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Advanced wireless power transfer system using Arduino

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Abstract

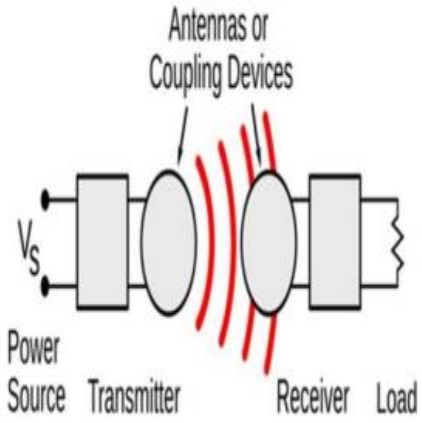
The charging of electric vehicles (EVs) could undergo a dramatic shift with the advent of WPT (wireless power transfer) technology. There are a number of advantages to integrating WPT with the grid and renewable energy sources like solar power, including less pollution, cheaper energy, and more reliable electricity. Wireless power transmission for electric car charging utilizing sun or grid energy is discussed in this abstract, which offers a review of the several factors involved. After a brief overview of WPT and its background, the various WPT technologies for pv and grid integration are detailed. Later on, it describes how to optimize distance, alignment, and frequency—three aspects that impact WPT efficiency—for grid and solar integration.

Introduction

More efficient and environmentally friendly charging options are in high demand due to the rising popularity of electric cars (EVs). A potential replacement for conventional cable charging methods is WPT (wireless power transfer) technology, which does away with the requirement for physical links

among the infrastructure for charging and the electric vehicle. The use of WPT in conjunction with the grid and renewable energy sources like solar power has several benefits, such as lowering energy prices, increasing grid stability, and reducing carbon footprint. Their liability and power availability might be improved with this combinational system, which also offers advantages for peak shaving and load control. Using solar and grid electricity, this study outlines the many facets of wireless power transmission for charging electric automobiles. The article starts off by providing a concise overview of WPT technology's background and outlining the various WPT options for solar or grid integration. Next, it delves into the specifics of optimizing WPT for solar or grid integration by looking at variables like

frequency, distance, and alignment, all of which impact efficiency. Solar power for WPT has several advantages, such as less carbon emissions, cheaper energy, and more stable grid operation, but there are also some disadvantages to solar integration, such as solar power's unpredictability and the necessity of energy storage solutions. Enhanced power availability and reliability, as well as the possibility of load control and peak shaving, are some of the advantages of grid integration that are covered in the article.



Finally, the article wraps up with a review of where WPT is in terms of solar and grid energy EV charging, including topics such as laws and standards development, commercial accessibility of WPT recharging systems, and the technology's potential moving forward. The overall environmental impact and effectiveness of electric vehicle charging might be greatly enhanced by combining WPT is an and sources of clean energy like solar and grid electricity. Transferring electrical energy from a generator to a consumer or the power grid without the need of individual man-made wires is known as wireless electricity transfer (WPT), electrical energy delivery, or electromagnetic power transfer. A wide variety of power transmission systems that make use of electrical power, magnetized, or electromagnetic fields that fluctuate with time are together known as wireless power. With wireless energy transfer, a power source's electromagnetic field is sent via an intervening distance to one or more the recipients which subsequently transform it into an electrical current for usage. When connecting cables is not an option, is too dangerous, or just not feasible, wireless transmission can power electrical equipment. Radiative and non-radiative wireless power methods are the two basic types. Power is transmitted in short field or non-radiative methods by use of electric fields susing capacitive connections between metal electrodes or magnetic fields used in inductive coupling between wire coils. Of all the wireless technologies, inductive coupling is by far the most common and ubiquitous. It powers and charges electric trains, buses, and implant table surgical instruments like artificial cardiac pacemakers, as well as

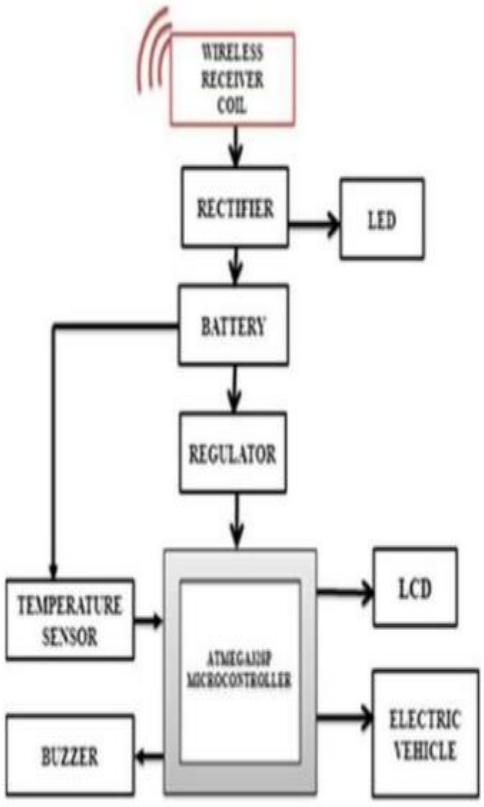
RFID tags, smart cards, and electric tooth brush chargers. Presently, research is focused on creating wireless systems that can power portable electronics like laptops, digital music players, and smartphones without connecting them to a wall outlet.

Power beaming, another name for far-field or radioactive methods, involves the transmission of energy by electromagnetic radiation beams such as lasers or microwaves. However, these methods need precise targeting of the receiver in order to transmit energy across greater distances. Some possible uses for this category include solar-powered satellites and drones that are powered by wireless technology.

Related Work

Mobiles powered by solar energy were developed. A state-of-the-art wireless charger was recently put into use, especially for systems with tiny loads. A commercial panel, temperature and electrical wiring, and a state-of-the-art wireless remote data collecting system make up the whole system's prototype. The latter has the essential properties of precision, remote data collecting, and flexibility, and it is built around an open-source electronic platform. After the model was fine-tuned, it was contrasted with experimental data to see how well the simulated results performed under different environmental conditions (sunlight, temperature, and wind speed). Discussion and analysis of the findings follow. When deciding whether or not to employ a hybrid structure instead of two individual devices, a validated model might be helpful.

Block Diagram

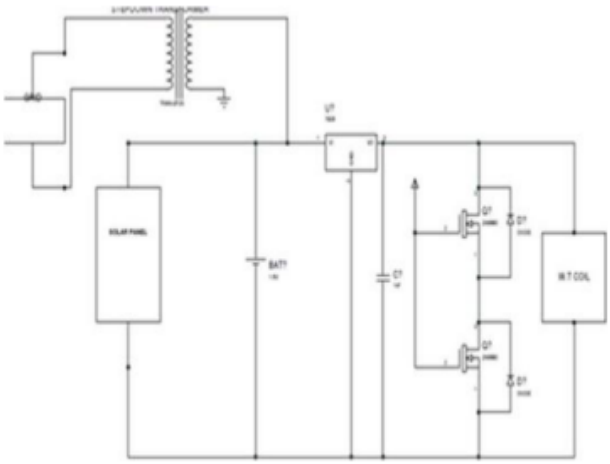


Proposed System

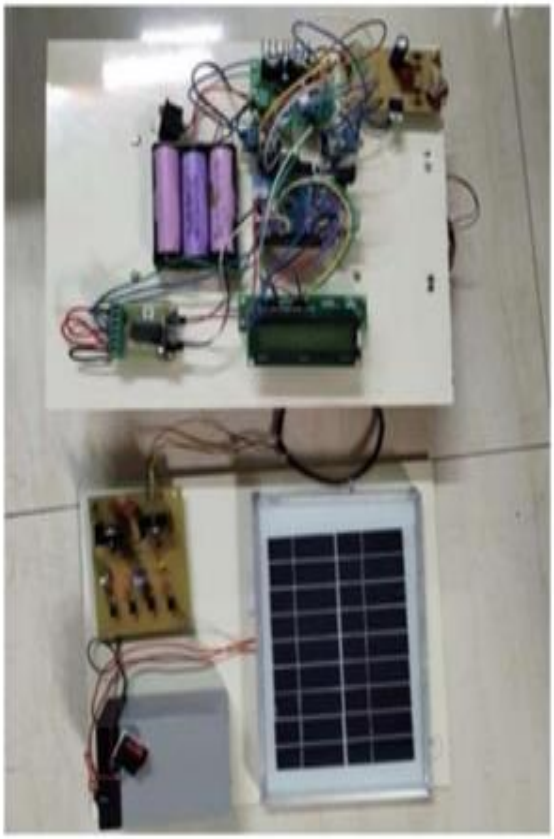
A high-frequency wireless transmitting coil, an inverter, and a rectifier make up the transmitter block of this system. The solar panel provides the electricity. The energy is

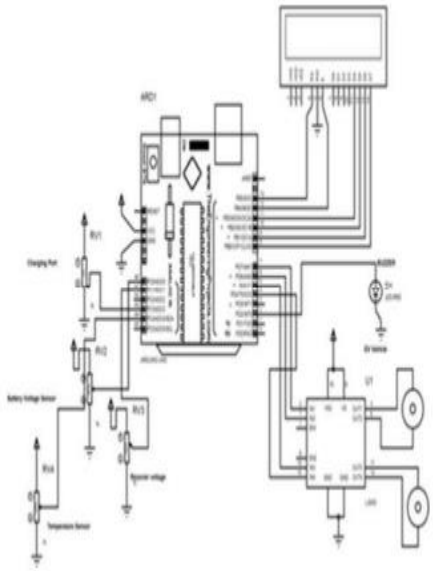
sent to the rectifier circuit from a battery that stores it, as well as from the grid. The rectifier circuit corrects the power and sends it on to the high-frequency transmission coil. To change the transmission power, the microcontroller in the transmitter circuit is linked to the inverter circuit. Switching the power has improved the transmission power efficiency. The inverter circuit receives switching power from the driving circuit. One component of the receiver block that takes electricity from the transmitter is the receiving coil. After that, the electricity goes into the battery and regulator circuits via the rectifier circuit. The temperature sensor keeps track of the battery's level. A buzzer will go out if the temperature readings go too high. The controller receives the controlled power in order to operate the vehicle's motor. The charging state is shown via the LED, and details on the transfer of energy and charging may be seen on the LCD. The controller controls the 12 volt motor via the motor drier. Each motor's rotation may also be controlled. One definition of a solar panel is an electrical or thermal energy collector that uses the rays of the sun as an input. Usually, 6×10 photovoltaic solar cells are assembled into a photovoltaic (PV) module. Commercial and residential photovoltaic systems that harness the sun's energy to power homes and businesses rely on photovoltaic modules, which together make up the array. Typically, modules are rated from 100 to 365 watts based on their DC power output under typical test conditions (STC). For the same rated output, the size of a module is determined by its efficiency; for example, a 230 watt module with an efficiency of 8% would have double the area of a 230 watt module with an efficiency of 16%. It has been stated that there are a handful of solar modules on the market with efficiencies higher than 24%.Most solar power setups use many modules since a single module has a limited power output. A photovoltaic system usually consists of a number of components, including a solar tracking device, interconnecting cable, a set of batteries for storage, an array of solar panels, and an inverter. Water heating systems that use solar panels are the most prevalent. As a result of ongoing price drops, solar power is now competitive with grid-supplied energy from fossil fuels in many nations. Stylish and durable 3W 12V DC photovoltaic solar panel. Protected against wind, snow, and hail. Solar cells made of multi-crystalline silicon housed in a sturdy iodized aluminum housing. Low-iron tempered glass with a high level of transparency.measuring 188 by

195 by 17 millimeters. Connector housing for use with solder or screw terminals.



Results





Conclusion

Views on electric car wireless charging were offered in this study. For the purpose of charging electric vehicles, we provide a wireless power transmission technology that is both efficient and effective. We delved deep into the analysis and discussion of system setup and design factors.

Environmental and energy-related concerns make the electrification of vehicles an inevitability. There are a lot of advantages to wireless charging over cable charging. A possible solution to the problems with wired chargers and other roadblocks to sustainable mobility and vehicle electrification is WPT for EVs. In addition to being more convenient than cable chargers, WPT also allows for a considerable reduction in the size of the electric vehicle's onboard battery. Solar energy, one of the most well-known renewable power sources, was used to design, construct, and test a prototype. The eventual realization of wireless EV charging is within reach, thanks to technological advancements. Upcoming research is still lacking in the areas of structure, control, inverters design, and human safety.

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