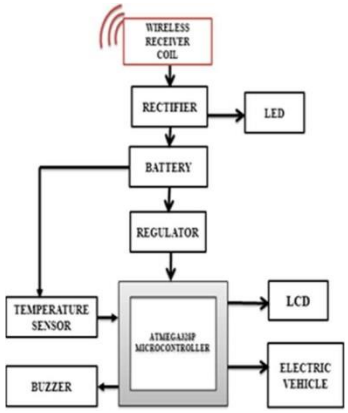
- High complexity switching process.
- High power losses

PROPOSEDSYSTEM

In this proposed system, we implement an ARDUINO microcontroller-based wireless power charging methodology in electric vehicles. This system consists of an ARDUINO microcontroller, inductive coils, and a vehicle prototype module. A solar panel system is implemented to transfer the power to the primary coil. Solar-based mobiles were designed. An advanced wireless charger, particularly for small load systems, was implemented recently. In this proposed system, we implement a microcontroller-based wireless power charging methodology in electric vehicles. This system consists of Arduino and MOSFET, inductive coils, vehicle prototype module, Power is transferred to the road by having the inductance primary coil from a DC supply. The secondary coil is installed in the vehicle. If the vehicle moves along the coil, it can charge automatically. If power is not available from solar, then the grid is used as a additional power supply. Through this, we can reduce the pollution of the air and demand for petroleum products. Magnetic induction charging uses the energy exchange between two pads, one located on the ground and one underneath the vehicle. The charging transmitter coil (on the ground) is approximately 1m, while the receiving coil (on the car) is enclosed in a small device. In addition to the ad optionally mounted on the vehicle, the infrastructure consists of an induction charging station. A receiver (receiving coil) is placed on the vehicle, while several coils acting as transmitters are embedded in the road surface. The battery temperature level are monitor the temperature sensor. If the temperature value are high to intimate on the buzzer. The latter is supplied with electrical energy. This works as follows:

The coils in the pavement produce magnetic field by means of current. The magnetic field ensures that the coil on the vehicle receives this and can transform it back into electrical energy. This produced energy is used to charge the battery that runs the motor.

BLOCK DIAGRAMTRANSMITTERSIDE
RECEIVERSIDE



Block diagram

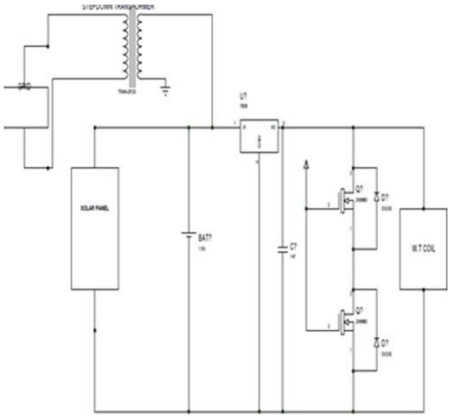
DESCRIPTION

In this system, transmitter block consisting of battery, inverter, rectifier, and High frequency wireless transmitting coil. The power supply is given from the solar panel. A solar panel and grid power is stored in battery then delivers its power to the inverter circuit. The power is rectified by the rectifier circuit and rectified power is transferred to high frequency transmission coil. In transmitter circuit microcontroller has been connected with the inverter circuit to switch the transmission power. The transmission power efficiency has been increased by switching the power.

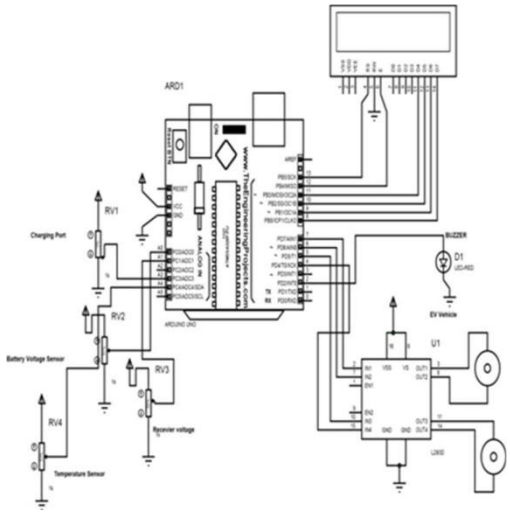
Then the switching power is transferred to the inverter circuit through the driver circuit.

The receiver block has receiving coil which receives the power from the transmitter coil. Then the power is fed into the rectifier circuit and drive to the regulator circuit and battery. The battery temperature level monitor the temperature sensor. If the temperature value are high buzzer will be on condition. The regulated power is given to the controller to drive the motor of the vehicle. LED indicated the charging status and LCD shows the information about power transfer and charging. Motor drier issued to controls the 12V motor by the controller. Also it can control the rotation of each motor.

CIRCUIT DIAGRAMTRANSMITTERSIDE



RECEIVERSIDE
HARDWARE REQUIREMENTS
SOLARPANEL



Solar panel refers to a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating. A photovoltaic (PV) module is a packaged, connect assembly of typically 6×10 photo voltaic solar cells. Photovoltaic modules constitute the photo voltaic array of a photo voltaic system that generates and supplies solar electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions (STC), and typically ranges from 100 to 365 watts. The efficiency of a module determines the area of a module given the same rated output– an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module. There are a few commercially available solar modules that exceed 22% efficiency and reportedly also exceeding24%.A single solar module can produce only a limited amount of power; most installations contain multiple modules. A photo voltaic system typically includes an array of photovoltaic modules, an inverter, a battery pack for storage, interconnection wiring, and optionally a solar tracking mechanism. The most common application of solar panels is solar water heating systems. The price of solar power has continued to fall so that in many countries it is cheaper than ordinary fossil fuel electricity from the grid. Rugged 3W12Vdc photo voltaic solar panel. Sealed to with stand hail, snow and wind. Multi crystalline silicon solar cells in a heavy-duty an iodized

aluminum frame. High-transparency, low-iron tempered glass.188x195x17mm. Junction box with screw or solder terminals.

SPECIFICATION

Max Power : 3W Open Circuit Voltage:21.6V
Operating Voltage : 17V
Operating Current : 0.18AShort Circuit Current : 0.21A

ADVANTAGES:

- □ Using an Arduino simplifies the amount of hardware and software development you need to do in order to get a system running.
- □ The Arduino hardware platform already has the power and reset circuitry setup as well as circuit ryto program and communicate with the microcontroller over USB.
- □ The I/O pins of the microcontroller are typically already fed out to sockets/headers for easy access (This may vary a bit with the specific model).
- □ On the software side, Arduino provides a number of libraries to make programming the microcontroller easier.
- □ The simplest of these are functions to control and read the I/O pins rather than having to fiddle with the bus/bit masks normally used to interface with the At mega I/O (This is a fairly min or in convenience).
- □ More useful are things such as being able to set I/O pins to PW Mata certain duty cycle using a single command or doing Serial communication.

SOFTWARES

A minimal Arduino C/C++sketch, as seen by the Arduino IDE programmer, consist of only two functions: setup:

This function is called once when a sketch starts after power-up or reset. It is used to initialize variables, input and output pin modes, and other libraries needed in the sketch.
loop: After setup has been called, function loop is executed repeatedly in the main program. It controls the board until the board is powered off or is reset. Most Arduino boards contain a light-emitting diode (LED) and a load resistor connected between pin 13 and ground, which is a convenient feature for many tests and program functions

PROTEUSINTRODUCTION

The microcontroller can understand a program written in assembly language, it must be compiled into a language of zeros and ones. Assembly language and Assembler do not have the same meaning. The first one refers to the set of rules used for writing program for the micro controller, while the later refers to a program on a personal computer used to translate assembly language statements into the language of zero and ones. A compiled program is also called Machine Code. In machine code, the same command is represented by a 14-bit array of zeros and ones understandable by the microcontroller. All assembly language commands are similarly compiled into the corresponding array of zeros and ones. A data file used for storing compiled program is called an "executive file ",i.e."HEX datafile".The name comes from the hexadecimal presentation of a data file and has a suffix of "hex" as well, for example" probe. hex".

After has been generated, the data file is loaded into the microcontroller using a programmer. Assembly language programs may be written in any program for text processing (editor) able to create ASCII data files on a hard disc or in a specialized work environment such as MPLAB described later.

Advantage

1. Machine Code
2. Low level language, i.e.,assembly
3. High level language like C,C++, Java, Ada,etc.
4. Application level language like Visual Basic, scripts, Access,etc.

- It is small and reasonably simpler to learn, understand, program and debug.
- C Compilers are available for almost all embedded devices in use today, and there is a large pool of experienced C programmers.
- Unlike assembly, C has advantage of processor-independence and is not specific to any particular microprocessor/ microcontroller or any system.
- This makes it convenient for a user to develop programs that can run on most of the systems

PROTEUSISIS7SIMULATOR

Proteus (Processor for Text Easy to Use) is a fully functional, procedural programming language created in 1998 by Simone Zanella. Proteus in corporates many functions derived from several other languages: C,BASIC, Assembly, Clipper/dBase; it is especially versatile in dealing with strings, having hundreds of dedicated functions; this makes it one of the richest languages for text manipulation.

Proteu so we sits name to a Greek god of the sea(Proteus),who took care of Neptune's crowd and gave responses; he was renowned for being able to transform himself, assuming different shapes. Transforming data from one form to another is the main usage of this language. Proteus was initially created as a multiplatform (DOS, Windows, Unix) system utility, to manipulate text and binary files and to create CGI scripts. The language was later focused on Windows, by adding hundreds of specialized functions for: network and serial communication, database interrogation, system service creation, console applications, keyboard emulation, ISAPI scripting (for IIS). Most of these additional functions are only available in the Windows flavor of the interpreter, even though a Linux version is still available.

Proteus was designed to be practical (easy to use, efficient, complete), readable and consistent. Its strongest points are:

- Powerful string manipulation;
- Comprehensibility of Proteus scripts;
- availability of advanced data structures: arrays, queues(single or
- double), stacks, bit maps, sets, AVL trees.

65

The language can be extended by adding user functions written in Proteus or DLLs created in C/C++.Proteus is design software developed by Lab center Electronics for electronic circuit simulation, schematic capture and PCB design. Its simplicity and user friendly design made it popular among electronics hobbyists. Proteusis commonly used for digital simulations such as

microcontrollers and microprocessors. It can simulate LED, LDR, and USB Communication etc...

At first sight, Proteus may appear similar to Basic because of its straight syntax, but similarities are limited to the surface:

- Proteus has a fully functional, procedural approach;
- Variables are un typed, do not need to be declared, can be local or public and can be passed by value or by reference;
- allthetypicalcontrolstructuresareavailable(if-then-else;for-next;while-loop;repeat-until; switch-case);
- new functions can be defined and used as native functions.

Data types supported by Proteus are only three: integer numbers, floating point numbers and strings. Access to advanced data structures (files, arrays, queues, stacks, AVL trees, sets and soon) takes place by using handles ,i.e. integer numbers returned by item creation functions.
Type declaration is unnecessary: variable type is determined by the function applied – Proteus converts on the fly every variable when needed and holds previous data renderings, to avoid performance degradation caused by repeated conversions.
There is no need to add parenthesis in expressions to determine the evaluation order, because the language is fully functional (there are no operators).
Proteus includes hundreds of functions for:

- accessing file system;
- sorting data;
- manipulating dates and strings;
- interacting with the user (console functions)
- Calculating logical and mathematical expressions.

Proteus supports associative arrays (called sets) and AVL trees, which are very useful and powerful to quickly sort and lookup values.
Two types of regular expressions are supported:

- extended(Unix like);
- basic(Dos like, having just the wild cards"? "and"*").

Both type so fix pressions can be used to parse and compare data.
The functional approach and the extensive library of built-in functions allow to write very short but powerful scripts; to keep them comprehensible, medium-length keywords were adopted.
The user, besides writing new high-level functions in Proteus, can add new functions in C/C++ by following the guidelines and using the templates available in the software development kit; the new functions can be invoked exactly the same way as the predefined ones, passing expressions by value or variables by reference.
Proteus is an interpreted language: programs are loaded into memory, pre-compiled and run; since the number of built-in functions is large, execution speed is usually very good and often comparable to that of compiled programs.
One of the most interesting features of Proteus is the possibility of running scripts as services or ISAPI scripts.
Running a Proteus script as a service, started as soon as the operating system has finished

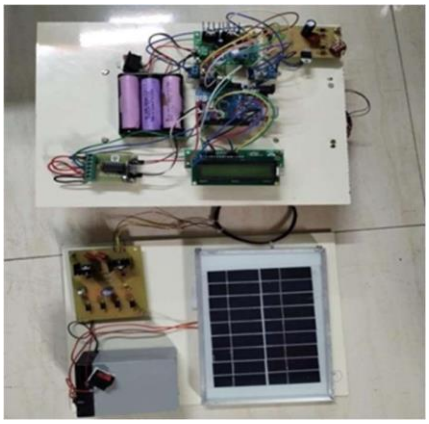
loading, gives many advantages:

- no user needs to login to start the script;
- a service can be run with different privileges so that it cannot best opped by a user.

This is very useful to protect critical processes in industrial environments (data collection, device monitoring),or to avoid that the operator in advertently closes a utility (keyboard emulation). The ISAPI version of Proteus can be used to create scripts run through Internet Information Services and is equipped with specific functions to cooperate with the webserver. For intellectual property protection Proteus provides:

- script encryption;

TEST REPORT



digital signature of the scripts, by using the development key (which is unique);

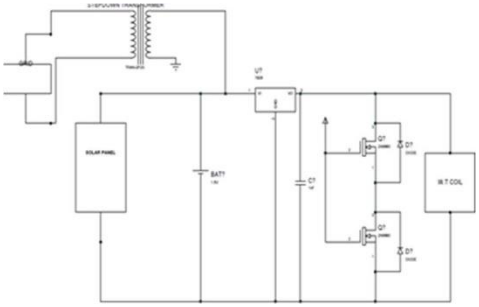
- The option to enable or disable the execution of a script (or part of it) by using the key of the customer.

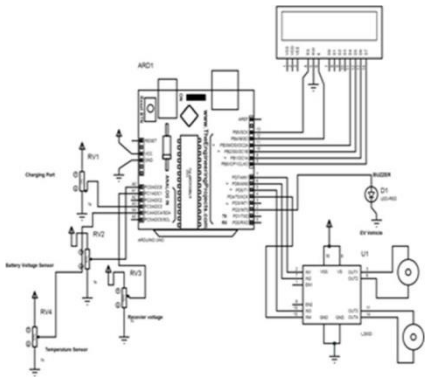
Proteus is appreciated because it is relatively easy to write short, powerful and comprehensible scripts; the large number of built-in functions, together with the examples in the manual, keeps low the learning curve.

IMPLEMENTATION

HARDWARE CIRCUIT DIAGRAMTRANSMITTERSIDE

RECEIVERSIDE





CONCLUSION

This paper presented are view of wireless charging of electric vehicles. A high efficiency wireless power transfer system for electric vehicle charging application is proposed. System configuration and design considerations were analyzed and discussed in details. It is clear that vehicle electrification is unavoidable because of environment and energy related issues. Wireless charging will provide many benefits as compared with wired charging. WPT for EVs has the potential to overcome the drawbacks of wired chargers and eliminate some hurdles towards vehicle electrification and sustainable mobility. A side from its convenience compared to wired chargers, WPT can enable significant downsizing of the onboard EV battery. A prototype was designed, built and tested with the popular renewable sources of energy, solar energy. With technology development, wireless charging of EV can be brought to fruition. Further studies in topology, control, inverter design, and human safety are still needed in the near term.

FUTUREWORK

In future we plan to further explore wireless power transfer technology for large load application like electricity supply home and hospital.

REFERENCES

[1] F.Musaviand W.Eberle,"Overview of Wireless Power Transfer Technologies for Electric Vehicle Battery Charging, "in IET Power Electronics, vol. 7,no.1,pp.60-66,January 2014.

[2] M.P.Kazmierkowski, R.M.Miskiewiczand A.J.Moradewicz, "Inductive coupled contactless energy transfer systems-are view, "Selected Problems of Electrical Engineering and Electronics (WZEE), 2015, Kielce, 2015, pp.1-6.

[3] J. H. Kim et al., "Development of 1-MW Inductive Power Transfer System for a High-Speed Train, "in IEEE Transactions on Industrial Electronics, vol. 62,no.10,pp.6242-6250,Oct. 2015

[4] R. Haldi and K. Schenk, "A 3.5 kW Wireless Charger for Electric Vehicles with Ultra High Efficiency," Energy Conversion Congress and Exposition(ECCE),2014IEEE,Pittsburgh,PA,2014,pp.668-674.

[5] C. Y. Liou, C. J. Kuo, and S. G. Mao, “Wireless-power-transfer system using near-field capacitively coupled resonators,” IEEE Transactions on Circuits and Systems II: Express Briefs, Vol. 63, Issue: 9, Sept. 2016, pp.898-902.

[6] C. S. Wang, O. H. Stielau and Covic, G. A, "Design considerations for a contactless electric vehicle battery charger,"IEEE Transactions on Industrial

Electronics,vol.52,no.5,pp.1308-1314,Oct.2005.

[7] C.L.Yang,Y.L.Yang,andC.C.Lo,"Subnano second Pulse Generators for Impulsive Wireless Power Transmission and Reception, "IEEE Transactions on Circuits and Systems II: Express Briefs, 2011, Vol.58,Issue: 12,pp.817-821.

[8] C. S. Wang, G. A. Covic, and O. H. Stielau, "Power transfer capability and bifurcation phenomena of loosely coupled inductive power transfer systems," IEEE Transactions on Industrial Electronics, vol. 51, no. 1, pp.148-157,Feb.2004.

[9] Fariborz Musavi and Wilson Eberle, "Overview of wireless power transfer technologies for electric vehicle battery charging," IET PowerElectronics,Volume7, Issue1, 2014,p.60 – 66.