

SOLAR POWERED ELECTRIC VEHICLE CHARGING STATION

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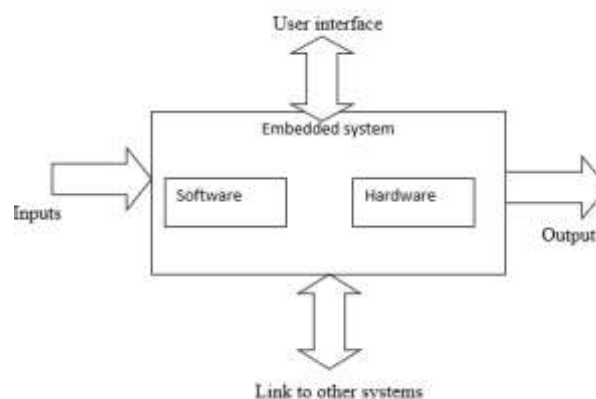
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ABSTRACT

The Solar Powered Electric Vehicle Charging Station is an innovative system that harnesses solar energy to charge electric vehicles efficiently. A 12V 50W solar panel captures sunlight and stores energy in a 12V battery for continuous power supply. IR sensors detect the presence of a vehicle, triggering a relay-controlled transmission (TX) coil, which is positioned near the sensor. The receiving (RX) coil, placed in the toy car, facilitates wireless energy transfer for charging. An Arduino UNO microcontroller manages system operations, while an LCD display provides real-time charging data. A voltage sensor continuously monitors the battery voltage to ensure safe and efficient charging, with LED indicators signaling system status. This project demonstrates a sustainable and automated approach to electric vehicle charging using IoT and renewable energy integration.

1. INTRODUCTION

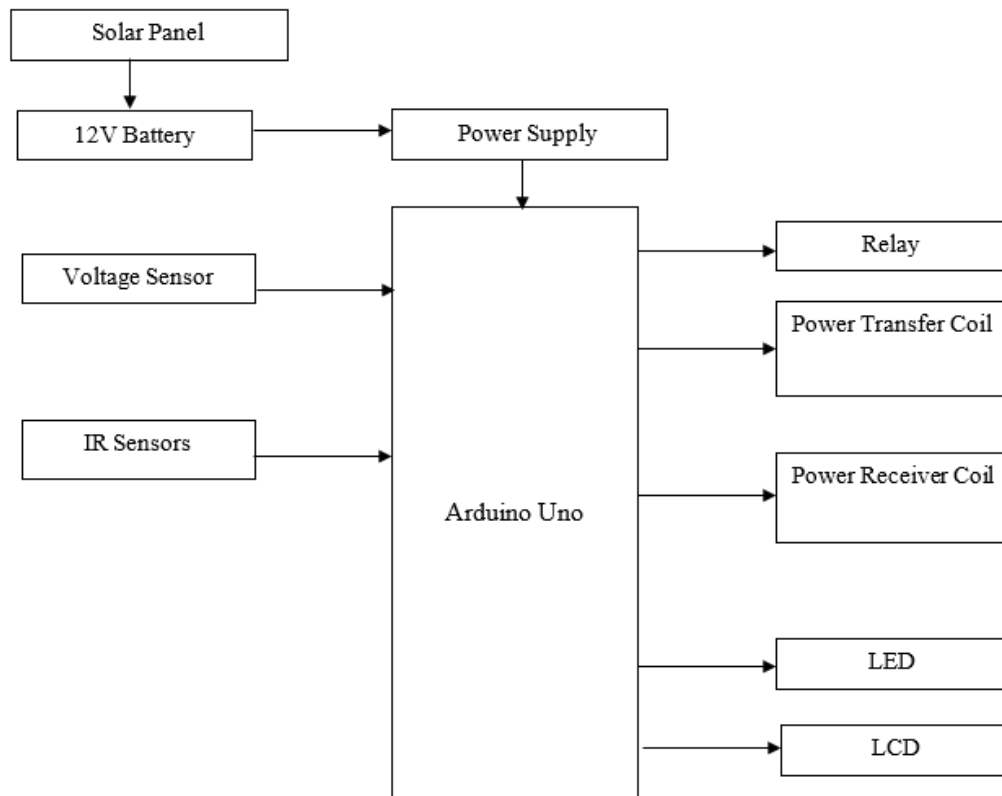
The Solar Powered Electric Vehicle Charging Station is a sustainable and efficient system designed to utilize renewable energy for charging electric vehicles. By integrating a 12V 50W solar panel, the system captures solar energy and stores it in a 12V battery, ensuring a continuous power supply. An IR sensor detects the presence of a vehicle, activating a relay-controlled transmission coil for wireless energy transfer to the receiving coil in the toy car. The Arduino UNO microcontroller manages system functions, while an LCD display provides real-time charging data. A voltage sensor monitors battery voltage, and LED indicators signal system status, ensuring safe and efficient operation. This project showcases an eco-friendly and automated approach to electric vehicle charging using solar energy and IoT technology. An embedded system is one kind of a computer system mainly designed to perform several tasks like to access, process, and store and control the data in various electronics-based systems. Embedded systems are a combination of hardware and software where software is usually known as firmware that is embedded into the hardware. One of its most important characteristics of these systems is, it gives the o/p within the time limits. Embedded systems support to make the work more perfect and convenient. So, we frequently use embedded systems in simple and complex devices too. The applications of embedded systems mainly involve in our real life for several devices like microwave, calculators, TV remote control, home security and neighbourhood traffic control systems, etc.



2. PROPOSED SYSTEM

The proposed method introduces a solar-powered electric vehicle charging station that integrates renewable energy and wireless charging for an efficient and eco-friendly solution. A 12V 50W solar panel captures sunlight and stores energy in a 12V battery, ensuring continuous power availability. An IR sensor detects the presence of a vehicle, activating a relay-controlled transmission (TX) coil for wireless power transfer. The receiving (RX) coil, placed in the toy car, receives the energy for charging. An Arduino UNO microcontroller manages the overall system operation, while an LCD display provides real-time data on the charging process. A voltage sensor continuously monitors battery voltage, and LED indicators display system status. This method eliminates the need for physical connection, enhances automation, and promotes sustainable EV charging by utilizing clean solar energy.

WORKING THEORY



Power supply:

A power supply is a component that provides at least one electrical charge with power. It typically converts one type of electrical power to another, but it can also convert a different Energy form in electrical energy, such as solar, mechanical, or chemical

Rectifier:

A **rectifier** is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), which flows in only one direction. The process is known as *rectification*, since it "straightens" the direction of current.

Capacitors:

Capacitors are used to attain from the connector the immaculate and smoothest DC voltage in which the rectifier is used to obtain throbbing DC voltage which is used as part of the light of the present identity. Capacitors are used to acquire square DC from the current AC experience of the current channels so that they can be used as a touch of parallel yield.

Voltage regulators:

The 78XX voltage controller is mainly used for voltage controllers. The XX speaks to the voltage delivered to the specific gadget by the voltage controller as the yield. 7805 will supply and control 5v yield voltage and 12v yield voltage will be created by 7812.

Solar panel:

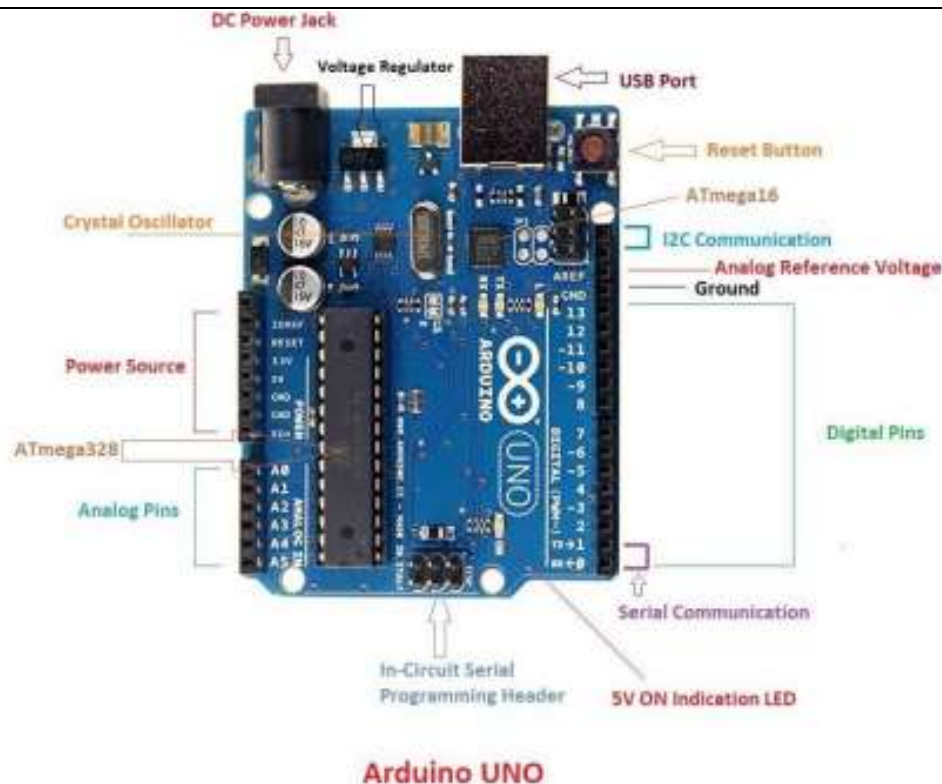
Photovoltaic solar panels absorb sunlight as a source of energy to generate electricity. A photovoltaic (PV) module is a packaged, connected assembly of typically 6x10 photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications.

Battery:

A rechargeable battery is an energy storage device that can be charged again after being discharged by applying DC current to its terminals.

Arduino:

Arduino Uno is a very valuable addition in the electronics that consists of USB interface, 14 digital I/O pins, 6 analog pins, and Atmega328 microcontroller. It also supports serial communication using Tx and Rx pins.



IR sensor: An infrared sensor is an electronic device, which emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These types of sensors measures only infrared radiation, rather than emitting it that is called as a passive IR sensor. Usually in the infrared spectrum, all the objects radiate some form of thermal radiations. These types of radiations are invisible to our eyes, which can be detected by an infrared sensor. The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode which is sensitive to IR light of the same wavelength as that emitted by the IR LED.

Voltage Sensor: This sensor is used to monitor, calculate and determine the voltage supply. This sensor can determine the AC or DC voltage level. The input of this sensor can be the voltage whereas the output is the switches, analog voltage signal, a current signal, an audible signal, etc. Some sensors provide sine waveforms or pulse waveforms like output & others can generate outputs like AM (Amplitude Modulation), PWM (Pulse Width Modulation) or FM (Frequency Modulation). The measurement of these sensors can depend on the voltage divider.

Relay: Most of the high-end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and a set of contacts. The switching mechanism is carried out with the help of the electromagnet.

There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays.

Light Emitting Diodes (LEDs): The Light emitting diode is a two-lead semiconductor light source. In 1962, Nick Holonyak has come up with an idea of light emitting diode, and he was working for the General Electric company. The LED is a special type of diode, and they have similar electrical characteristics of a PN junction diode. Hence the LED allows the flow of current in the forward direction and blocks the current in the reverse direction

Liquid Crystal Diode (LCD): LCD (Liquid Crystal Display) is the innovation utilized in scratch pad shows and other littler PCs. Like innovation for light-producing diode (LED) and gas-plasma, LCDs permit presentations to be a lot slenderer than innovation for cathode beam tube (CRT). LCDs expend considerably less power than LED shows and gas shows since they work as opposed to emanating it on the guideline of blocking light.

Software Requirements: To program and upload control logic to the Arduino UNO board, the system is created using the Arduino IDE platform. The tools are discussed in the following paragraph.

Arduino IDE: Arduino IDE where IDE stands for Integrated Development Environment – An official software introduced by Arduino.cc, that is mainly used for writing, compiling and uploading the code in the Arduino Device. Almost all Arduino modules are compatible with this software that is an open source and is readily available to install and start compiling the code on the go.



3. CONCLUSION

The solar-powered electric vehicle charging station presents an innovative and sustainable solution for efficient EV charging by utilizing renewable energy and wireless power transfer. By integrating a solar panel, battery storage, IR sensors for vehicle detection, and an Arduino-based control system, this method eliminates the need for physical connections, reduces dependence on grid electricity, and enhances automation. Real-time monitoring through an LCD display and voltage sensors ensures system efficiency and reliability. With its eco-friendly approach and potential applications in smart transportation, this project contributes to the advancement of green energy solutions, promoting a cleaner and more sustainable future for electric vehicle infrastructure.

4. REFERENCES

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- [2] WWW.IRJMETTS.COM